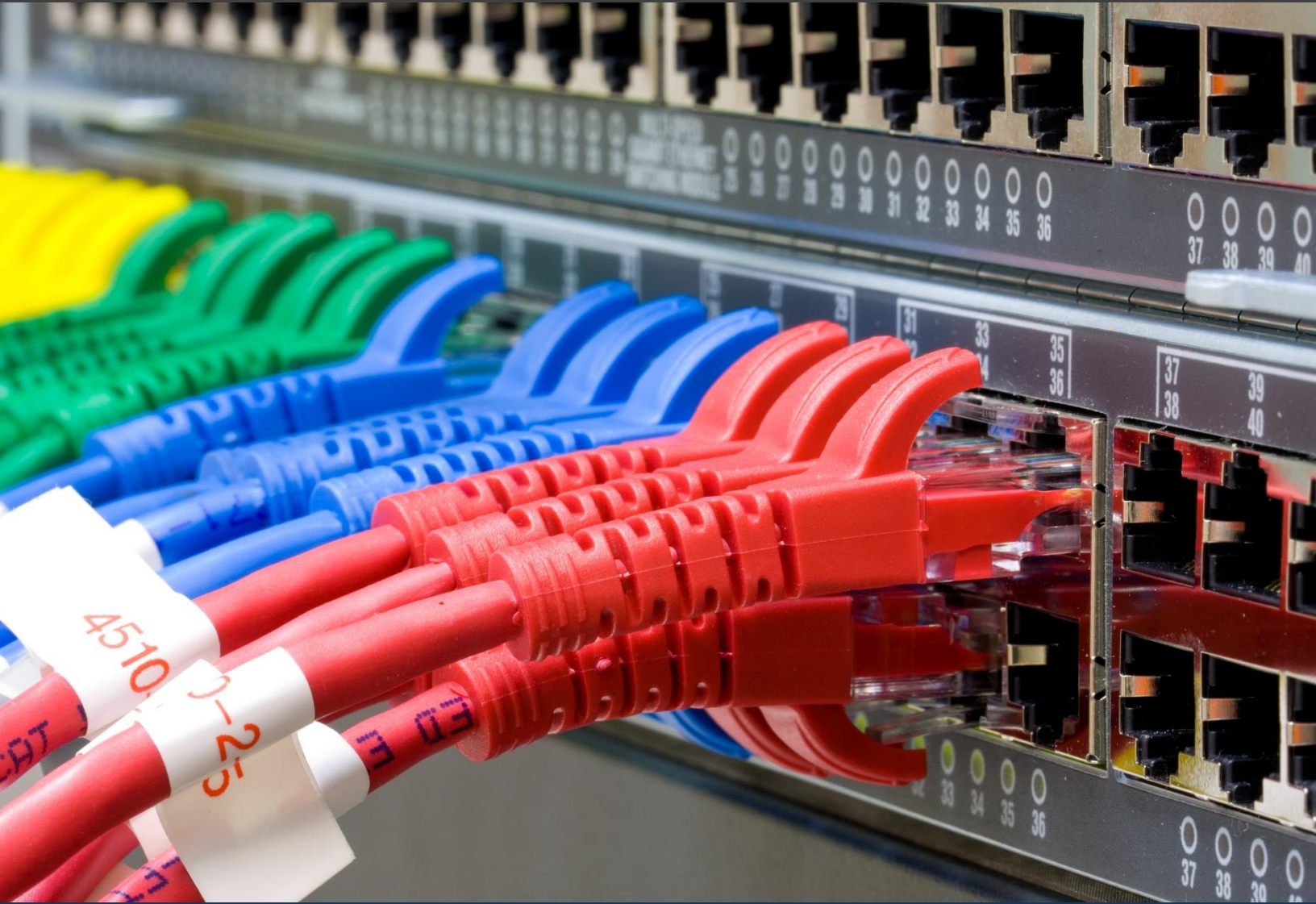


August 2, 2021



Clark County Broadband Study



Acknowledgements

West Central Wisconsin Regional Planning Commission (WCWRPC) would like to thank everyone who provided the assistance, input, and support that made this study possible. Special thanks to the following:

- Clark County Economic Development & Tourism Bureau
- Everyone who participated in the Clark County Broadband Survey
- Wisconsin Department of Public Instruction (*Thank you Kurt, Shelley, & Rachel*)
- Wisconsin Public Service Commission – State Broadband Office (*Thank you Jaron & Colter*)
- Scott Johnson, Tech Consultant, Loyal School District
- Tom Lange, VP of Information Technology & Chief Information Officer, Chippewa Valley Technical College
- Cities & Villages who participated in our Business Park Broadband Survey
- Participants in the June 2021 Broadband Workshop, including guest speakers Michael Bub, Taylor County Board of Supervisors and Greg Whelan of Greywale Advisors
- Eau Claire County Planning & Development for insights into their survey effort (*Thank you Rod*)
- Ookla® (*Ookla trademarks are used under license and reprinted with permission within this report*)
- The West Central Wisconsin Broadband Alliance members for input on the update of the community toolkit for broadband expansion

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APPENDIX A: Comments from the 2021 Broadband Survey

APPENDIX B: Broadband Expansion Tools for Local Communities



I. Introduction

In today's world, high-speed internet or broadband is essential to a strong economy and an exceptional quality of life. The COVID-19 pandemic has demonstrated the importance of broadband to daily living, including telecommuting, distance learning, telemedicine, and online shopping. And the pandemic has laid bare Wisconsin's digital divide with many rural areas at an economic, educational, and social disadvantage due to a lack of broadband service. A January 2021 University of Wisconsin-Madison Extension report¹ shows that Clark County is among the Wisconsin counties with the greatest lack of internet access. And a January 2021 Wisconsin State Journal article reported that Clark and Forest counties ranked near the bottom 10% of all U.S. counties in broadband access; not desirable press coverage when attempting to attract business investment and workforce. Such findings are not a surprise to many Clark County residents and businesses who lack the broadband access that they desire.

In response to such needs, West Central Wisconsin Regional Planning Commission (WCWRPC) has partnered with Clark County Economic Development Corporation (EDC) to conduct this study, which included the following activities:

- a County-wide broadband survey of residents and businesses;
- compiling all readily available broadband supply & demand data for Clark County in a single report;
- analyzing the above data to identify data gaps and better define current broadband supply and demand, which is important to building a business case for broadband investment and identifying potential partners; and,
- sharing a community broadband toolkit and suggestion on how the study's findings can be put into action.

An overarching goal of the study is to build community capacity and foster partnerships to address local broadband needs. This is a County-level analysis intended to supplement existing data with the web-based survey results to broadly identify broadband demand and service levels for generalized geographic areas. The study does not yield "last-mile" broadband supply and demand data for all addresses in Clark County and additional supply data was not obtained directly from Internet Service Providers (ISPs). The study provides insight into available broadband infrastructure and the demand from residents and businesses; special surveys, analysis, or strategies for specialized public-sector broadband services is not included, such as broadband technology and coordination for emergency services and educational institutions. Further, this study does not explore more detailed aspects of broadband access and barriers to adoption, such as affordability, digital literacy, and disabilities.

Identifying specific broadband expansion solutions primarily occurs at the local, community, or neighborhood level; such efforts vary by community or neighborhood and often require significant time and resources. As such, the study includes some initial recommendations for putting the findings into action, but does not offer community-specific solutions.

¹ University of Wisconsin-Madison Extension. *Broadband and the Wisconsin Economy*. The Wisconsin Economy Study Series No. 7. January 2021.

II. What is Broadband?

A. Broadband Definitions

Most residents who desire internet access have some level of access. However, having internet access is not the same as having broadband. Broadband is a high-speed data transmission in which a single cable (e.g., fiber, DSL, cable modem, power lines) or radio frequency (e.g., satellite, wireless, TV white space) can transfer or carry large amounts of data at one time. Most commonly,

Broadband is a high-speed data transmission in which a single cable or radio frequency can transfer or carry large amounts of data at one time.

broadband is used as a tool to access the internet. In this context, broadband is high-speed internet access that is always on and faster than the older dial-up access (e.g., dial-up modems). Due to equipment or local conditions, even some more current technologies may not consistently and reliably achieve the requisite high speeds to be considered broadband. And in today's world, broadband internet access has become as vital to local economies and quality of life as any other utility.

FCC Broadband Criteria. Currently, the Federal Communications Commission (FCC) defines broadband as a minimum of 25 Megabits per second (Mbps) download speed and 3 Mbps upload speed. This official Federal definition is often used by public-sector agencies when evaluating whether a community has broadband service. However, this definition is now five years old and societal demands for high-speed access have increased dramatically as more transactions and business occurs electronically. The Wisconsin Public Service Commission has a goal of covering 75% of Wisconsin with 100 Mbps down and 20 Mbps up by 2025. The Governor's Task Force on Broadband Access recently released their study report that included the goals of 50% of all homes and businesses in Wisconsin having access to 100 Mbps download speeds by 2025 and 90% by 2030; the Task Force did not set upload speed goals. Broadband speeds are discussed later in Section II.D.

Latency (sometimes called "Ping"). This is the reaction time of the internet connection measured in milliseconds (ms). It is an indicator of the time it takes between requesting information on the internet and when it arrives. For most end users it is difficult to distinguish between speed and latency, but an internet connection with good broadband speeds (high bandwidth) can still feel slow if latency is high. The best internet connections have high bandwidth/speeds and low latency. Generally, fiber optic broadband is going to have the lowest latencies over longer distances followed by cable modem, while satellite broadband will have the highest latencies (500-700 ms). While latency is not part of FCC's criteria for defining broadband, the FCC does require latencies below 100ms for certain grant programs.

Symmetrical Broadband. The FCC's broadband standard is asymmetrical with higher download speeds and lower upload speeds. 3 Mbps upload speed minimum standard is especially behind the times. Households and businesses are no longer using the internet to just download information. Symmetrical service is where download and upload speeds are equal or near equal. Symmetry is necessary for the efficient exchange of large amounts of information, including telecommuting, video conferencing, remote learning, and telehealth. Low upload speeds can result in "bottlenecking", dropped calls, and reduced productivity during high traffic periods. And high upload speeds are essential as more and more businesses, essential services, and households (as well as software companies) are turning to cloud-based services. The COVID-19 public health emergency has further increased the demand for greater symmetry.

Shared vs. Dedicated Service. Many high-speed internet platforms, including cable modem and Digital Subscriber Line (DSL), are shared-service systems with “up-to” speeds. On a shared-service, internet bandwidth is shared with other subscribers, and you may not get the highest speed at all times, especially during peak hours. There is variation in the speeds received on a shared network. The availability of service depends on the bandwidth usage of other users on the network. Dedicated internet access provides a dedicated fiber-optic connection from the business to the internet. The physical fiber path provided by this dedicated access gives dedicated bandwidth, so the full bandwidth is always available to a business when it is needed. Performance is always consistent and reliability is very high. This is essential to business performance and continuity of business operations.

Internet Redundancy. Natural hazards, accidental damage, and equipment breakdowns are a few ways in which an internet network can fail. A 2014 Gartner study found that the average cost of network downtime to a business was over \$300,000 per hour.² And repairing service can require hours. Damage to a fiber optic line in 2018 resulted in the loss of 9-1-1, phone, and internet services for nearly six hours in multiple Wisconsin counties. Such downtime can be mitigated through internet or network redundancy, such as distributing and looping the network in a way that clients can receive service from more than one source or geographic direction.

B. Broadband Technologies

The types of broadband technology fall into two general categories—wired and wireless.³

Common Wired Broadband Technologies

- **Dial-Up** internet access is an older technology using existing copper telephone lines and a modem, which made the funny sounds when connecting and “tied-up” your phone lines when in use. Due to its lower speeds, it is not considered a broadband service.
- **Digital Subscriber Line (DSL)** uses the existing copper telephone lines. It is faster than the older dial-up service by using entirely different frequencies. DSL-based broadband provides transmission speeds ranging from several hundred Kilobits per second (Kbps) to millions of bits per second (Mbps). The availability and speed of your DSL service may depend on the distance from your home or business to the closest telephone company facility as well as the quality of the phone lines. Because telephone cable is thinner in diameter than coaxial television cable or fiber, the DSL signal will degrade with distance and is only effective as broadband up to 2-3 miles without a repeater. DSL is often further separated into Asymmetrical (ADSL) and Symmetrical (SDSL); based on the PSC’s broadband data, SDSL is not available in Clark County. Related to DSL are **T1, T2, and T3 lines**, which pairs and uses bundles of copper wires to symmetrically transmit and receive data, potentially for speeds exceeding that of DSL.
- **Cable Modem** enables cable operators to provide broadband using the same coaxial cables that deliver pictures and sound to your TV set. They provide transmission speeds of 1.5 Mbps or more with speeds comparable to DSL. Transmission speeds vary depending on the type of cable modem, cable network, and traffic load.

² <https://blogs.gartner.com/andrew-lerner/2014/07/16/the-cost-of-downtime/>

³ The technology descriptions in this section are largely adapted from the FCC’s website: <https://www.fcc.gov/general/types-broadband-connections#wireless>

- **Fiber or Fiber-to-the-Premises (FTTP)** is the broadband “gold standard” with the greatest potential for reliable, symmetrical service at the highest speeds. 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. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps. The actual speed you experience will vary depending on a variety of factors, such as how close to your computer the service provider brings the fiber and how the service provider configures the service, including the amount of bandwidth used. The same fiber providing your broadband can also simultaneously deliver voice (VoIP) and video services, including video-on-demand.
- **Broadband over Powerline (BPL)** is a newer technology that is not widely used given related technical challenges (e.g., attenuation/signal loss, electromagnetic interference). BPL is the delivery of broadband over the existing low- and medium-voltage electric power distribution network using radio frequencies with speeds that are comparable to DSL and cable modem speeds.

Wireless Broadband Technologies

- **Wireless (Fixed or Mobile) broadband connects a home or business to the internet using a radio link between the customer’s location and the service provider’s facility.** Service quality generally requires a direct line-of-sight between the wireless transmitter and receiver, so this may not be the best solution for all areas. The coverage area can also be limited depending upon whether the broadcast spectrum in use is licensed or not (unlicensed fixed wireless must operate at lower power levels than licensed spectrum).
 - **Fixed Wireless** customers are stationary (e.g., a directional radio signal from a tower to a home or business) and this service can have speeds comparable to DSL and cable modem. An external antenna is usually required at the premises. If there is good line-of-sight, a fixed wireless tower may be effective up to 5-10 miles. According to a November 2020 report, fixed wireless technology fills over 90% of the wired gap in Wisconsin, which is the 6th highest in the Nation. “However, it is has been less effective at filling the gap at higher speeds. At 25 Mbps or greater, fixed wireless fills only 30% of the wired gap.”⁴
 - **Mobile Wireless** (i.e., cellular phone networks) broadband services are available from mobile telephone service providers and others. These services are generally appropriate

This study does not explore mobile wireless service data as an affordable long-term broadband alternative given its current weaknesses.

According to the Wisconsin Public Service Commission (PSC):

“The FCC has found that a fixed broadband service with a speed of 25/3 Mbps and a 4G mobile wireless are not functional substitutes for each other. The higher price, lower speeds and significant data caps that are common with mobile services limit the utility of those options when compared to a fixed alternative.”

*- Broadband Expansion Grant Program
Frequently Asked Questions, p.1*

It is not yet known if mobile 5G will be an effective and affordable broadband alternative for lower-density rural areas with varied topography.

⁴ Forward Analytics. “Broadband in Rural Wisconsin”. November 2020

for highly-mobile customers for use on smartphones, tablets, or laptops. These networks are generally optimized for larger numbers of non-stationary users, but this can be at the sacrifice of speeds and latency. Generally, they provide lower speeds, in the range of several hundred Kbps, and data plans can be costly and/or have limits. The newer 5G wireless technology is becoming more common with a promise of increased capacity, lower latency, and faster speeds, though it may be a few years before we know if 5G will be an effective (and affordable) broadband alternative for rural areas.

- **Satellite** broadband is wireless internet beamed down from satellites orbiting the earth using radio waves and some type of receiver (e.g., satellite dish). Downstream and upstream speeds for satellite broadband depend on several factors, including the provider and service package purchased and the consumer's line of sight to the orbiting satellite. While many types of broadband can be impacted by weather, satellite service in particular can be disrupted by the weather and other types of atmospheric interference. Generally, satellite broadband has a higher latency (slower data transfer) than DSL and cable modem due to the distance that the signals must travel resulting in lower speeds; many satellite services have difficulty delivering latencies less than the FCC 100ms standard. However, the SpaceX StarLink project, that is currently in testing, will use a network of low-orbit satellites to provide high speed, lower latency service with a goal of 1 gigabyte service (e.g., comparable to some fiber). One StarLink pilot project is underway in Eau Claire County and is worth monitoring, especially as more users are added to this service. At least one report suggests that it could still be a challenge for StarLink to stay under the 100ms latency threshold.⁵
- **TV White Space**, sometimes called Super WiFi or White Fi, is an emerging technology that uses unused parts of the radio spectrum (i.e., gaps between TV channels). It does not require line-of-sight, nor have the topographic barriers (hills, trees, etc.) of many other wireless services. Current speeds are in the 25-50 Mbps range. This technology is worth monitoring since the FCC adopted rules in October 2020 that would increase its potential use in rural areas. There are some limitation of transmission equipment and some customers may object to the installation of the required antennas.

Other wireless broadband concepts:

- **Wireless Local Area Networks (WLANs)** provide wireless broadband access over shorter distances and are often used to extend the reach of a "last-mile" wireline or fixed wireless broadband connection within a home, building, or campus environment.
- **WiFi (Wireless Fidelity)** is a wireless networking technology that allows devices and equipment to interface with the internet through an access point, such as a wireless router. Wi-Fi networks use unlicensed devices and can be designed for private access within a home or business, or be used for public internet access at "hot spots" such as restaurants, hotels, city parks, libraries, and busses. WiFi can be provided by many of the technologies above (e.g., fiber or fixed wireless to a municipal building that offers public WiFi).

Broadband access in low-density rural areas may use a mix of these technologies. For example, a fiber connection could provide service to a repeater that uses DSL over existing phone lines for the final two miles. Or the fiber could connect to a transmission tower with a fixed wireless point that provides fixed wireless broadband to homes and businesses within five miles if good line-of-sight exists.

⁵ <https://arstechnica.com/tech-policy/2020/06/fcc-has-serious-doubts-that-spacex-can-deliver-latencies-under-100ms/>

C. Broadband's Economic Importance

In today's business world, no matter what the industry, stable and fast internet connectivity is needed to stay current and competitive. This need is even more profound as most businesses, regardless of industry type or size, attempt to pivot their operations towards an online market and tele-work during the COVID-19 pandemic. Most sectors of the economy rely on the internet, and for many, high-speed internet is a necessity to operate efficiently and effectively, as reflected in the following examples:

- **Manufacturing:** Given the predominance of just-in-time and lean manufacturing models, customers expect instant insights into their orders and being able to respond to customer inquiries require reliable broadband connectivity. Manufacturers who must provide designs, orders, and other materials to suppliers or contractors need sufficient bandwidth to electronically exchange larger files. New technology equipment, such as 3D printing, which can provide innovation and increase production, rely on large internet bandwidth speeds to function.
- **Retail:** Online storefronts rely on a consistent internet network to finalize sales transactions and serve customers. The use of social media for online marketing also requires reliable broadband connectivity.
- **Finance:** Without high-speed, reliable broadband connectivity, financial transactions may not be able to be processed.
- **Health Care:** Electronic medical records systems as well as tele-medicine, financial billing, and insurance transactions depend on reliable broadband.
- **Agriculture:** Like most small businesses, internet access is important for communication, transactions, and management of farm operations. Further, many farmers are embracing technology and using precision agriculture techniques to help make nutrient management decisions and assist in planting, which benefits the farmer financially and the natural environment.
- **Tourism:** Broadband allows for online bookings, electronic marketing, cashless payment technologies, and is an increasingly necessary amenity to attract and retain guests and visitors.

Many other sectors of the economy, such as education, government, and agriculture, also rely on high-speed internet for efficient, effective operations. And over the past year, there has been a dramatic increase in the demand for reliable broadband among both the private and public sectors for tele-conferencing, distance learning, tele-commuting, and virtual customer services due to COVID-19. This heightened demand is expected to continue in the future, even once the current public health emergency has passed.

A 2011 Site Selection magazine article titled "The Importance of Broadband To Economic Development" details how corporate site selectors consider business broadband a critical piece of infrastructure when making location decisions noting that "The availability, quality, and competitiveness of broadband service have become and will continue to be a key issue for many locations." This still holds true today as companies look to locate in areas that are equipped to foster increased productivity, improved communications with supply chains, and services that allow them to market and sell goods electronically to consumers, especially during the COVID-19 health crisis. As an August 2020 article titled "4 Reasons Why Businesses are Choosing Fiber First" in the *Minneapolis/St. Paul Business Journal* notes "A business' broadband platform makes a difference on whether a company can keep up with customer demands, compete in their market and stay relevant. Speed matters to your clients and

customers. Research from HubSpot found that 82% of customers want an ‘immediate’ response to a sales or marketing question.”⁶

Corporate site selectors expect broadband; it is no longer seen as a “perk” or an added benefit, rather it is a requirement and a “must-have” for companies. “Specifically, a company is likely to require a direct fiber connection and redundancy. As with electric service, the reliability of the service is heavily scrutinized to ensure the operation will not be placed offline or that the risk of being offline is minimal.”⁷

Broadband is a critical piece of infrastructure for communities looking to attract new capital investment. Locations with inadequate connectivity are more likely to be passed over for projects requiring broadband and miss out on economic development opportunities. According to the research, various analyses have identified a positive correlation between broadband and economic growth. “With public and private investment in broadband infrastructure, communities lagging behind will be placed in an ever more competitive disadvantage.”⁸

This competitive disadvantage is further exacerbated when a community lacks broadband service for its residents and critical facilities. Broadband is now essential to quality of life, which influences the economy in a number of ways, such as:

- Clark County has been experiencing workforce shortages. Broadband is an asset to help attract workers as well as providing certain training programs. This is reflected by the fact that homes with higher broadband speeds typically have a higher home value.⁹ During a recent West Central Wisconsin Broadband Alliance meeting, Bruce King, the Government Affairs Director for the REALTORS Association of Northwestern Wisconsin, stated that the number one question that his realtors are receiving in rural areas is “How is the broadband?”
- When determining where to make a capital investment, quality of life factors are also considered by site selectors. For instance, will managers want to move their families to a community without broadband access?
- Broadband also supports many public-sector critical facilities and other essential services that are vital to the local economy and attracts workers and business investment (e.g., government, emergency responders, public utilities, schools, health care).

A broadband white paper prepared by Pierce County Economic Development Corporation¹⁰ noted the following key findings from Oklahoma State University research and a 2019 report:

- Rural areas with high broadband adoption had higher income growth.
- Broadband is associated with a 2% increase in employment rate and lower unemployment rates. There is also a positive correlation between broadband expansion and local employment growth.
- Broadband access has a positive effect on firm relocation decisions and broadband speed has impacts on rural entrepreneurship.

⁶ <https://www.bizjournals.com/twincities/news/2020/08/12/4-reasons-why-businesses-are-choosing-fiber-first.html>

⁷ *The Importance of Broadband to Economic Development*. <https://siteselection.com/issues/2011/sep/sas-optical-infrastructure.cfm>

⁸ *Ibid.*

⁹ <https://realtorparty.realtor/community-outreach/rural-outreach-initiative/news-resources/impact-of-broadband>

¹⁰ Pierce County Economic Development Corporation. *Exploring the Benefits of High-Speed Broadband for Pierce County*.

- Farmers without broadband access are willing to pay more in property taxes to support broadband investments.
- Broadband increases civic engagement and is a significant benefit for disadvantage residents in communicating with friends and family.
- Single-family homes with access to a 25 Mbps broadband connection have a price that is about \$5,977 (or 3%) more than similar homes in neighborhoods with 1 Mbps.

The Pierce County white paper went on to estimate that \$2.48 million to \$3.72 million in increased property value could be achieved in the county solely due to improved access to broadband. This, in turn, would directly result in increased tax revenue for local taxing jurisdictions.

Corning Optical Communications LLC, in Charlotte, NC, created the following excellent graphic that reinforces the necessity of broadband as the fourth utility—on par with water, gas, and electricity—in today’s world. In this context, treating broadband as a utility suggests that reliable, affordable broadband access is an essential right; it is not suggesting that broadband be made a public utility.

Broadband

The Fourth Utility

For communities to thrive in a global economy, broadband must join electricity, water, and natural gas as required utilities. The stakes couldn't be higher ...

Between 2010 and 2016, overall population declined in rural U.S. counties for the first time in history. **Lack of broadband is a contributing factor.**¹

With higher rates of chronic illness and overall poor health, **rural communities could benefit from telehealth services.**²

7 out of 10 teachers now assign homework that requires internet access, creating a homework divide where broadband is not present.³

Only 32.6 percent of rural libraries report having a fiber broadband connection, compared to 62.3 percent of their urban counterparts.⁴

66 percent of individuals age 35 and under living in MDUs get about half of their video content online.⁵

If communities are to keep pace with evolving mobile wireless technology, or 5G, **an extensive fiber-based backhaul network will be required.**

Smart communities require **robust broadband** for applications like precision agriculture, e-government, next-generation public safety (FirstNet), smart grids, and smart connected homes.

Let's connect on your vision of a brighter future for your community.
www.corning.com/muni

Broadband services enabled by robust fiber networks can make a difference, often making or breaking a community's ability to survive over the long term ...

Between 2005 and 2016, **output in the digital economy grew 5.6 percent per year.** Annual growth in total U.S. GDP by contrast, was just 1.5 percent.⁶

FTTH-available communities enjoy **46 percent better new business formation** compared to communities without fiber broadband services.⁷

Fiber-based broadband correlates with **higher property satisfaction.**⁸

Since the Sevier County School system in TN instituted a telehealth program, **84 percent of students treated via telehealth remain in school.**⁹

Thanks to a broadband grant from the U.S. Economic Development Agency, the Eastern Kentucky Concentrated Employment Program (EKCEP) **saved 142 jobs and created 25 new ones.**¹⁰

The **average revenue from a home-based business using FTTH (\$73,000)** far exceeds, cable broadband (\$43,000), DSL (\$38,000), and wireless (\$25,000).¹¹

When available, **rural markets enjoy better average take rates (63 percent) for fiber broadband** than urban (50 percent) or suburban (43 percent).¹²

CORNING

¹ Rural Economy and Population, USDA
² Rural Health Disparities, Rural Health Information Hub
³ Bridging a Digital Divide That Leaves School Children Behind, New York Times
⁴ Rural Libraries in the United States, American Library Association
⁵ Poptel LLC
⁶ Defining and Measuring the Digital Economy, Bureau of Economic Analysis, U.S. Dept. of Commerce
⁷ Fiber Broadband Association
⁸ The Tangible Value of Advanced Broadband to MDUs - RIA LLC
⁹ Health Care Hubs: The Future of Telemedicine and Broadband
¹⁰ Building the Broadband Economy, Broadband Properties Magazine
¹¹ © 2018 Corning Optical Communications. All rights reserved. COR-82-4EN / July 2018
¹² © 2018 Corning Optical Communications. All rights reserved. COR-82-4EN / July 2018

D. The Need for Speed

Broadband needs for businesses and anchor institutions (e.g., hospitals, schools, government) can be very different than for residential use. And greater speeds are necessary as the number of users/employees increases. However, broadband service is also essential for attracting and retaining the workforce upon which local businesses depend.

The internet is changing how we live, work, and play and broadband use is not limited to computers. More and more consumer products are web-capable and the **internet of things** (e.g., security systems, appliances, HVAC systems, health monitors, farming equipment, shipping/inventory logistics) requires network connectivity at both home and work to allow devices to generate, exchange, and consume data with minimal human intervention. For example, a 2020 *statistica.com* survey found that the average American household had ten connected devices. The projected global economic impact of the internet of things is estimated to be nearly \$15 trillion by 2025.¹¹

The following table shows that video streaming/conferencing and larger places of business require internet speeds well above the FCC definition:¹²

Internet speed (download)	Number of connected users/devices	What you can do
5 Mbps	1 or 2	Online browsing, research, email
25 Mbps	3 to 5	Large-file downloading, basic Wi-Fi, business communication
75 Mbps	5 to 10	Video streaming, frequent file sharing, numerous POS transactions
150 Mbps	10 to 15	Frequent cloud computing, video conferencing, data backups
250 Mbps	15 to 20	Server hosting, seamless streaming and conferencing
500 Mbps	20 to 30	Multiple-server hosting, constant cloud-based computing, heavy online backups
1 Gbps (1,000 Mbps)	30+	Extreme-speed operating for enterprise-ready offices with near-zero interruptions

Megabits vs. Gigabits

Broadband and internet speeds are most commonly defined in Megabits per second (Mbps). Generally, the higher the Mbps, the faster the speed. There are a 1,000 Megabits in 1 Gigabit. Having Gigabit (Gbps) service has become vital for attracting and growing manufacturing, research, medical facilities, and certain other businesses as well as the anchor institutions and other services that support the local economy and workforce.

¹¹ <https://towardsdatascience.com/internet-of-things-booming-15-trillion-market-88fde1da2113>

¹² <https://www.business.org/services/internet/business-internet-speed/>, March 19, 2020.

When considering the previous table, keep in mind that the average home now has ten connected devices as well as the number of connected devices in a modern business. Further, more and more software is cloud-based and online data backup is becoming more common and frequent. These trends and needed speeds are important to remember as you explore the remainder of this report. The broadband supply maps later in this study use comparable breakdowns of broadband download speeds when data allowed.

E. COVID-19 and Broadband Demand

COVID-19 has transformed the way people think about conducting business and daily functions. The Wisconsin Economic Development Corporation’s (WEDC) “Wisconsin Tomorrow – An Economy for All” report notes, much of that transformation relies on dependable, widely available internet connectivity.¹³ While all sectors of the economy have been encouraged to find alternative ways to conduct business in a “socially distanced” format (such as online storerooms and sales), many businesses are left behind as they don’t have the internet speeds and capacities to complete this necessary “transformation.” Without access to reliable broadband, businesses are cutoff from one of the most essential tools that can assist in recovery, especially during the COVID-19 health crisis. According to Broadband USA, 97 percent of Americans search online for local products and services, but just half of small businesses have websites. Additionally, small business owners report that using broadband increases sales and cost savings, creates jobs and retains sales and jobs. “Broadband unleashes entrepreneurship and empowers small businesses to compete online.”¹⁴

“Small town businesses must also be able to connect to the rest of the world to compete and offer the same level of services as any large city business”.

- Jeff Smith, Wisconsin Senator

In addition to identifying the impacts of COVID-19 on Wisconsin’s regions and industries, the WEDC report identified three key ways to mitigate the impact that COVID-19 has had on the state’s economy. These include: (i) teaching those dealing with unemployment new skills; (ii) entrepreneurship; and (iii) **broadband access**. The

report calls for greater broadband services, especially in rural areas where the lack of access impedes connections, including those for businesses looking for new ways to market products. It recognizes that broadband is critical to achieving the economic goals across the state. “From agribusiness to manufacturing, industry has underscored the need for strong and reliable internet connections to serve their rural-based customers, suppliers and employees.”¹⁵ The Wisconsin Department of Tourism also cites broadband as an essential strategy in rebuilding the state’s hard-hit tourism industry. The economy of Clark County relies heavily on tourism. By providing stable, reliable, high-speed broadband, tourism businesses can remain competitive.

During these challenging times of economic response and recovery, it will be even more important for Clark County and its communities to be development ready. Communities that have sites prepared, with efficient transportation and utility connections, including broadband fiber, will be better positioned to support, retain, and grow existing businesses who are pivoting to online sales and transactions as well as

¹³ *Wisconsin Tomorrow – An Economy for All*. Prepared by the Wisconsin Economic Development Corporation. https://wedc.org/wp-content/uploads/2020/06/Wisconsin_Tomorrow_Single_Page_Layout.pdf

¹⁴ Broadband USA. *Why does Broadband matter?* https://broadbandusa.ntia.doc.gov/sites/default/files/resource-files/bbusa_why_does_broadband_matter.pdf

¹⁵ *Wisconsin Tomorrow – An Economy for All*. Prepared by the Wisconsin Economic Development Corporation. https://wedc.org/wp-content/uploads/2020/06/Wisconsin_Tomorrow_Single_Page_Layout.pdf

to attract and accommodate the technology and communication needs of new businesses and the workforce. Having shovel-ready business sites also increases the resiliency of the investment area by allowing the economy to bounce back and grow much more quickly once the current public health emergency subsides. COVID-19 also exposed the rural digital divide with many rural households lacking adequate, affordable broadband service that prevented participation in distance learning and remote working/telecommuting as schools and places of employment closed their doors. These households also lacked the ability to use other internet services that mitigated the risk of COVID-19 exposure, such as tele-medicine and online shopping.

An August 2020 report evaluated trends and implications of the 2020 Pandemic Recession for rural community development. The report identified six important post-great recession rural trends, the first of which was the importance of broadband. It states, “as the importance of high-speed broadband has become central to business, life, and work, the importance of broadband access in rural America has grown as a priority issue.”¹⁶ The report goes on to identify four likely post-pandemic trends, all of which heightens broadband’s importance for rural communities to remain economically vibrant and competitive: (1) rising necessity of entrepreneurship, (2) expanding remote work, (3) increasing outsourcing of work, and (4) more urban-to-rural migration.

¹⁶ Entrepreneurial Ecosystems. *The 2020 Pandemic Recession-Future Trends: Implications for Rural Community Development*. August 2020.

II. Community Profile – Clark County

The purpose of this brief section is two-fold:

1. Provide a basic understanding of key socio-economic and development factors in Clark County that may influence broadband supply, demand, and related strategies.
2. Provide general background information that may be useful for future broadband-related grant applications.

A. Geographic Location

Clark County is located in west-central Wisconsin (see **Map 1**). With 1,215 square miles of surface area, Clark County is the seventh largest county in the State of Wisconsin. The county is bordered to the west by Chippewa and Eau Claire counties, to the south and west by Jackson County, to the east by Wood and Marathon counties, and to the north by Taylor County.

Clark County is comprised of all or parts of 46 civil divisions, consisting of 33 towns, five villages and eight cities. The City of Neillsville, with a 2017 estimated population of 2,405 is the largest community in Clark County and is also the county seat.

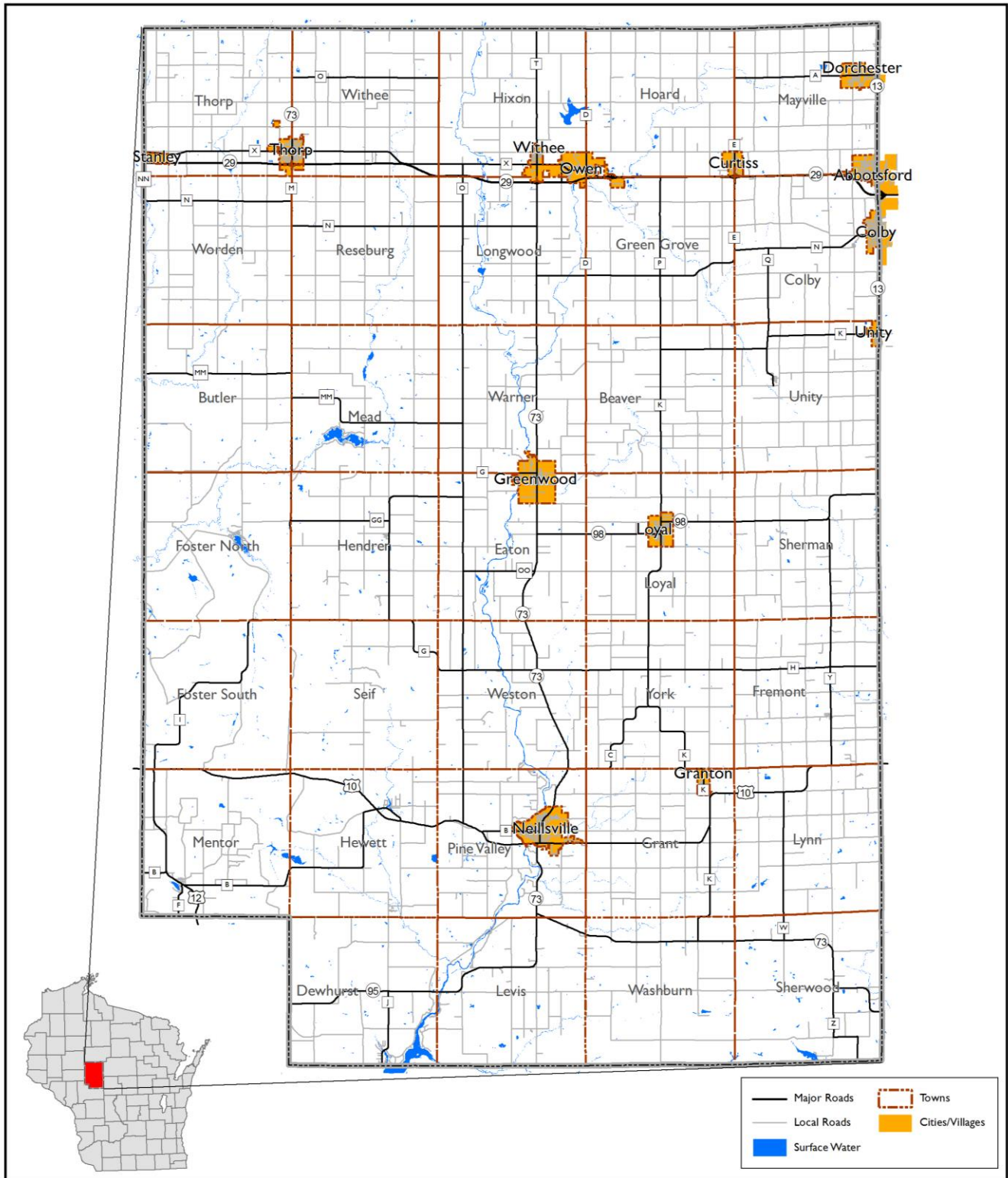
B. Topography and Land Cover

Topography and land cover can influence the feasibility of different broadband technologies and is also interrelated to development patterns, which are factors in both broadband supply and demand. In short, it may be more cost effective and financially feasible to provide different areas of Clark County broadband service in different ways due to, in part, the physical landscape.

As shown in **Map 2**, the topography of Clark County is generally gently rolling, becoming increasingly more rugged and hilly in the southwestern portion of the county where the most recent glacial activity had not eroded away the sandstone. Prime farm soils dominate the northeast and east central portions of the county, while forest, wetlands, and other undeveloped uses dominate the more poorly drained soils in the western and southern areas of the county.

Historically, Clark County's landscape was dominated by a range of vegetation that included various types of maple, birch, and pine. **Map 3** shows that Clark County's landscape today is dominated by Forest (39%) and Agricultural land (37%), with a significant amount of wetland areas (11%).

Map 1. Clark County Location and Municipalities



Map 2. Clark County Slopes

SLOPE

CLARK COUNTY, WI

Slopes

(in percent)

- ≤ 2
- ≤ 10
- ≤ 20
- ≤ 25
- ≤ 40

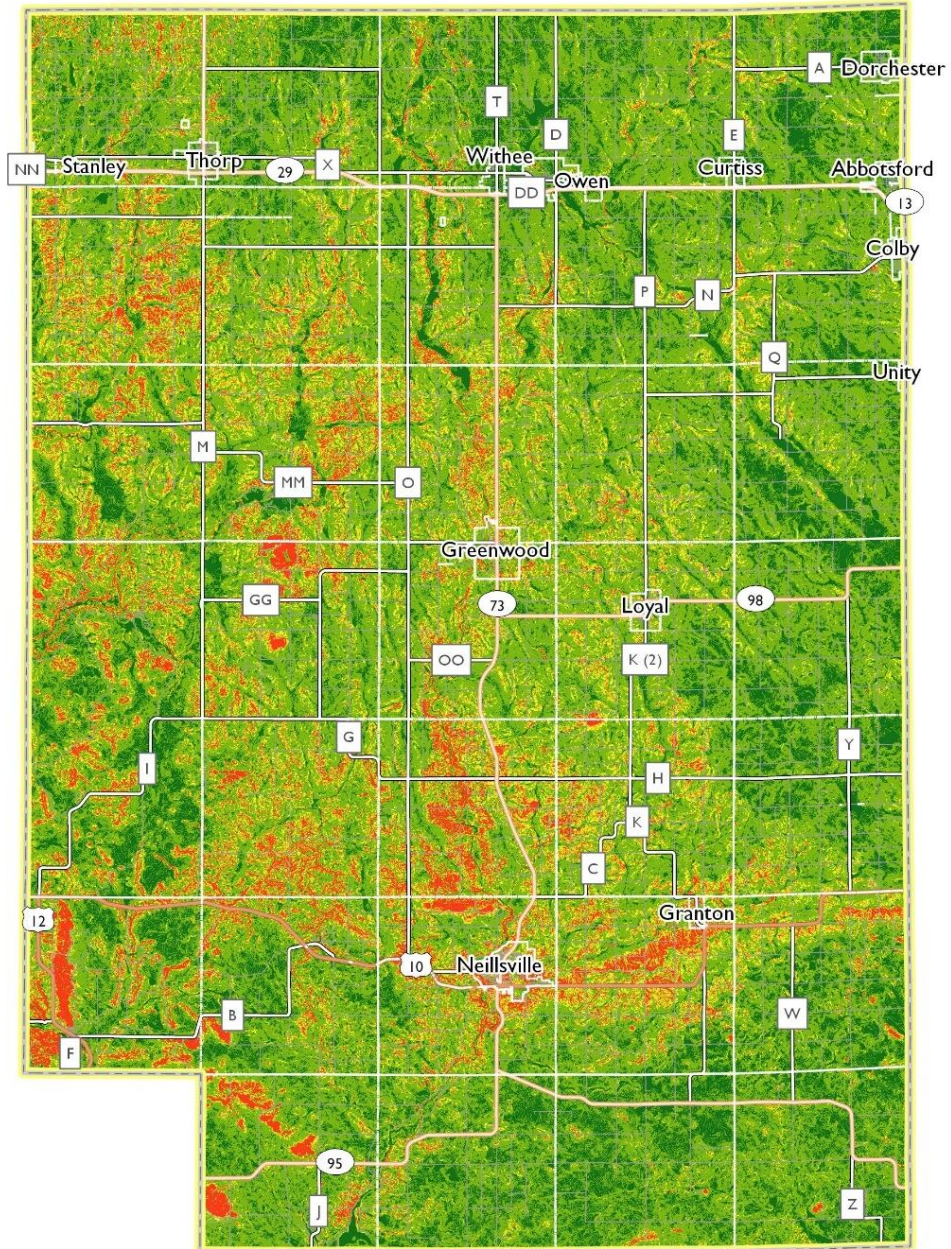
Municipal Boundaries

Clark County



September 2018

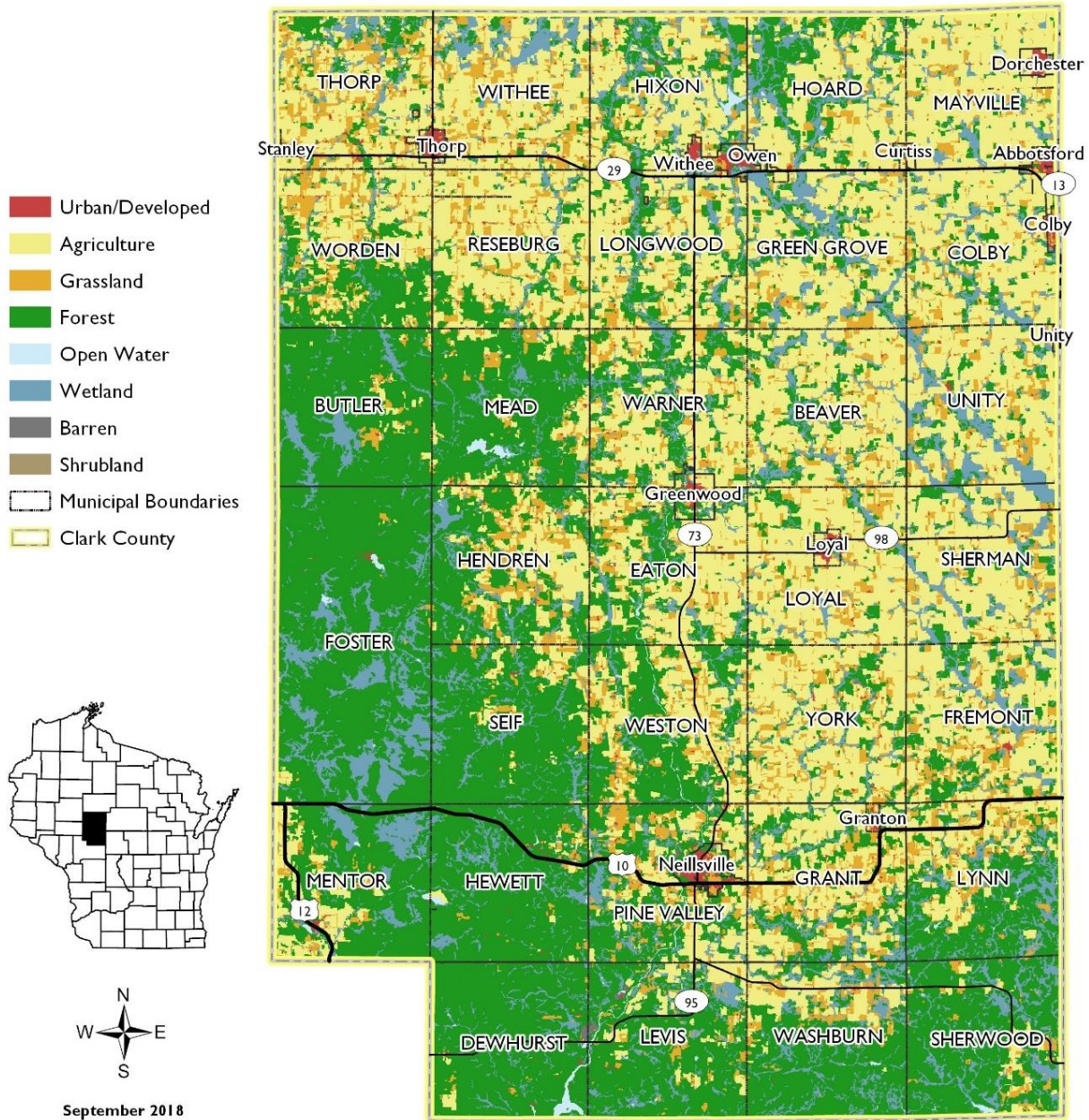
Data Sources:
WisDOT, Wisland 2016, Wisconsin
Department of Administration,



Map 3. Clark County Land Cover

LAND COVER

CLARK COUNTY, WI



- Urban/Developed
- Agriculture
- Grassland
- Forest
- Open Water
- Wetland
- Barren
- Shrubland
- Municipal Boundaries
- Clark County



September 2018

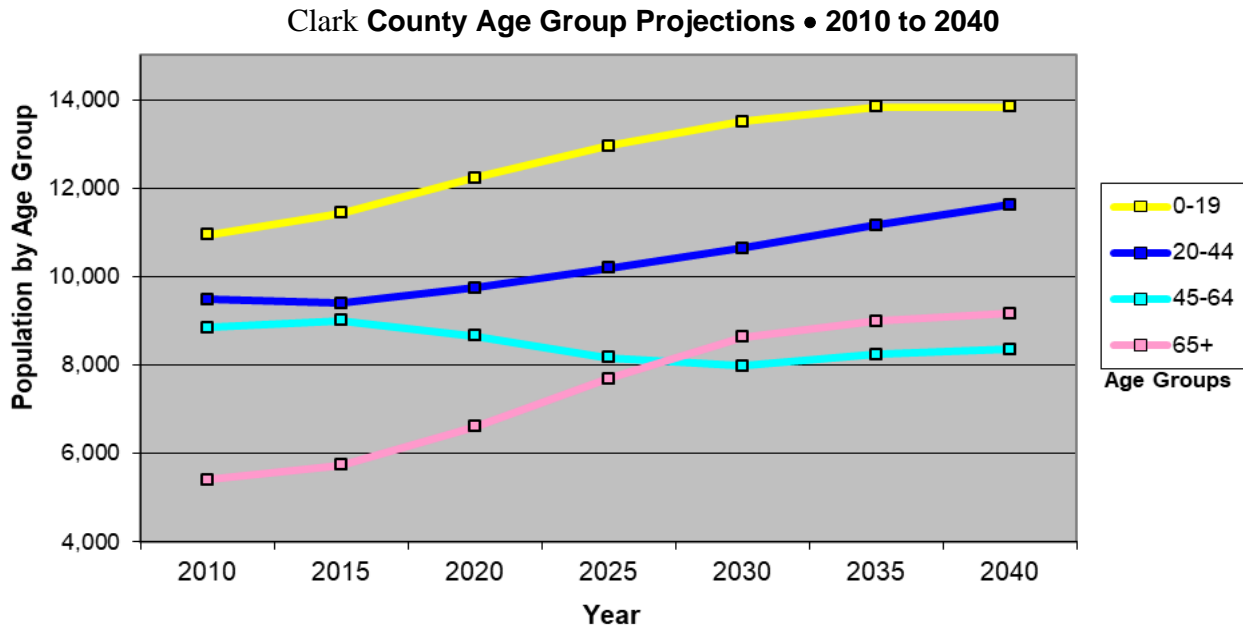
Data Sources:
WisDOT, Wisland 2016, Wisconsin
Department of Administration,



2018 HAZARD MITIGATION PLAN UPDATE

C. Demographics

At approximately 29 persons per square mile on average, Clark County is quite rural overall, and the percentage of the County’s population in unincorporated areas (towns) continues to slowly increase. According to the State’s official estimates prepared by the Wisconsin Department of Administration (WDOA), Clark County’s 2020 estimated population was 34,725, which represents a slight increase (+35) since the 2010 U.S. Census. However, the County experienced significant growth (+1,133 residents) between 2000 and 2010. As a result, in 2014, WDOA projected Clark County to be Wisconsin’s eighth-fastest growing county at 23.9% between 2010 and 2040 as reflected in the chart below.



source: Wisconsin Department of Administration, August 2014

The table on the following page shows the population change for Clark County communities between 1970 and 2020. Growth was influenced by a variety of factors, such as proximity to jobs, highway access, availability of farmland, and recreational amenities. Many of the fastest growing communities during the past forty years were in the eastern parts of the County and located closer to Wausau and Marshfield.

A number of towns with lake properties, such as Dewhurst, Mead, and Sherwood, also experienced relatively higher rates of growth since 2010. This does not necessarily equate to a proportional increase in new development, but in part represents seasonal homes being converted to year-round residences. This has been a regional trend over the past twenty-five years as retirees choose to move to lakefront and recreational properties. Telecommuting has the potential to strengthen such trends, if adequate, reliable broadband service is available.

Clark County Population Trends – 1970 to 2020

	Year						Percent Change				
	1970	1980	1990	2000	2010	2020	'70-'80	'80-'90	'90-'00	'00-'10	'10-'20
Towns	19,756	20,755	19,768	21,301	22,335	22,536	5.1%	-4.8%	7.8%	4.9%	0.9%
Beaver	775	777	703	854	885	879	0.3%	-9.5%	21.5%	3.6%	-0.68%
Butler	87	81	91	88	96	97	-6.9%	12.3%	-3.3%	9.1%	1.04%
Colby	887	800	846	908	874	897	-9.8%	5.8%	7.3%	-3.7%	2.63%
Dewhurst	90	132	197	321	323	337	46.7%	49.2%	62.9%	0.6%	4.33%
Eaton	600	663	640	665	712	716	10.5%	-3.5%	3.9%	7.1%	0.56%
Foster	53	111	85	95	95	96	109.4%	-23.4%	11.8%	0.0%	1.05%
Fremont	934	982	963	1,190	1,265	1,281	5.1%	-1.9%	23.6%	6.3%	1.26%
Grant	786	882	890	920	916	938	12.2%	0.9%	3.4%	-0.4%	2.40%
Green Grove	685	678	628	675	756	755	-1.0%	-7.4%	7.5%	12.0%	-0.13%
Hendren	582	570	542	513	499	503	-2.1%	-4.9%	-5.4%	-2.7%	0.80%
Hewett	198	301	314	314	293	297	52.0%	4.3%	0.0%	-6.7%	1.37%
Hixon	793	810	673	740	808	810	2.1%	-16.9%	10.0%	9.2%	0.25%
Hoard	895	881	805	821	841	833	-1.6%	-8.6%	2.0%	2.4%	-0.95%
Levis	365	433	492	504	492	495	18.6%	13.6%	2.4%	-2.4%	0.61%
Longwood	724	673	661	698	858	856	-7.0%	-1.8%	5.6%	22.9%	-0.23%
Loyal	827	882	757	787	826	832	6.7%	-14.2%	4.0%	5.0%	0.73%
Lynn	543	587	703	834	861	885	8.1%	19.8%	18.6%	3.2%	2.79%
Mayville	975	962	932	919	961	935	-1.3%	-3.1%	-1.4%	4.6%	-2.71%
Mead	220	303	249	290	321	337	37.7%	-17.8%	16.5%	10.7%	4.98%
Mentor	586	596	521	570	584	577	1.7%	-12.6%	9.4%	2.5%	-1.20%
Pine Valley	955	1,137	1,032	1,121	1,157	1,160	19.1%	-9.2%	8.6%	3.2%	0.26%
Reseburg	735	761	687	740	776	784	3.5%	-9.7%	7.7%	4.9%	1.03%
Seif	168	254	211	212	172	167	51.2%	-16.9%	0.5%	-18.9%	-2.91%
Sherman	667	766	736	831	882	917	14.8%	-3.9%	12.9%	6.1%	3.97%
Sherwood	190	173	195	252	220	230	-8.9%	12.7%	29.2%	-12.7%	4.55%
Thorp	871	743	710	730	808	824	-14.7%	-4.4%	2.8%	10.7%	1.98%
Unity	786	815	735	745	878	888	3.7%	-9.8%	1.4%	17.9%	1.14%
Warner	609	668	599	627	669	673	9.7%	-10.3%	4.7%	6.7%	0.60%
Washburn	344	276	310	304	290	285	-19.8%	12.3%	-1.9%	-4.6%	-1.72%
Weston	625	646	662	638	699	688	3.4%	2.5%	-3.6%	9.6%	-1.57%
Withee	791	859	767	885	966	988	8.6%	-10.7%	15.4%	9.2%	2.28%
Worden	559	650	575	657	666	705	16.3%	-11.5%	14.3%	1.4%	5.86%
York	851	903	857	853	886	871	6.1%	-5.1%	-0.5%	3.9%	-1.69%
Villages	1,668	1,814	1,948	2,098	2,068	2,047	8.8%	7.4%	7.7%	-1.4%	-1.0%
Curtiss	148	127	173	198	216	209	-14.2%	36.2%	14.5%	9.1%	-3.24%
Dorchester	520	613	697	823	871	852	17.9%	13.7%	18.1%	5.8%	-2.18%
Granton	317	399	379	406	355	350	25.9%	-5.0%	7.1%	-12.6%	-1.41%
Unity	172	166	196	163	139	136	-3.5%	18.1%	-16.8%	-14.7%	-2.16%
Withee	511	509	503	508	487	500	-0.4%	-1.2%	1.0%	-4.1%	2.67%
Cities	9,849	10,341	9,931	10,158	10,287	10,142	5.0%	-4.0%	2.3%	1.3%	-1.4%
Abbotsford	1,205	1,401	1,409	1,412	1,616	1,727	16.3%	0.6%	0.2%	14.4%	6.87%
Colby	869	1,151	1,116	1,156	1,354	1,305	32.5%	-3.0%	3.6%	17.1%	-3.62%
Greenwood	1,144	1,124	969	1,079	1,026	1,009	-1.7%	-13.8%	11.4%	-4.9%	-1.66%
Loyal	1,221	1,252	1,205	1,308	1,261	1,232	2.5%	-3.8%	8.5%	-3.6%	-2.30%
Neillsville	2,784	2,780	2,680	2,731	2,463	2,362	-0.1%	-3.6%	1.9%	-9.8%	-4.10%
Owen	1,037	998	895	936	940	913	-3.8%	-10.3%	4.6%	0.4%	-2.87%
Stanley	NA	NA	NA	NA	6	6	NA	NA	NA	NA	0.00%
Thorp	1,589	1,635	1,657	1,536	1,621	1,588	2.9%	1.3%	-7.3%	5.5%	-2.04%
Clark County	31,273	32,910	31,647	33,557	34,690	34,725	5.2%	-3.8%	6.0%	3.4%	0.1%

source: U.S. Census Bureau; 2020 estimates are from WDOA; includes Clark County residents only for those cities and villages in multiple counties.

In 2020, the County's median age was estimated at 37.8 years, below the State of Wisconsin average of 40.0 years. From 1980 to 2020, the average age of Clark County residents increased 7.4 years. In 2020, about 23.5% of Clark County's population was under the age of 15 and 15.6% is age 65 years or older.¹⁷ These population trends reflect two key factors:

- Like most rural areas in the region, the baby boomer generation is becoming a dramatically larger proportion of the County's population. Between 2010 and 2040, the number of residents ages 65 and over is projected to nearly double.
- Unlike most areas in the region, Clark County also has a relatively high natural increase rate of 4.0%. A high rate of natural increase typically indicates a comparatively young population and a high birth rate. In fact, the median age of residents ranks the County as the 11th youngest in Wisconsin.¹⁸ Meanwhile, net migration (people moving into the County minus those leaving) has been negative over the past decade.

Clark County cannot be simply classified as a "young" county because of its unique age distribution. The County substantially exceeds the state in the share of population under 18 years old AND share of population 65 and over. To put it simply, Clark County has a lot of children and a lot of senior citizens compared to the rest of the State. Part of this unique dynamic is caused by a significant Amish population. The Amish are generally associated with high birth rates and, consequently, a young population. The high share of population 65 or older is typical of rural counties.

Overall, Clark County's population is relatively homogenous, with 93.9% of the population in the white, non-Hispanic racial group as of 2020. However, the number of persons of other ethnicities has been growing, in particular those of Hispanic or Latino ethnicity, which now constitutes about 5.3 percent of the County's population. While the 2018 average age of the County's overall population was 37.9 years, the average age of the Hispanic population was much lower at 23.6 years. A majority of the County's Hispanic population resides in the northeastern part of the County.

Obtaining estimates of Clark County's Amish and Mennonite population (Plain Community) is difficult. One 2013 study of the Amish population estimates that Clark County is the 19th "most Amish" county in the United States, with 2,093 Amish residents or about 6.3 percent of the total County population.¹⁹ Some local officials have stated that Clark County's Amish and Mennonite population is significantly higher and as much as 30 to 60 percent of the County's total population. The households, schools, and businesses of Clark County's Plain Community are distributed over much of the County within the unincorporated towns. This has significant ramifications for broadband planning. Amish households do not have electricity and have little or no broadband demand. Technology and internet use among the Mennonite communities varies by order or sect. For example, some within the Mennonite community of the Thorp-Owen-Withee area use technology, mostly for business purposes, while some Mennonite families elsewhere in the County use horse and buggy, have electricity, but no television.

A significant proportion of the Clark County population has a disability, which can also influence broadband demand and adoption. According to a 2019 U.S. Census estimate, 12.1% of the County's non-institutionalized civilian population had a disability compared to 11.7% at the State level. This, in

¹⁷ ESRI Community Analyst estimate based on U.S. Census Bureau data. February 2021.

¹⁸ U.S. Census Bureau. American Community Survey 2011-2015.

¹⁹ Donnermeyer, Anderson, and Cooksey. *The Amish Population: County Estimates and Settlement Patterns*. Journal of Amish and Plan Anabaptist Studies, Volume 1, Issue 1, April 2013.

part, reflects the County’s growing senior population; 68.5% of residents with a disability were over the age of 65.

D. Local Economy

For purposes of this study, this subsection focuses on two components of the local economy-- household income and the business mix.

Household Income

Household income is important when considering broadband affordability. As explained in Section I, this study does not delve deeply into broadband adoption factors, such as affordability, though this should not minimize its importance when identifying broadband strategies. In fact, the Wisconsin Public Service Commission’s *State Broadband Plan* includes the following goal:

75% of [Wisconsin] households with income below 200% of the federal poverty level have access to fixed home internet service at a cost of less than \$25 per month by 2025.

As shown in the table below, the County’s median household income of \$42,777 is significantly below that of the State median. And **Map 4** on the next page shows that this median can also vary significantly by community or area (in this case by census tract).

Median Household Income, 2010-2019

	2010	2019	% change
Clark County	\$42,777	\$54,012	26.3%
Wisconsin	\$49,001	\$61,747	26.0%

Source: U.S. Census Bureau, 2010 & 2015-2019 American Community Survey

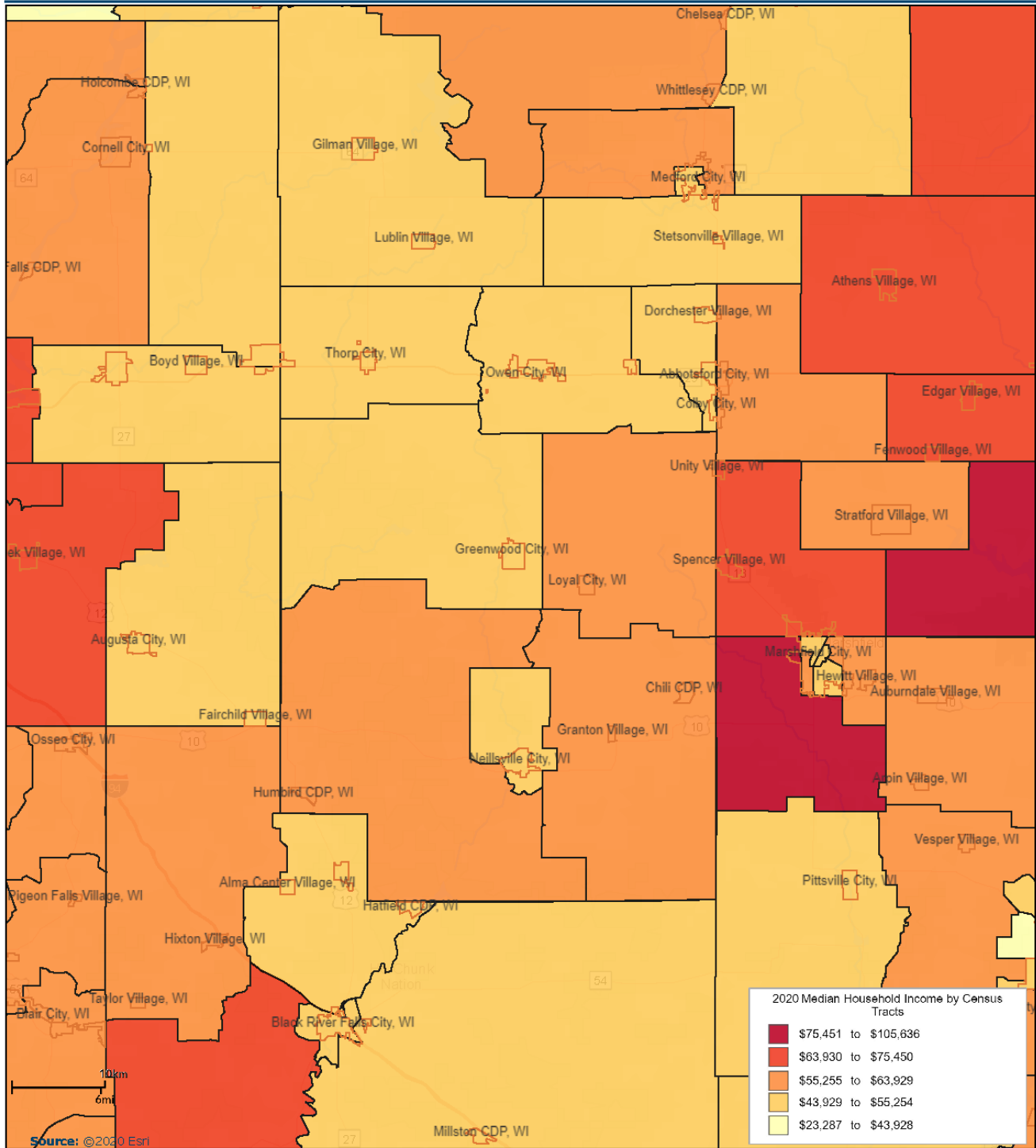
The following additional demographics from the U.S. Census 2015-2019 American Community Survey (ACS) for Clark County can influence broadband affordability and adoption:

- 24.5% of owner-occupied households with a mortgage were spending more than 30% of their income on housing costs, which is considered unaffordable.
- 29.6% of renter households were spending more than 30% of their income on housing costs, which is considered unaffordable.
- 12.1% of the population and 8.2% of families are below the poverty level, compared to 11.3% and 7.2%, respectively, at the State level.
- 17.8% of the population has less than a high school education, compared to 7.8% at the State level.

Map 4. Clark County Median Household Income by Census Block



Median Household Income



March 28, 2021

United Way has also studied the financial hardship of American families and created their ALICE index to compare incomes to a range of essential household costs (e.g., housing, child care, food, transportation, health care). The 2018 ALICE Household Survival Budget for Wisconsin estimated that a family of four (2 adults, 1 infant, 1 preschooler) required an annual income of \$68,472 to meet these essential needs, which is significantly higher than the Federal poverty level of \$25,100 for a family of four. The United Way estimated that 42% of Clark County households live below the poverty + ALICE level, which further supports that income is very limited for many residents and is a potential barrier to broadband adoption.²⁰

Business Mix

As explained previously in Section III.D., different businesses have different broadband needs. This section provides an overview of the business and industry mix and distribution of Clark County. The table below shows the jobs and number of businesses in Clark County by industry. Based on federal data, this information does have some weaknesses, such as excluding many of the smallest businesses.²¹

Clark County Industry Mix, 2020

Description	2020 Jobs	2020 Payrolled Businesses	2020 L.Q.
Manufacturing	3,556	68	3.46
Government	2,161	98	1.09
Agriculture, Forestry, Fishing and Hunting	1,321	61	8.30
Retail Trade	1,036	101	0.81
Health Care and Social Assistance	944	139	0.56
Construction	888	104	1.18
Transportation and Warehousing	785	57	1.52
Other Services (except Public Administration)	589	58	0.85
Wholesale Trade	524	62	1.09
Accommodation and Food Services	479	57	0.46
Administrative and Support, including Waste Management	227	17	0.28
Finance and Insurance	192	33	0.35
Professional, Scientific, and Technical Services	157	30	0.18
Information	71	12	0.30
Educational Services	69	1	0.21
Arts, Entertainment, and Recreation	60	7	0.28
Real Estate and Rental and Leasing	44	4	0.19
Utilities	35	3	0.77
Management of Companies and Enterprises	18	4	0.10
Mining, Quarrying, and Oil and Gas Extraction	13	2	0.26

source: EMSI complete employment, December 2020

²⁰ United Way. *ALICE in Wisconsin: A Financial Hardship Study*. 2020.

²¹ Since these numbers are largely based on unemployment insurance and other such employment filings to the federal government, many small businesses without employees are not included in these numbers, including most small, family farms. Further, the numbers are sometimes reported for the location of the main offices of the place of business, which may be in a different community or counties than some of its ancillary businesses sites.

Manufacturing is the top job-producing industry within Clark County, with approximately 3,556 jobs reported in 2020. The types of manufacturing within the county are diverse, with food manufacturing accounting for 42% of jobs as represented by the large facilities of Grassland Dairy Products Inc. in Greenwood and Abbyland Pork Pack Inc. in Curtiss. Machinery and fabricated metal product manufacturing together account for 31% of the manufacturing jobs within the County.

In addition to being home to large manufacturing companies, Clark County communities also thrive on small-to-mid-size businesses. Retail trade made up approximately 8% of all jobs within the County in 2020. Among the retail industry cluster are car dealerships, supermarkets, gas and convenience stores, hardware stores, automotive parts and accessories stores, and other business types.

Also included in the previous table are location quotient numbers for each industry within the County. Location quotient (L.Q.) is a “snapshot in time” of how concentrated or clustered each industry is within the area. L.Q. can also reflect the importance of an industry sector on the local economy and an economic strategy might focus on supporting and building upon these economic drivers and their supply chains. Not surprising, Clark County has 8.30 times more agriculture, forestry, fishing, and hunting jobs compared to the national average. And given its high L.Q. and total number of jobs, ensuring that the manufacturing sector has the broadband service it needs to thrive and grow is vital to the Clark County economy, including the role of broadband availability in the attraction and retention of workers.

E. Critical Facilities and Anchor Institutions

In 2011, the Wisconsin Broadband Office within the Public Service Commission (PSC) engaged stakeholders from west-central Wisconsin to develop a regional broadband investment plan. This plan recommended a strong initial focus on ensuring the connectivity of anchor institutions (e.g., schools, libraries, hospitals, major governmental offices, business/industrial parks) due to their economic and social importance. And the plan concluded that the extension of broadband service to underserved anchor institutions would be a step forward to creating needed partnerships and, then, extending additional connections to area residents and businesses.

The Clark County Land Information Office has been proactive in its development of databases that identify many of the critical facilities in the County, in part for emergency management purposes. The *Clark County Multi-Hazard Mitigation Plan* adopted in 2020 identifies the general location of many of the County’s critical facilities as shown in **Map 5**, including:

- government buildings (113 mapped)
- community wastewater treatment facilities, wells, and drinking water systems (87 mapped)
- fire/EMS departments (11 mapped)
- law enforcement offices (7 mapped)
- pre-K through 12 schools (20 public and 46 private, including 17 Amish, 19 Mennonite, and 10 parochial, mapped)
- licensed childcare centers (21, not mapped)
- hospitals and primary clinics (2 hospitals mapped, primary clinics unmapped)
- radio and cell towers (16, not mapped)
- long-term care facilities (5 nursing homes, 8 CBRFs, 16 adult family homes, and 3 residential care assisted living apartments mapped)

Map 5. Clark County Critical Facilities

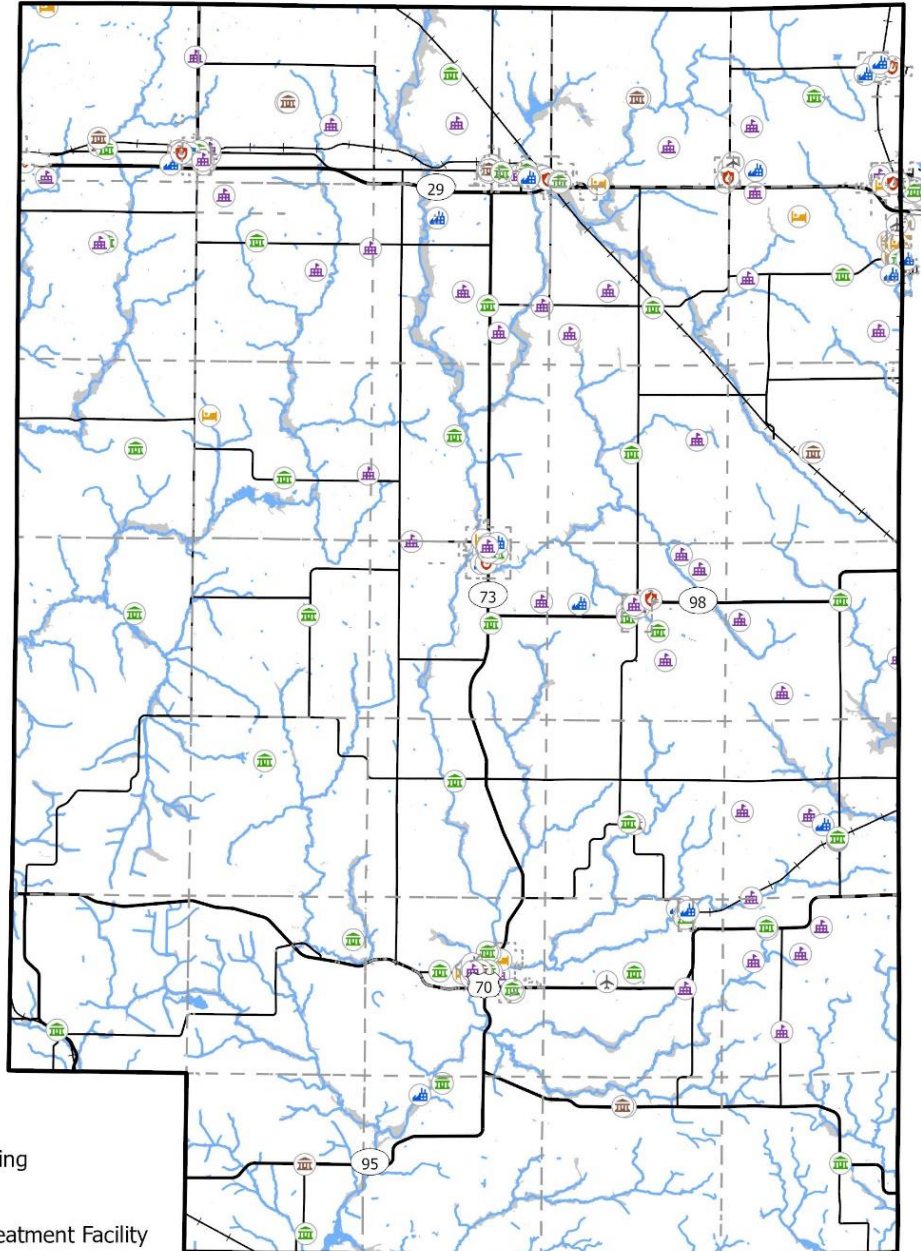
CRITICAL FACILITIES

CLARK COUNTY, WI

2020

HAZARD MITIGATION
PLAN UPDATE

THORP	WITHEE	HIXON	HOARD	Dorchester
THORP	Withee	Withee	HOARD	MAYVILLE
WORDEN	RESEBURG	Owen	GREEN	Abbottford
		LONGWOOD	GROVE	Colby
BUTLER	MEAD	WARNER	BEAVER	Unity
		Greenwood	LOYAL	SHERMAN
FOSTER	HENDREN	EATON	SEIF	WESTON
		YORK	GRANT	FREMONT
HEWETT	NEILVILLE	GRANT	LYNN	
MENTOR	PINEVALLEY			
DEWHURST	LEVIS	SHERWOOD	WASHBURN	



Critical Facility

- Airport
- Police Station
- Fire & Rescue
- Government Building
- Other Government Building
- School
- Water or Wastewater Treatment Facility
- Hospital
- Long Term Care Facility
- School
- FEMA 100-Year Floodplain
- Municipal Boundary



Data Source: WisDHS, FEMA, Clark County

The previous list is primarily based on those facilities that have been mapped by Clark County as GIS data layers and available in the Mitigation Plan. While this critical facilities database continues to be improved, not all facilities are yet mapped, so the above list is not complete.

There is not a survey or inventory available that states broadband service levels for all of the previous critical facilities. For some, such as public schools and hospitals, high bandwidth broadband service is imperative. The demand for broadband service is growing for many critical facilities as more and more essential functions are now performed digitally. Not surprisingly, higher concentrations of the mapped critical facilities are located in the cities and villages where broadband service is generally better as will be later discussed. During this study, WCWRPC surveyed the cities and villages to obtain insights into broadband availability at their business/industrial parks, which is later discussed in Section IV.D.

F. General Development Pattern

Clark County has an overall population density of about 29 persons per square mile, which is much less than the State of Wisconsin density of 107 persons per square mile of land area. While 65% of the County's population is concentrated in the unincorporated towns, the density in these towns drops to 18.8 persons per square mile in comparison to 717 persons per square mile in the incorporated cities and villages.

Maps 6 and 7 on the following pages show the residential development distribution and density in Clark County based on residential parcels with taxable improvements, which largely parallels the population density. While 61% of all improved residential parcels in the County are located in the unincorporated towns, these developed, taxable parcels are spread over a much larger area. However, the population and residential density is also not evenly distributed throughout the County as shown. Non-taxable parcels (e.g., non-profit housing) and rental properties assessed as commercial are not included in these maps. The density heat map in particular will be helpful in understanding some of the broadband service data results in later sections.

Not surprisingly, the County's non-agricultural businesses are also concentrated in its cities and villages. However, nearly one-third (29%) of Clark County's improved commercial and industrial parcels are located in the unincorporated towns, which further supports that the economic importance of broadband access is not limited to the County's cities and villages.

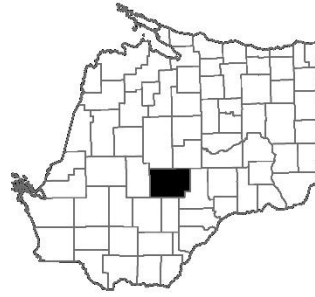
Map 6. Clark County Improved Residential Parcels

Clark County Broadband

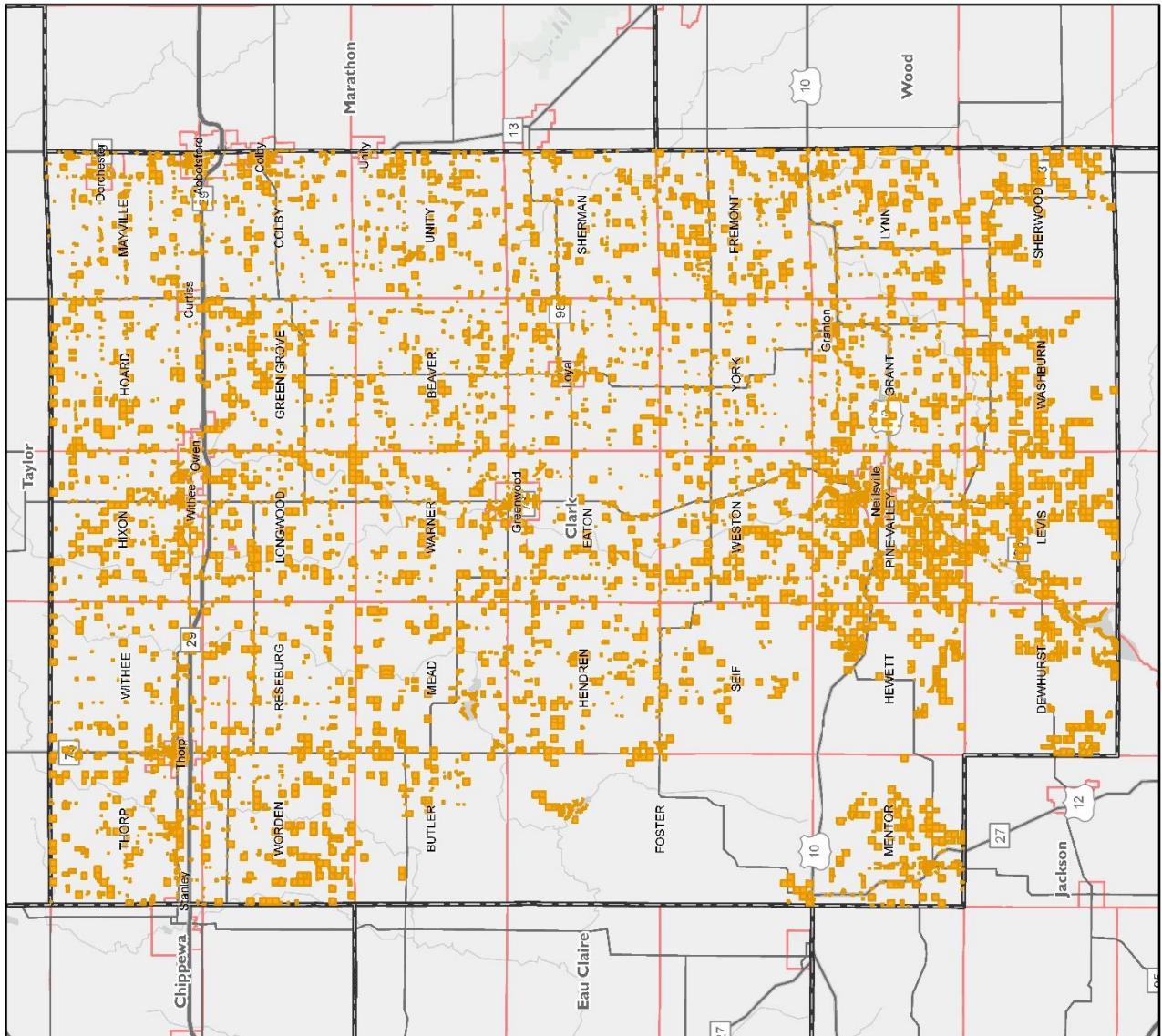
May 2021

2020 Residential Land Use Map

- Improved Residential Parcels
- Municipal Boundaries
- County Boundaries



Data Sources:
Wisconsin Parcel Database - 2020.



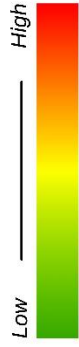
Map 7. Clark County Residential Density Heat Map

Clark County Broadband

May 2021

2020 Residential Land Use Map

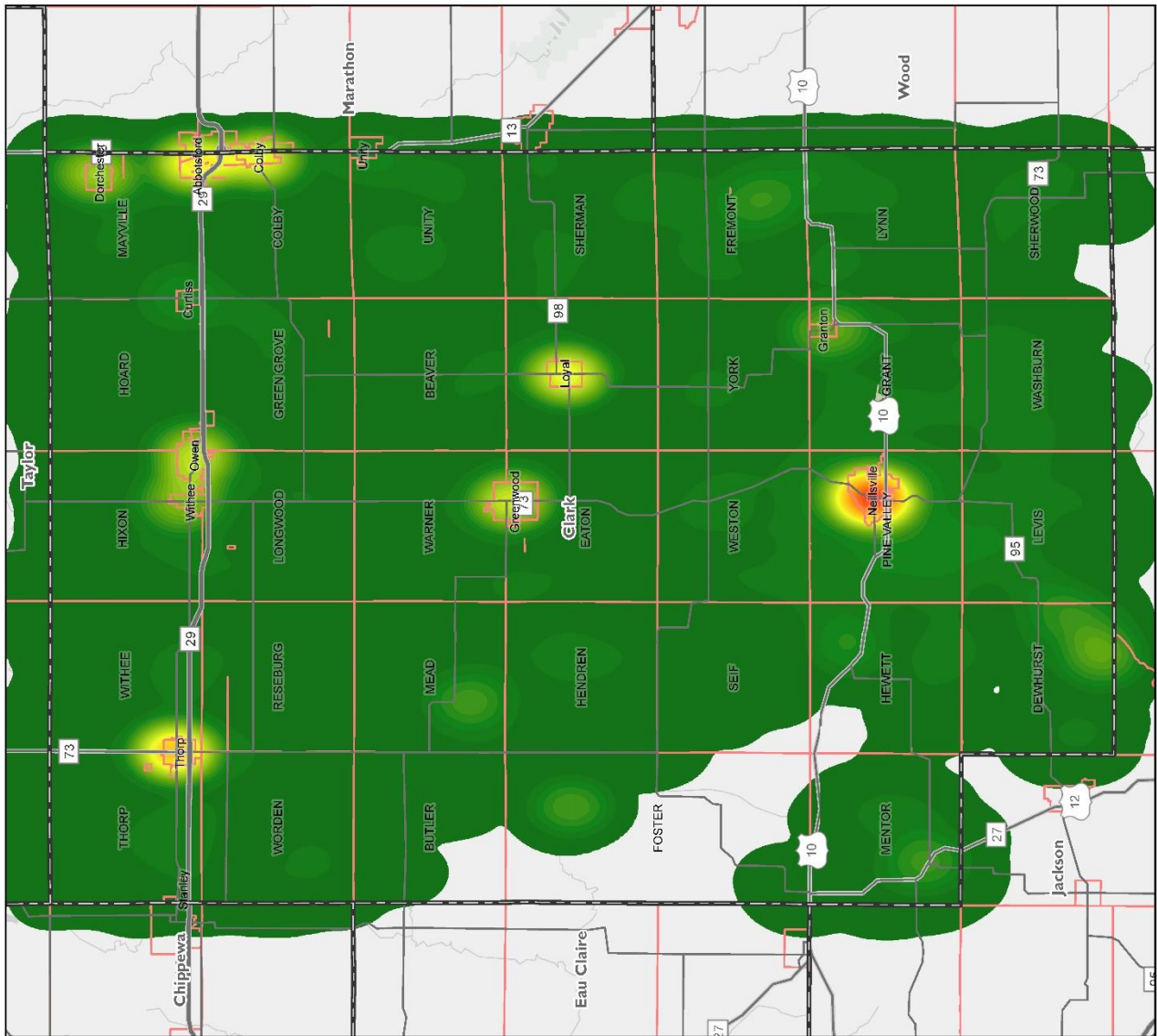
Kernel Density of All Improved Residential Parcels



- Municipal Boundaries
- County Boundaries



Data Sources:
Wisconsin Parcel Database - 2020.



IV. Current Broadband Supply

This section primarily provides an overview of the current state of broadband supply (available broadband services) in Clark County from readily available sources. This section is further supplemented by the County Broadband Survey results in Section V, the Ookla® analysis in Section VI, and the Wisconsin Department of Public Instruction data in Section VII.

A. FCC & PSC Data

The Public Service Commission’s Wisconsin Broadband Office (WBO) has a wealth of data and maps available at their website including the interactive *Wisconsin Broadband Map*.²² WBO staff was very helpful in providing support to WCWRPC in the download of the data used for the maps and tables in this sub-section.

The data and maps in this sub-section are primarily drawn from internet service provider (ISP) reporting to the Federal Communications Commission (FCC) via Form 477, while the CAF2, ACAM, and RDOF maps are also taken from data originally compiled by the FCC for these grant programs. See the text box to the right (and footnote below) for some very important factors to consider when considering maps and data derived from Form 477 reporting.²³

About FCC Form 477 Reporting and “Advertised Speeds”

FCC Form 477 is the original data source for many of the maps in this sub-section. All facilities-based ISPs are required to file data with the FCC twice a year (Form 477) on where they offer Internet access service at speeds exceeding 200 kbps in at least one direction.

There are two important factors to remember:

(1) Fixed providers file lists of census blocks in which they can or do offer internet service to at least one location. Rarely, some ISPs may provide more detailed mapping to the WBO. So, while a map may suggest that an entire census block has the reported broadband service available, this is often not the case and only one customer may be connected within that entire block. To confuse things further, on occasion, an ISP may only report those census blocks in which they have a franchise agreement with a municipality or are exclusively allowed to cover; they may also provide some service in an unreported area.

(2) ISPs report their “advertised speed.” Actual speeds can be significantly lower. A 2020 Purdue study found that “on average, FCC advertised download speeds were 10.7 times higher than average [M-Lab] test speeds in the country compared to 7.4 times regarding upload speeds.” The report also found that advertised speeds are closer to the speed test results in urban counties, while the gap in rural counties is larger. This is very important and justifies the need for studies such as this. Higher, inaccurate reported speeds may deter much needed investment, especially in rural areas such as Clark County, if the State and Federal governments are basing policy and financial decisions on advertised speeds (and not actual speeds). As explained in the Purdue article and Section VI, actual speeds will differ for numerous reasons, including some factors not controlled by the ISPs, such as the choice in subscription plans by the end user.

²² <https://psc.wi.gov/Pages/Programs/WBO.aspx>

²³ The text box references the following article from Purdue Center for Regional Development regarding advertised vs. actual broadband speeds: <https://pcrd.purdue.edu/the-real-digital-divide-advertised-vs-actual-internet-speeds/>

Broadband Availability

The first five maps within this subsection were created largely based on FCC Form 477 reporting and show:

- **Map 8.** WBO's Combined Fixed Technologies Advertised Speeds
- **Map 9.** Wireline Advertised Download Speeds
- **Map 10.** Wireline Connection Types
- **Map 11a.** Fixed Wireless (non-satellite) Advertised Download Speeds
- **Map 11b.** Fixed Wireless (non-satellite) Advertised Download Speeds (June 2021)
- **Map 12.** Satellite Advertised Download Speeds

When considering these maps, keep in mind the definitions and strengths/weaknesses of the various broadband technology types discussed in Section II.B. It is also useful in comparing these maps to the findings in other study sections to gain a better understanding of the actual experiences of the customers.

These five maps suggest the following:

- Clark County's current broadband picture is complicated and challenging.
- As reported by the ISPs themselves, most of Clark County lacks internet service that meets the FCC minimum broadband standard of 25 Mbps down and 3 Mbps up, unless satellite service is used. Even fewer areas meet the PSC's 2025 goal of 100/20 Mbps. Again, keep in mind that the census block data overstates the size of the geographic area being served.
- The wireline connection type map shows that there is very limited fiber or cable modem service available. Most wireline connections are being made through phone lines using DSL. As discussed in Section II.B., DSL is only effective as broadband up to 2-3 miles without a repeater before the quality and speed of the connection begins to suffer.
- Until recently, the fixed wireless map (Map 11a) suggested that this technology does not meet the minimum broadband standard anywhere in the Clark County. This changed significantly in June when newer data was released (Map 11b). As part of this newer data, Country Wireless and Bug Tussel reported providing wireless service over much of Clark County at speeds of 50/6 and 25/5 respectively. These may be a newer service since no test data supporting these speeds were discovered during this study.
- The advertised download speeds on the satellite map suggests that broadband service is available countywide. However, Section II.B. discusses some of the weaknesses with satellite service, including very high latency, which can impact the actual experience of the end user.






Also concerning is that Federal and State grant programming often use this data as a starting point for broadband programming and grant eligibility. As discussed previously, the data over-represents actual speeds and geographic availability; it can appear that more areas are served with higher speeds than actually experienced by the customers. This can impact both overall grant program budgeting/allocation at the Federal and State levels as well as grant eligibility at the local level. For grant eligibility, it then becomes the responsibility of the local community or grant applicant to provide more accurate data to demonstrate need and service gaps.

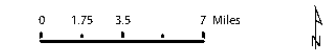
Map 8. WBO's Combined Fixed Technologies Advertised Speeds


CLARK COUNTY CONNECTIVITY SUMMARY

Presented by the Wisconsin Broadband Office



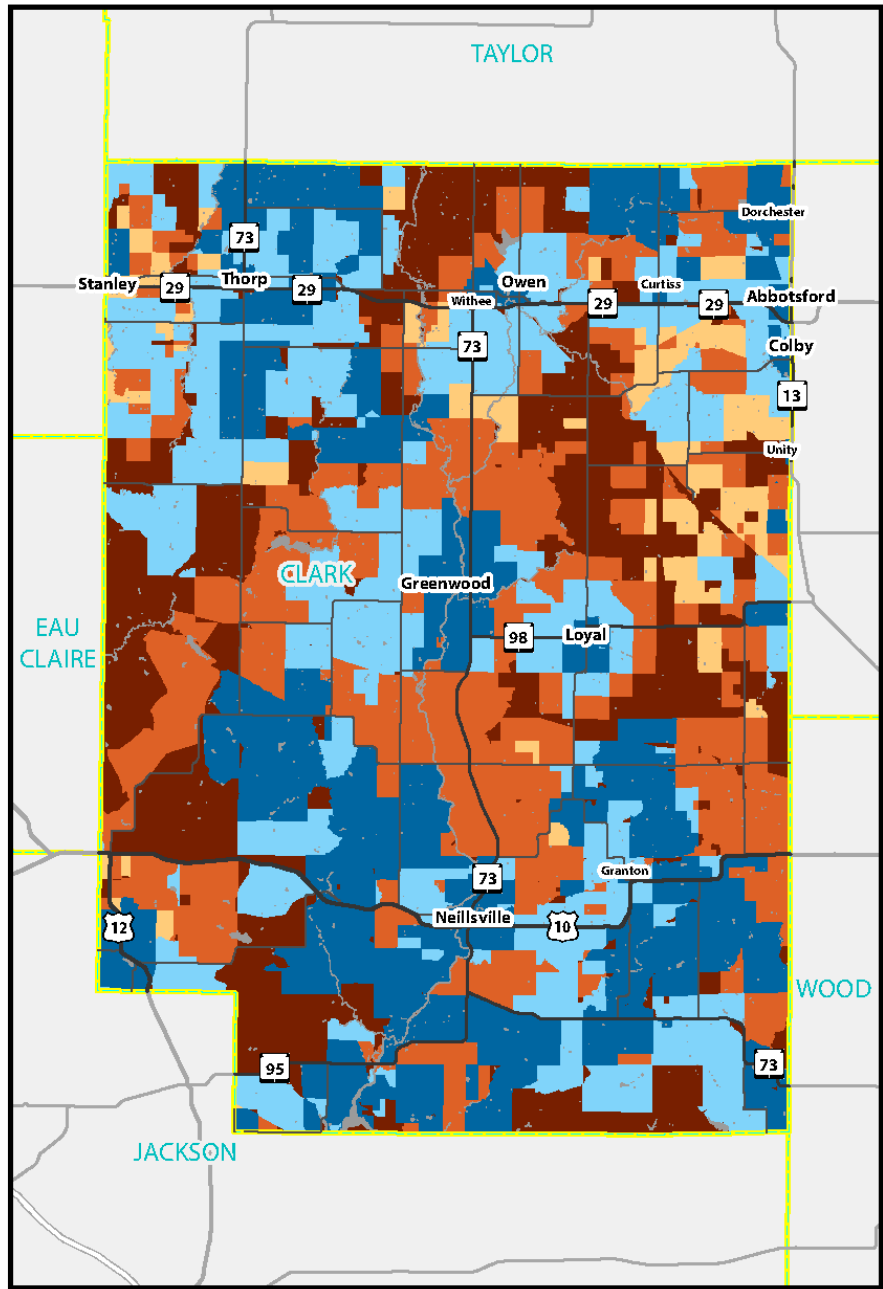
- Clark County Internet Speeds**
Includes Wireline and Fixed Wireless Technologies
Download Speed / Upload Speed (Megabits per Second)
-  25+ Mbps Down / 3+ Mbps Up
 -  10 Mbps Down / 1 Mbps Up
 -  3 Mbps Down / .768 Mbps Up
 -  Less than 3 Mbps Down / .768 Mbps Up
 -  Unserved for Fixed Internet Access



 **Broadband Expansion Grants**
Grant recipients impacting Clark County
(Project Name, Fiscal Year of Award, Award Total)
Eau Claire County (Chippewa Valley Project), 2018R2, \$200,000

 **broadband forward!** Community
Certified communities impacting Clark County
City of Thorp

 **telecommuter forward!** Community
Certified communities impacting Clark County
None at this time. Consider certifying your community. Contact the Wisconsin Broadband Office for more information.



Disclaimer: This map displays areas of the state that may have fixed internet access, but does not guarantee that said coverage exists in specific locations. Fixed internet access includes all wireline and fixed wireless services. Please contact any internet provider of interest to verify availability at a specific location. Access data are retrieved from internet providers and the Federal Communications Commission's Form 477. Map includes data as recent as December 31, 2018. For more information, view the Wisconsin Broadband Map at <https://maps.psc.wi.gov/apps/WisconsinBroadbandMap/> Map Drafted: 7/31/2019



Wisconsin Broadband Office, Public Service Commission of Wisconsin
psc.wi.gov PSCStateBroadbandOffice@wisconsin.gov
4822 Madison Yards Way, P.O. Box 7854, Madison, WI 53707-7854



Map 9. Wireline Advertised Download Speeds

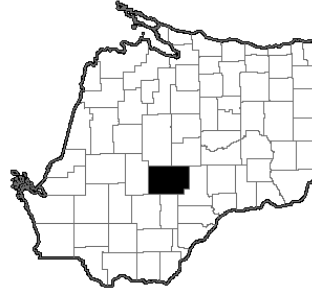
Clark County Broadband

May 2021

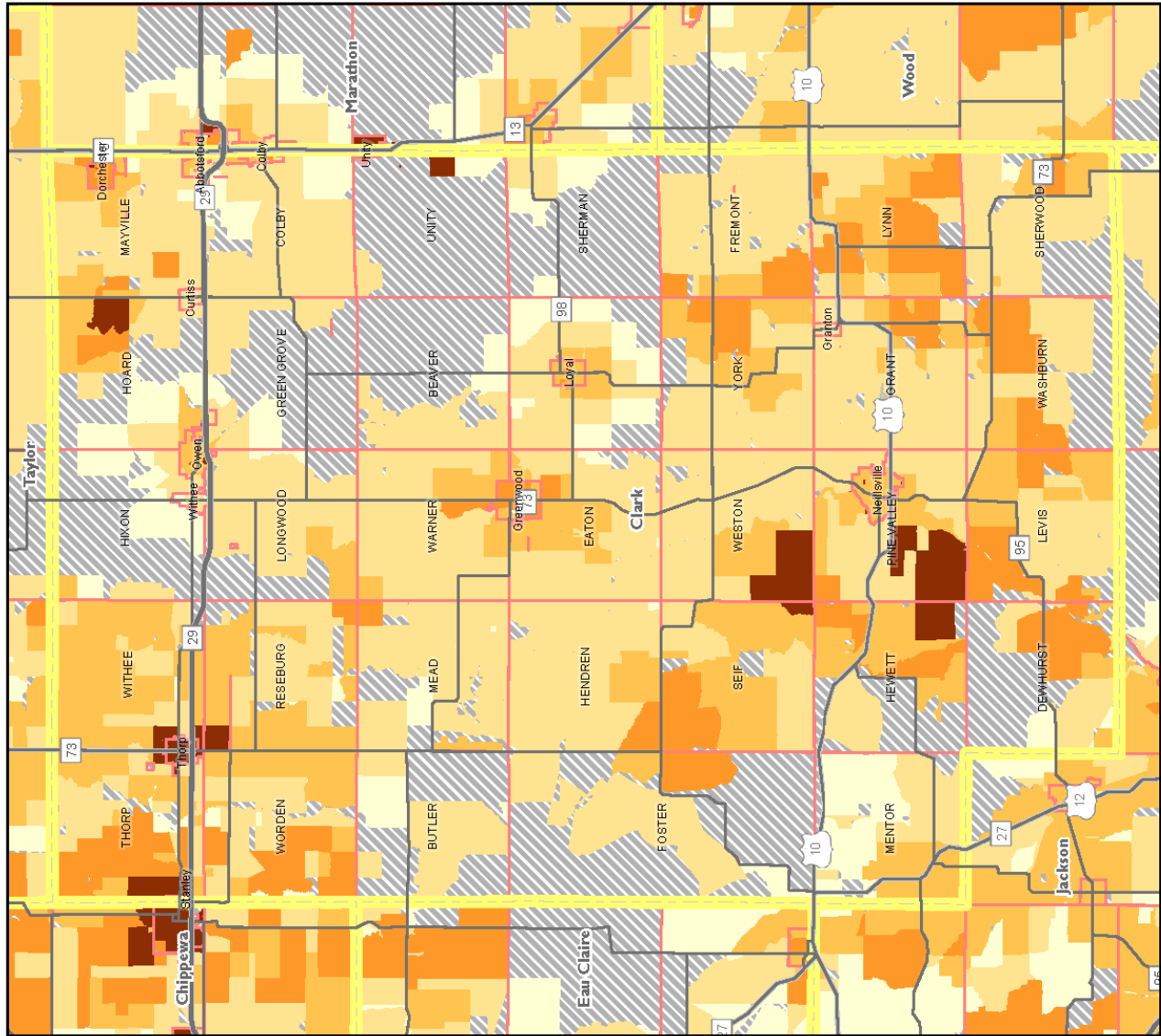
Wireline Download Speed
(In Megabits per Second - Mbps)

Advertised Speed

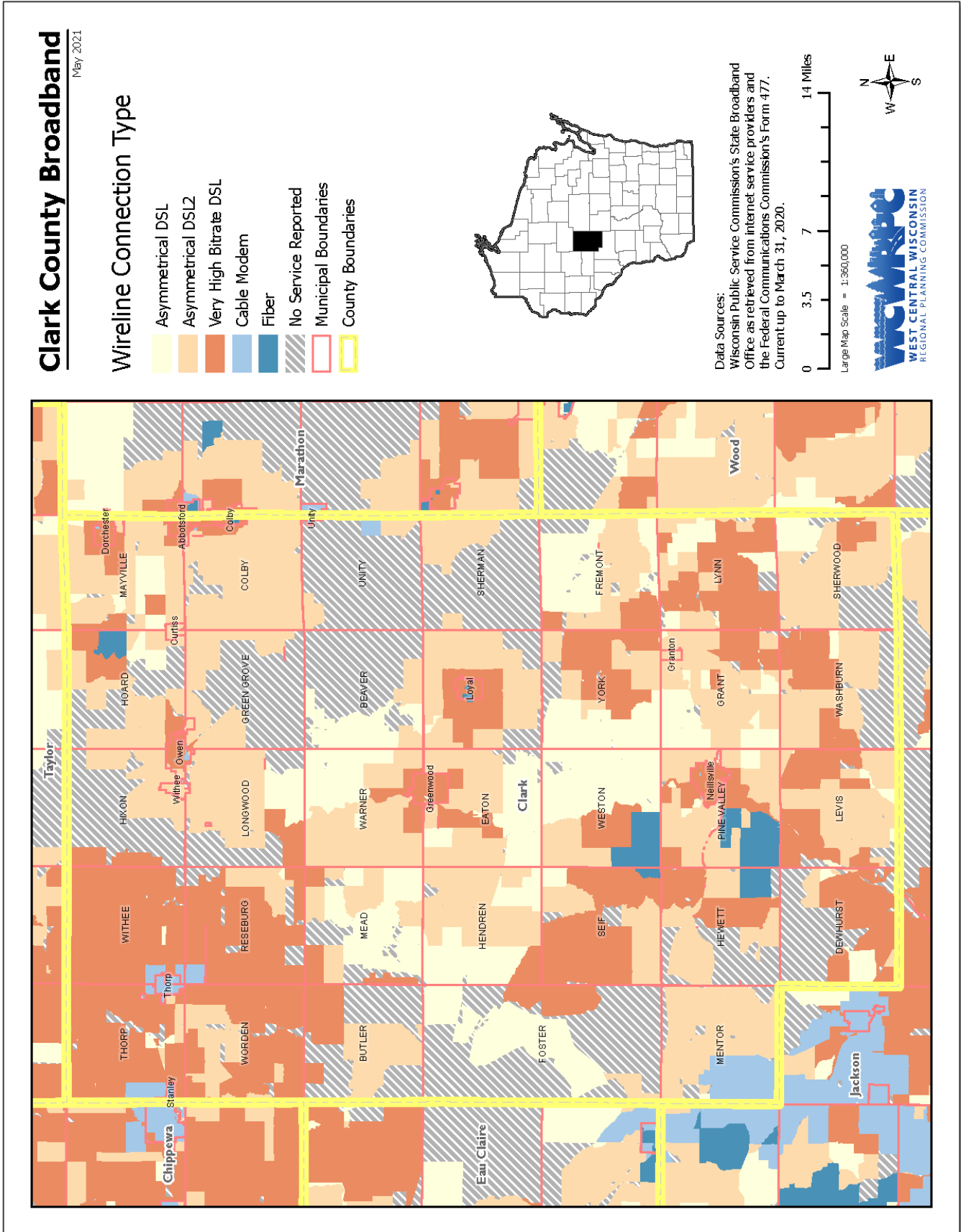
- 500 - 1025
- 250 - 499.99
- 150 - 249.99
- 75 - 149.99
- 25 - 74.99
- 5 - 24.99
- Less than 5
- No Service Reported
- Municipal Boundaries
- County Boundaries



Data Sources:
Wisconsin Public Service Commission's State Broadband Office as retrieved from internet service providers and the Federal Communications Commission's Form 477.
Current up to March 31, 2020.



Map 10. Wireline Connection Types



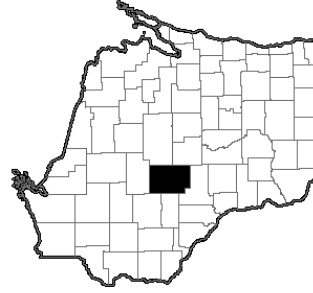
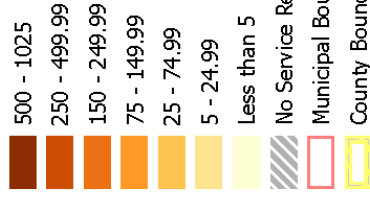
Map 11a. Fixed Wireless (Non-Satellite) Advertised Download Speeds

Clark County Broadband

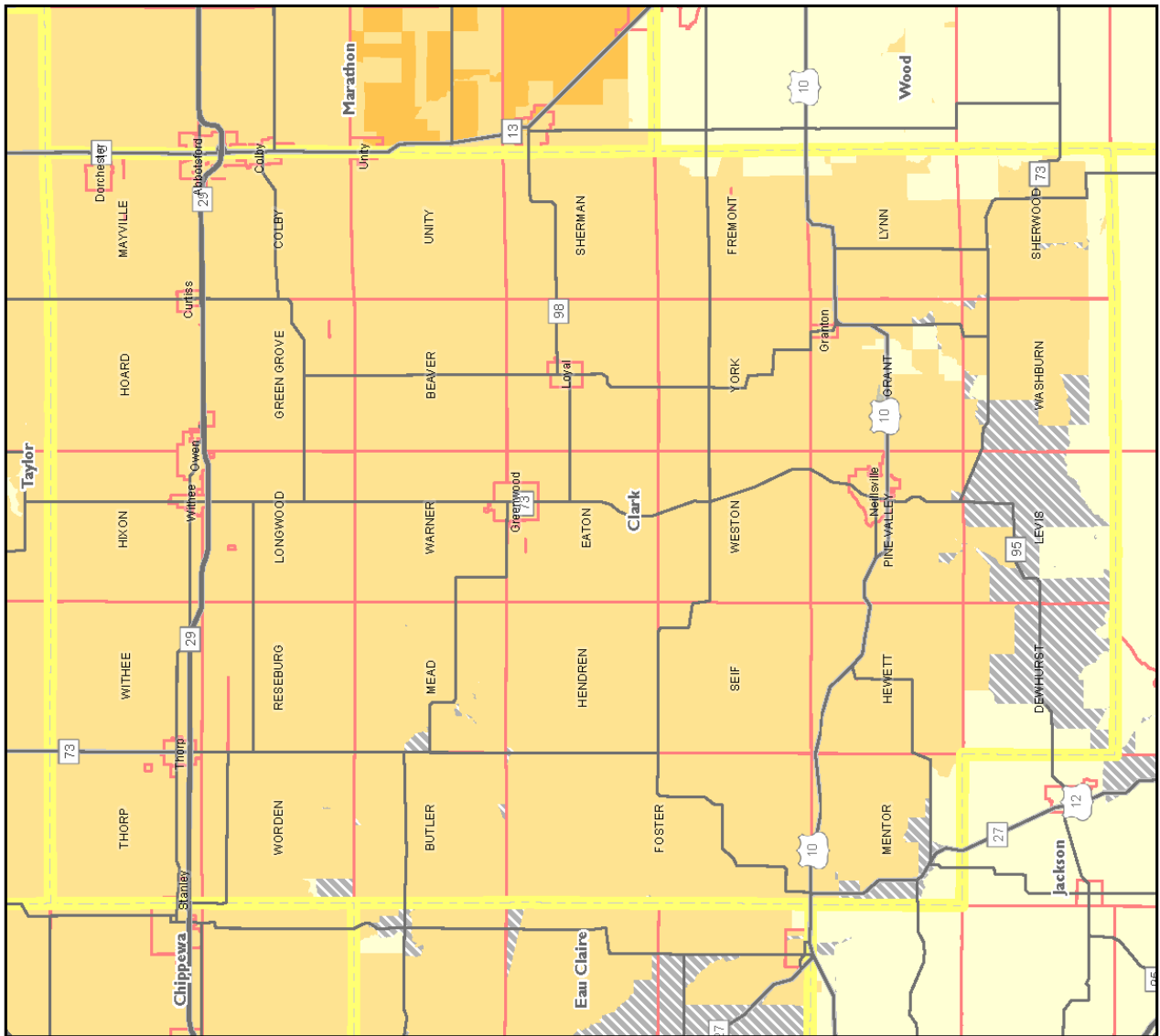
May 2021

Fixed Wireless Download Speed
(In Megabits per Second - Mbps)

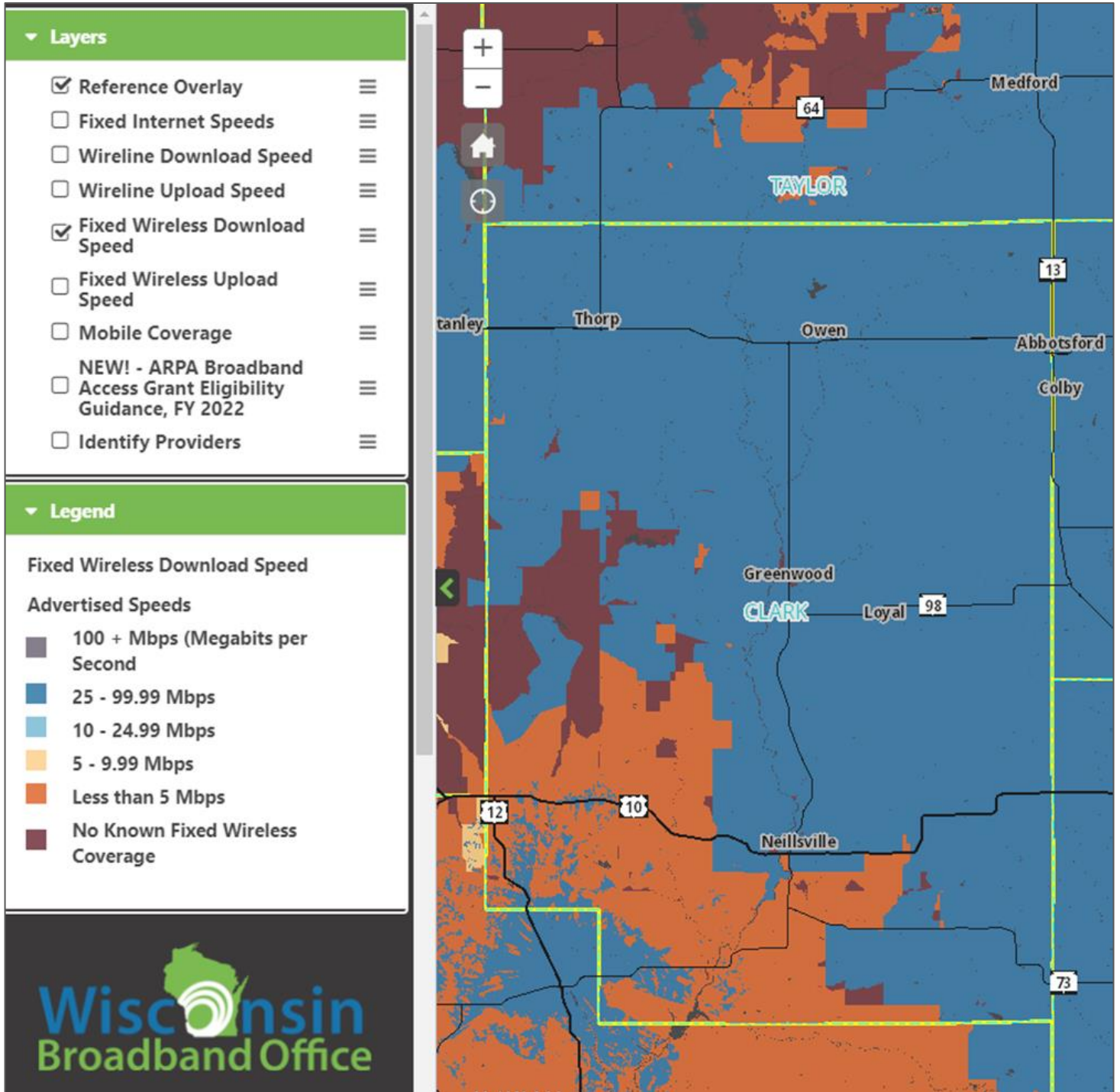
Advertised Speed



Data Sources:
Wisconsin Public Service Commission's State Broadband Office as retrieved from internet service providers and the Federal Communications Commission's Form 477.
Current up to March 31, 2020.



Map 11b. Fixed Wireless (Non-Satellite) Advertised Download Speeds (June 2021)



Map 12. Satellite Advertised Download Speeds

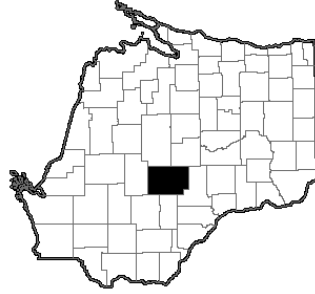
Clark County Broadband

May 2021

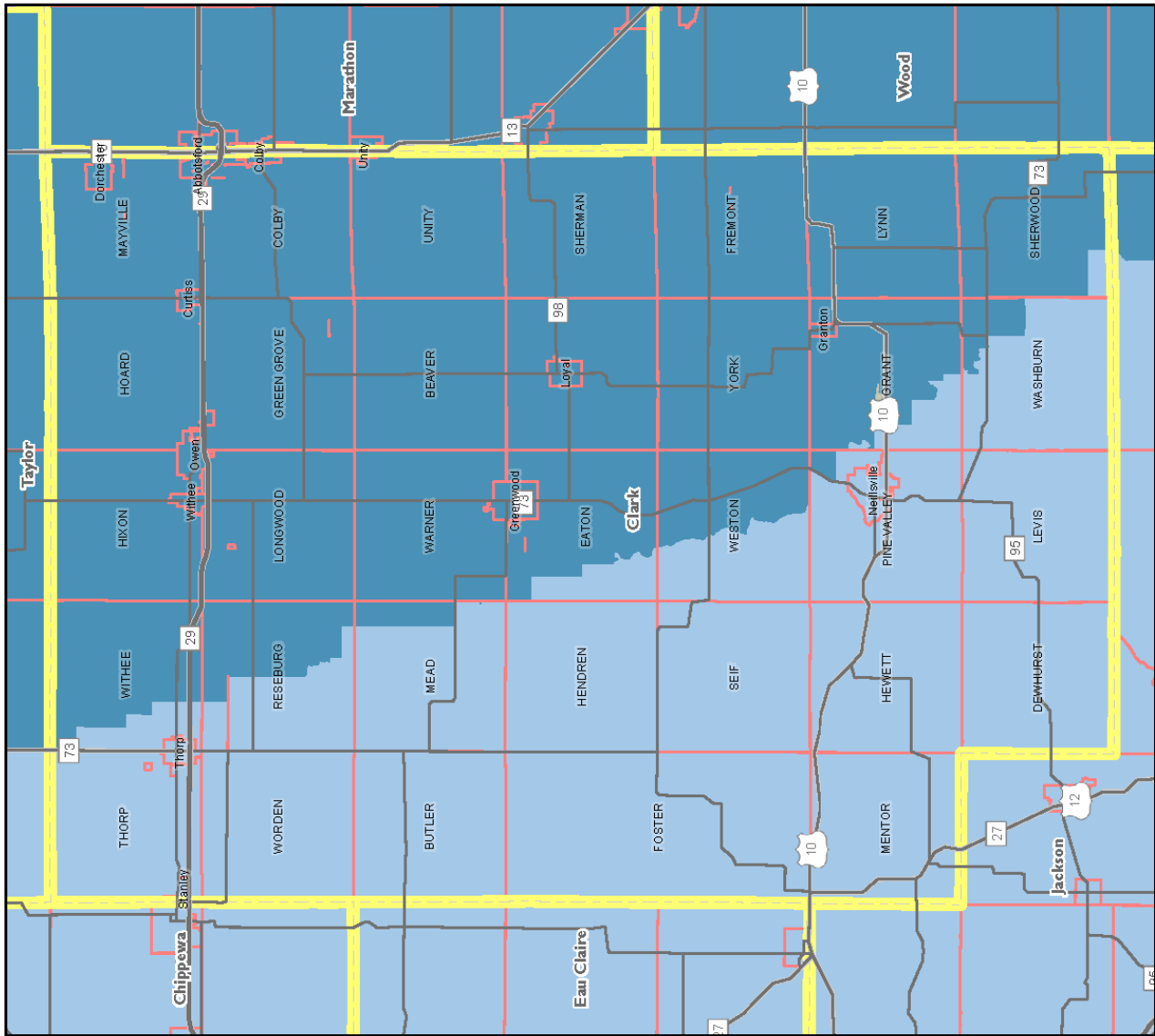
Satellite Download Speed
(In Megabits per Second - Mbps)

Maximum Advertised Speeds

- 100
- 35
- Municipal Boundaries
- County Boundaries



Data Sources:
Wisconsin Public Service Commission's State Broadband Office as retrieved from internet service providers and the Federal Communications Commission's Form 477. Current up to March 31, 2020.



The table below identifies the ISPs who have reported to the FCC, organized by type of connection/technology with the approximate square miles that each ISP reported as being served. Again, the approximate square miles of the service areas are based on census blocks as previously noted. This table does not include the most recent fixed wireless data that was released in June just as the bulk of this study was being completed.

While three ISPs provide some fiber service, the actual amount of fiber being used in Clark County is relatively small as reflected by the previous wired connections map.

Internet Service Provider	General Connection Type	Specific Connection Types (for wireline ISPs)	Approx. Square Miles	% of Clark County
TDS	Wireline	ADSL, ADSL2/2+, Fiber	584	48%
CenturyLink	Wireline	ADSL, ADSL2/2+, Fiber	203	17%
Frontier Communications	Wireline	ADSL, ADSL2/2+, Fiber	150	12%
Spectrum/Charter Communications Inc	Wireline	cable modem	42	3%
Tri-County Communications Cooperative	Wireline	cable modem	9	1%
Astrea	Wireline	cable modem	2	0%
Country Wireless	Fixed Wireless (terrestrial)		890	73%
King Street Wireless L.P.	Fixed Wireless (terrestrial)		866	71%
Nsight/Cellcom	Fixed Wireless (terrestrial)		764	63%
United States Cellular Corporation	Fixed Wireless (terrestrial)		55	5%
AirRunner Networks LLC	Fixed Wireless (terrestrial)		6	0%
HughesNet	Satellite		1215	100%
Skycasters	Satellite		1215	100%
Viasat Inc	Satellite		1215	100%
AT&T Mobility	Mobile Wireless		1215	100%
Verizon Wireless	Mobile Wireless		1163	96%
Cellcom	Mobile Wireless		457	38%
Sprint	Mobile Wireless		336	28%
T-Mobile	Mobile Wireless		139	11%
United States Cellular Corporation	Mobile Wireless		107	9%

In November 2020, Forward Analytics released its “Broadband in Rural Wisconsin Report.” This report used 2019 FCC data to compare rural access to different broadband speeds for each Wisconsin county. Overall, Clark County ranked 55th of Wisconsin’s 72 counties with the following results by download speed:

25+ Mbps	49.1%	of the rural population had this level of service
10-24 Mbps	42.6%	
<10 Mbps	8.2%	
None	0.1%	

While some counties ranked lower, the numbers are not good. Less than half of the County’s population has access to the minimum 25 Mbps to qualify as broadband. In fact, only six other counties had lower percentages of their population with 25+ Mbps access ranging from 35.5% (Rusk County) to 48.8% (Douglas County). And, again, the FCC data is reported by census block and overestimates the actual percentage of population served.

FCC Reverse Auctions – CAF II, A-CAM, & RDOF

The next three maps reflect the results of FCC-administered reverse auctions. These reverse auctions awarded financial assistance to the lowest qualifying bidder that meets the program requirements in order to provide internet or broadband service to underserved or unserved areas.

Map 13 shows the **Connect America Fund II (CAF-II)** auction winners in Clark County. Only the price cap carriers (larger, for profit ISPs) were eligible, such as AT&T, CenturyLink, Frontier, and Verizon. Winning bidders were required to provide a minimum median speed of 10 Mbps download and 1 Mbps upload with 90% of locations having a latency of 100 ms or less. Service must also be provided to at least 95% of funded locations in the state with full build-out completed in 2020.

Map 14 shows the **Alternate Connect America Cost Model (A-CAM)** auction winners. Rate-of-return carriers (typically local or regional ISPs) could participate in A-CAM, which also had a 10/1 minimum median speed to at least 95% of funded locations, with 25/3 speeds in some instances. Full A-CAM build-out must be completed by 2028.

As of Spring 2021, WCWRPC is unaware of the specific build-out plans or evaluation activities regarding the above two auctions in Clark County. Further, the minimum, median speeds for CAF-II and A-CAM are well below even the FCC's outdated minimum speeds (25/3) to be considered broadband.

Map 15 shows the **Rural Digital Opportunity Fund (RDOF)** auction winners. It was widely hoped that the more recent RDOF auction would address some of the weaknesses of CAF-II and A-CAM and help fill remaining gaps in the rural digital divide. First, a minimum of 25/3 service must be provided and applicants could apply under different tiers of service, such as a Gigabit tier. Further, 100% of homes and businesses within the area bid upon must be served. Further, any eligible telecommunications carrier could participate, including smaller cooperatives. Full build-out must be completed within eight years.

Preliminary winners of RDOF Phase I were announced in Fall 2020 and the long-form applications are being processed. LTD Broadband LLC and CCO Holdings, LLC were awarded large areas of Wisconsin, including portions of Clark County as shown in Map 15. Both were awarded under the Gigabit tier, suggesting that the areas shown will have 100+ Mbps download speeds available within eight years. However, we do not know their specific plans for Clark County. For example, LTD has stated that they will be building-out a mix of fiber and fixed wireless service. There is skepticism whether fixed wireless is a practical solution given the varied topography and forest cover of rural Wisconsin.²⁴ However, one article suggests the LTD Broadband plans to build a network relying almost exclusively on fiber.²⁵

²⁴ <https://wecnmagazine.com/article/rural-america-broadbands-disconnection-section/>;
<https://ecfsapi.fcc.gov/file/10201387611048/Letter%20and%20technical%20whitepaper%20on%20Gigabit%20standards%20020121.pdf>

²⁵ <https://www.lightreading.com/opticalip/some-big-rdof-winners-lean-away-from-fixed-wireless/d/d-id/767204>

Map 13. CAF-II Auction Areas

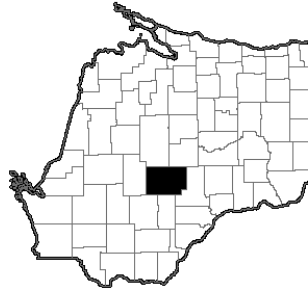
Clark County Broadband

May 2021

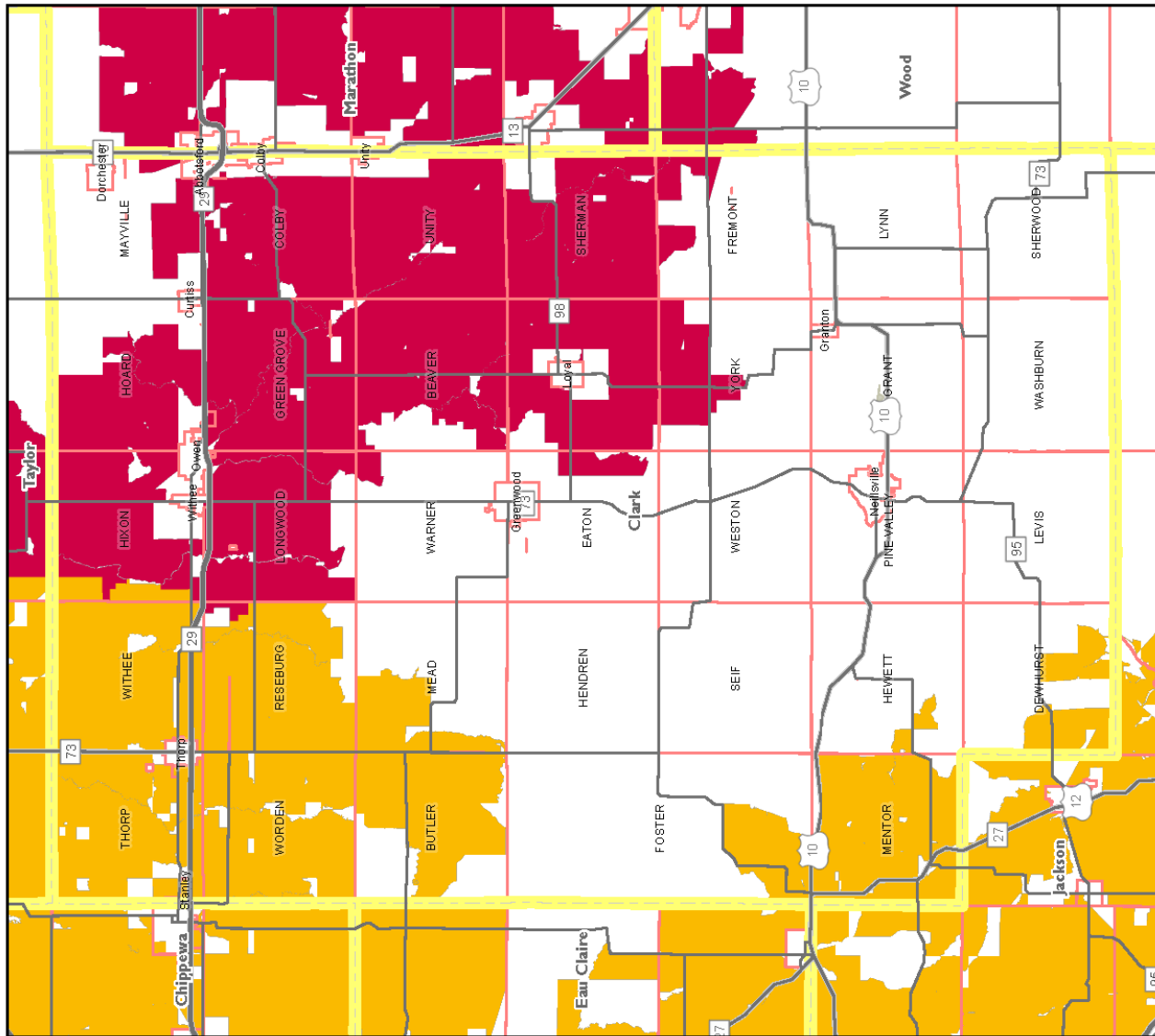
Connect America Fund Phase II

- CenturyLink
- Frontier
- Municipal Boundaries
- County Boundaries

Description: Depiction of areas awarded subsidies under the Connect America Fund - Phase II (CAF-II) through the Federal Communications Commission (FCC).



Data Sources: Wisconsin Public Service Commission's State Broadband Office as provided by the Federal Communications Commission (FCC). Current up to March 31, 2020.






Map 14. A-CAM Auction Areas

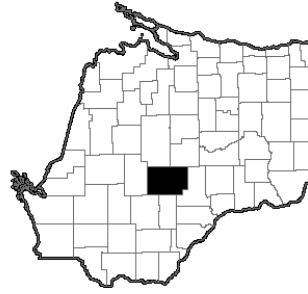
Clark County Broadband

May 2021

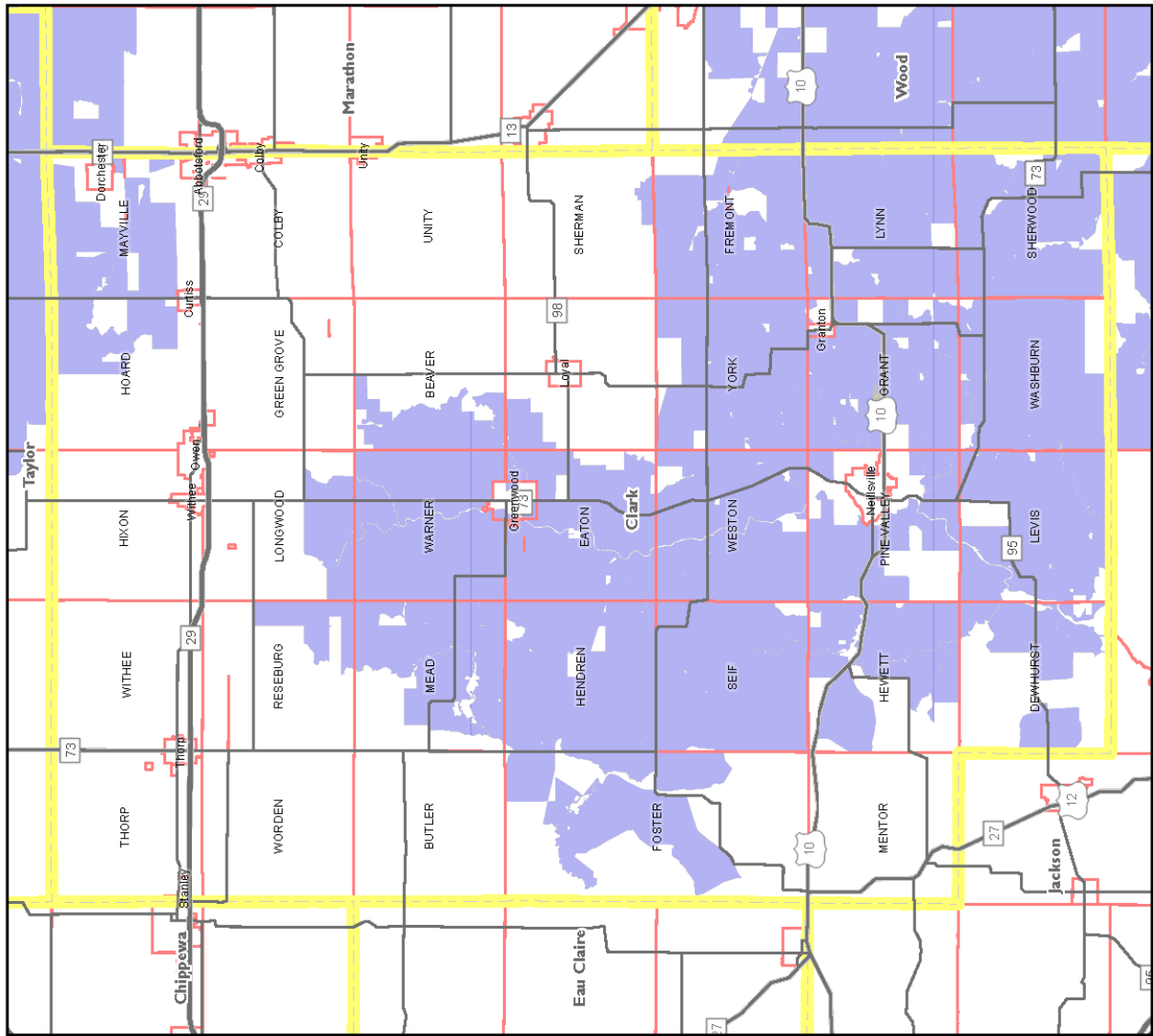
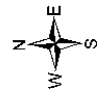
Alternative Connect America Cost Model (A-CAM)

-  Telephone and Data Systems, Inc.
-  Municipal Boundaries
-  County Boundaries

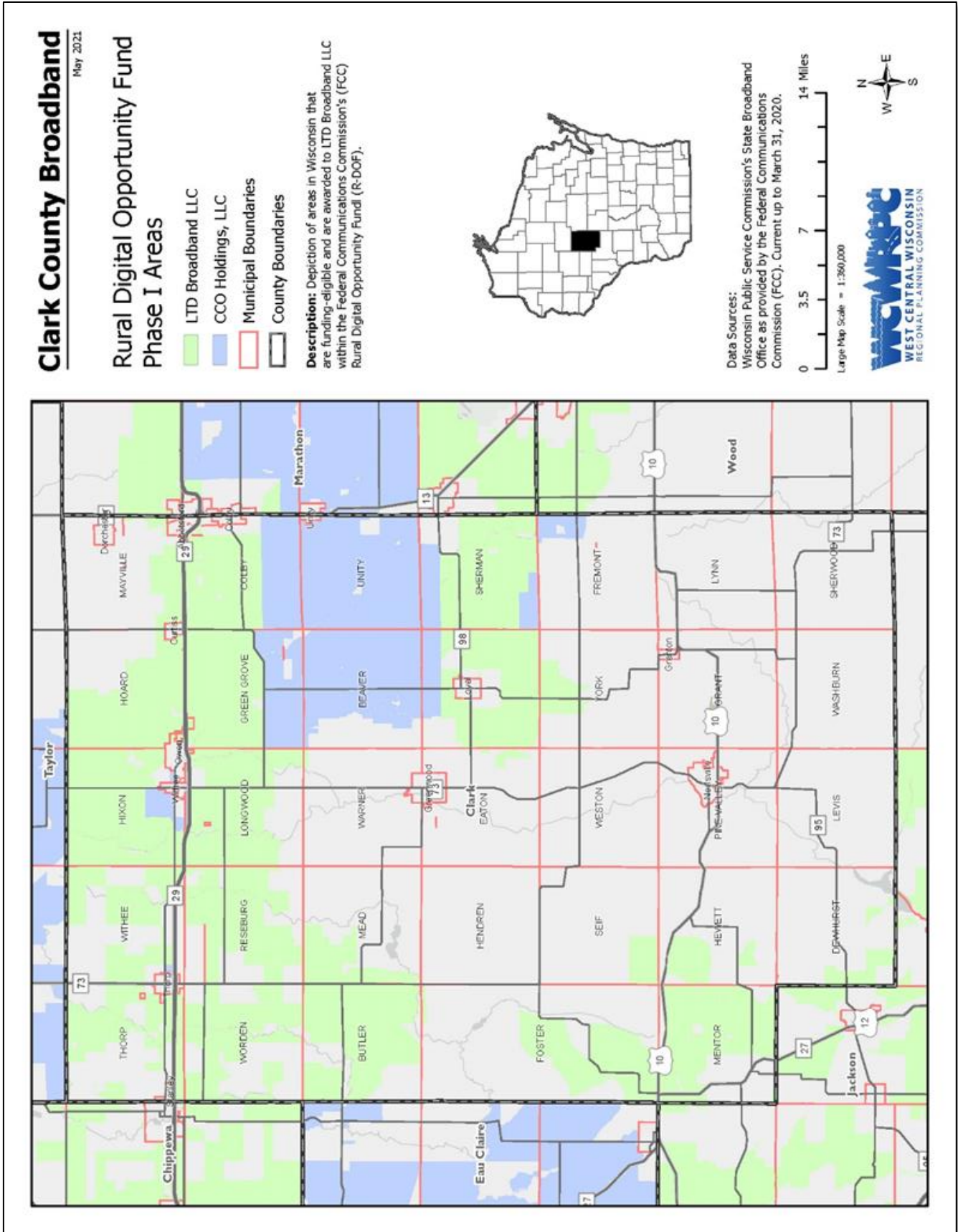
Description: Depiction of areas in Wisconsin that are funding-eligible and awarded subsidised by the Federal Communications Commission's (FCC) Alternative Connect America Cost Model (A-CAM).



Data Sources: Wisconsin Public Service Commission's State Broadband Office as provided by the Federal Communications Commission (FCC). Current up to March 31, 2020.



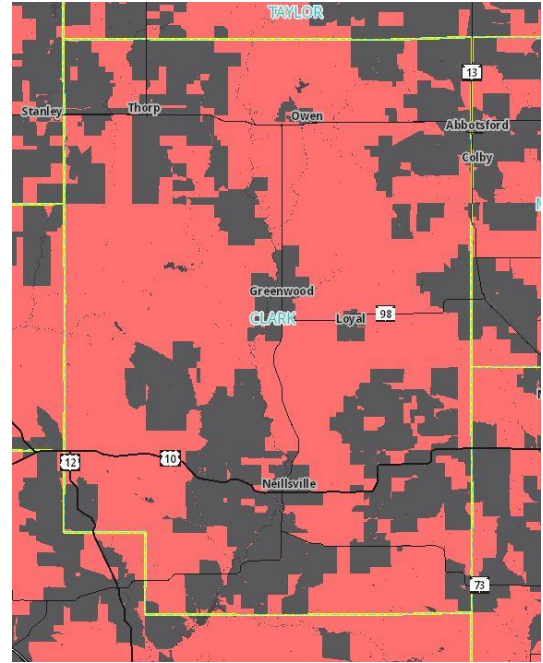
Map 15. RDOF Auction Areas



Wisconsin Broadband Expansion Grant & ARPA Broadband Access Grant Eligibility

The Wisconsin PSC recently released application instructions for the Federal American Rescue Plan Act (ARPA) Broadband Expansion Access Grants with a July 27, 2021, deadline. To be eligible, an area must be unserved or underserved as defined by one or more households and businesses that are not currently served by a wireline connection that reliably delivers at least 25 Mbps download speed and 3 Mbps of upload speed.

The PSC broadband map excerpt to the right shows in red that most of Clark County is eligible. However, as previously discussed, this map is based on FCC Form 477 data reported by census block, which overstates the geographic area that actually meets the definition as being served; additional areas are likely eligible. If the project area lies within a census block designated as served (gray) on the map, the applicant can provide additional documentation to demonstrate that the actual broadband service, speed, or reliability that is available in the proposed project area would qualify the area as un-/underserved.



The Wisconsin Broadband Expansion Grant has a similar eligibility definition using Form 477 data, with one significant difference. An underserved area is served by fewer than two broadband service providers providing a broadband service with a speed of 25 Mbps download and 3 Mbps upload, but does not include a commercial mobile radio service or a broadband service in which a stand-alone satellite provider connects directly to the end user with a satellite connection. Based on the information in this study, most (if not all) of Clark County would likely meet this eligibility definition. Again, an applicant can provide additional data to demonstrate an area is un-/underserved.

B. Chippewa Valley Internetworking Consortium (CINC)

CINC is a community area network (CAN) that currently manages more than 300 miles of fiber for transport to ISP connections. CINC is designed so its members can link to each other or so that a member can get to an ISP or data center on an extremely fast connection. Members include anchor institutions such as education facilities and affiliates, health care and affiliates, city and county government, libraries, etc. Many CINC members use WiscNet as their internet network or ISP, while others use Wisconsin Independent Network (WI), Charter, AT&T, etc. The CINC website includes a full list of its members: <https://cincua.org/about/faq/>

CINC does not currently have a presence in Clark County. At one time in the past, a CINC-supported CAN was nearly created in the Neillsville area for anchor institutions such as Chippewa Valley Technical College (CVTC), school district, library, hospital, and governmental services, but the effort stalled. The potential exists to extend the CINC network east of Cadott along Highway 29 and up Highway 27 to Cornell. There are also CINC connections in Fairchild. CINC partners with the Wisconsin DOT, WiscNet, and other ISP for some fiber; such relationships could be explored and potentially expanded upon in Clark County if a need exists.

The Chief Information Officer at CVTC reports that their Neillsville campus currently has more than adequate bandwidth through a contract with Spectrum Charter, which suggests that the need for a CINC presence in Neillsville may no longer be needed. In short, if the County’s anchor institutions have adequate broadband services available, a CINC network is likely not going to be a solution to meeting the broadband needs of Clark County residents and businesses. This doesn’t mean that a new community area network couldn’t be created to serve existing broadband supply gaps however.

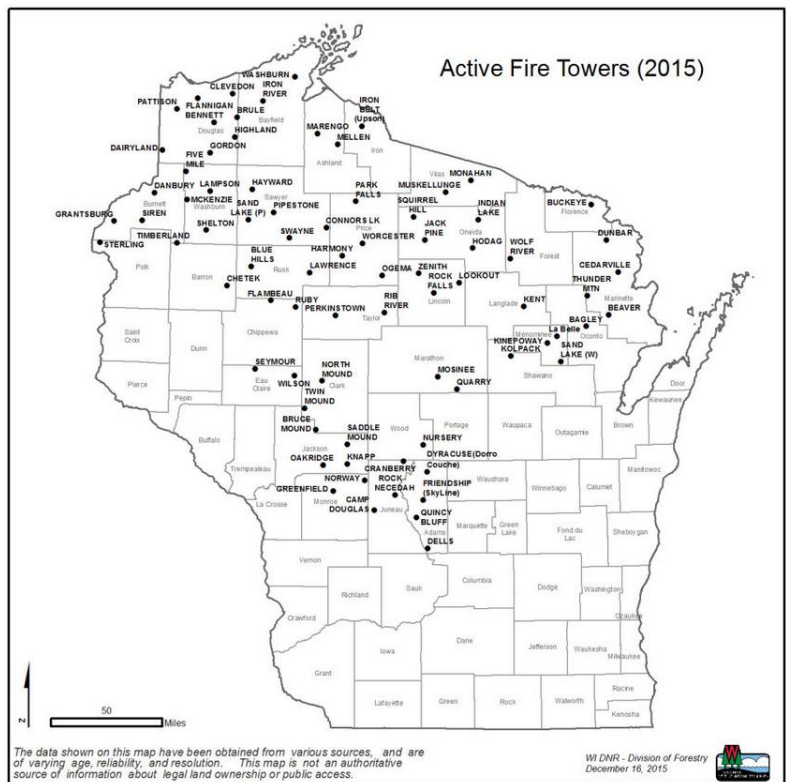
From their perspective, CVTC recognizes that their “potential student population for online classes from home...is the largest need.” CVTC appears willing to participate in an effort to explore options, such as the creation of a CAN, and other grant opportunities to improve broadband services for Clark County residents. CVTC and other anchor institutions can be important resources (technical, financial, and supportive) to help form and implement a county broadband strategy, though they may not be the lead champions and coordinating entities if their current service levels are adequate.

C. Wisconsin DNR Fire Towers

This subsection is not addressing broadband supply, but does represent a potential opportunity to expand broadband service.

In 2016, Wisconsin Department of Natural Resources (WDNR) decommissioned its remaining fire towers. This included three towers in Clark County at North Mound, Twin Mound, and Bruce Mound. At the time, WDNR approached local governments to determine interest in repurposing the towers for broadband and communications infrastructure.

Given that these towers are located in relatively sparsely populated areas that may not currently have broadband availability, the towers could be a fixed wireless opportunity or serve to house some type of signal repeater.



D. Connectivity of Clark County’s Business Parks

As discussed in Section II, larger businesses often need the highest levels of broadband service, so communities should strive to offer the best service available to their industrial and business parks in order to remain competitive for attracting and retaining business investment. This is reflected by the fact that the Wisconsin Economic Development Corporation (WEDC) has added Gigabit office and industrial parks to their interactive LocateInWisconsin.com map for marketing to site selectors. There are twelve designated business or industrial parks within ten communities in Clark County. During the study, WCWRPC reached out to these ten cities and villages with a very brief web-based

survey asking for the type of broadband technology (e.g., fiber, cable modem) and name of the ISP for the highest level of currently available broadband service in their business parks. After multiple requests, only one community was able to fully complete the survey; most started the survey, but left the questions incomplete or responded “don’t know.” This finding is important regardless of level of service and suggests that most communities do not have this information “at their fingertips” as part of marketing materials for their business parks. And, if excellent broadband service is available, is this being effectively marketed?

As an alternative, WCWRPC compiled the table below, which shows:

- The ISP, wireline broadband type, and advertised speeds for the highest level of service for each business or industrial park based on Form 477 data reported to the FCC (the same data source as Maps 9 & 10).
- The average speeds as reported by users from the 2021 Clark County Broadband Survey discussed in Section V. These speeds are based on very low sample sizes and not all business parks had respondents to the 2021 County Broadband survey.

Map Number	Name	Address/General Location	Primary ISP(s)	Wireline Broadband Type	PSC Advertised		Reported by User (WCWRPC Survey)	
					Mbps Down	Mpbs Up	Mbps Down	Mpbs Up
1	Abbotsford Industrial Park	11th St. & E. Linden St area	Charter	Cable Modem	940	35	46.74	10.93
2	Colby Industrial Park	Industrial Dr-Park Place-Meadow Dr	Charter	Cable Modem	940	35	44.58	39.64
3	Dorchester Industrial Park	South side of CTH "A" & e. of STH 13	Charter	Cable Modem	940	35	51.65	10.4
4	Greenwood - Baird Industrial Park	Baird St. & CTH "G" area	TDS	VDSL	100	15	None	None
5	Greenwood - New Way Industrial Park	bet. E. Begley St. & Division St.	TDS	VDSL	100	15	None	None
6	Greenwood - CECO Industrial Park	Opportunity Dr & Cooperative Way area	TDS	Asymmetrical DSL2	25	5	152	106
7	Loyal Industrial Park	Industrial Dr. & Davel Dr. area	Charter	Cable Modem	940	35	3.14	9.06
8	Neillsville Industrial Park	n. of USH 10 & Industrial Park Dr. area	Charter	Cable Modem	940	35	57.24	14.46
9	Owen - East Industrial Park	Industrial Park St., ne of CTH "X"	Charter	Cable Modem	940	35	None	None
10	Stanley - Business/Industrial Park	n. of STH 29 on e. side of City	Charter	Cable Modem	940	35	None	None
11	Thorp - West Side Industrial Park	n. of CTH "X" & e. of Town Road	Charter	Cable Modem	940	35	None	None
12	Withee Industrial Park	n. of STH 29 along CTH "T"	Charter	Asymmetrical DSL2	940	35	158.75	8.67

The above tables reflect the lack of fiber broadband service in Clark County and suggests that no parks had fiber service, Gigabit service, or symmetrical service. Further, the survey speeds were much lower than maximum advertised speeds, though Section V and VI will discuss that this could be, in part, due to factors outside the ISP’s control.

The above table reflects readily available information and great caution should be used before making any decision based on the table. WCWRPC recommends additional work to inventory broadband availability within the business parks and to obtain a more accurate picture of current service levels.


V. 2021 Clark County Broadband Survey

A. Survey Approach

In February and March 2021, WCWRPC partnered with Clark County Economic Development Corporation & Tourism Bureau (County EDC) to conduct a broadband survey of residents and businesses. The County EDC took the lead in distribution and advertising the survey within the County.

The web-based survey was based on a similar effort conducted by Eau Claire County in 2020, including nearly identical questions:

- Download and upload speeds as determined by use of a built-in internet test of speeds measured using M-Lab.
- Location address.
- Whether the address is a residence, business, or both.
- Satisfaction (Very, Somewhat, or Not)
- Was a mobile wireless hotspot or cell phone data plan used to complete the survey.
- Did the respondent have any additional comments.



Extended Survey Period

CLARK COUNTY BROADBAND SURVEY

Clark County Economic Development Corporation (CCEDC) is inviting residents and businesses within Clark County and its school districts to participate in a broadband survey. **We want to hear from everyone**, regardless of your current level of internet access. Your participation will help improve broadband service in Clark County. The survey results will be used as part of a Clark County Broadband study and, potentially, to support grant funding requests.

Complete the survey by April 1st. This very brief survey only takes a few minutes to complete. If your home and business are at different addresses, please complete separate surveys.

If you have internet access at your home or business:

- Complete the survey online at this link: [Clark County Broadband Survey](https://clark-county-broadband-internet-survey-wcwrpc.hub.arcgis.com/) or copy-and-paste this URL address into your internet browser: <https://clark-county-broadband-internet-survey-wcwrpc.hub.arcgis.com/>
- Take the survey while connected to the primary internet service at your home or business. Use your primary internet service or Wi-Fi not your cellular plan unless it is your only service.
- The survey includes a speed test. You may take the survey multiple times since speeds can vary.

If you do NOT have Internet access at your home or business:

For each property without internet or broadband service, please answer the following questions then return your reply to the CCEDC office address listed below no later than March 15th.


Street Address of Unserved Property:		
City:		Zip Code:

Property Type (check one)	Residence:	<input type="checkbox"/>	
	Business:	<input type="checkbox"/>	
	Residence & Business (both):	<input type="checkbox"/>	


Would you subscribe to broadband service if available and affordable? Any additional comments?

Please return completed surveys to Clark County EDC and we welcome any questions:

Sheila Nyberg, Executive Director
Clark County Economic Development Corporation & Tourism Bureau
301 North Main Street P.O. Box 236 Loyal, WI 54446
715-255-9100 sheila@clarkcountyedc.org



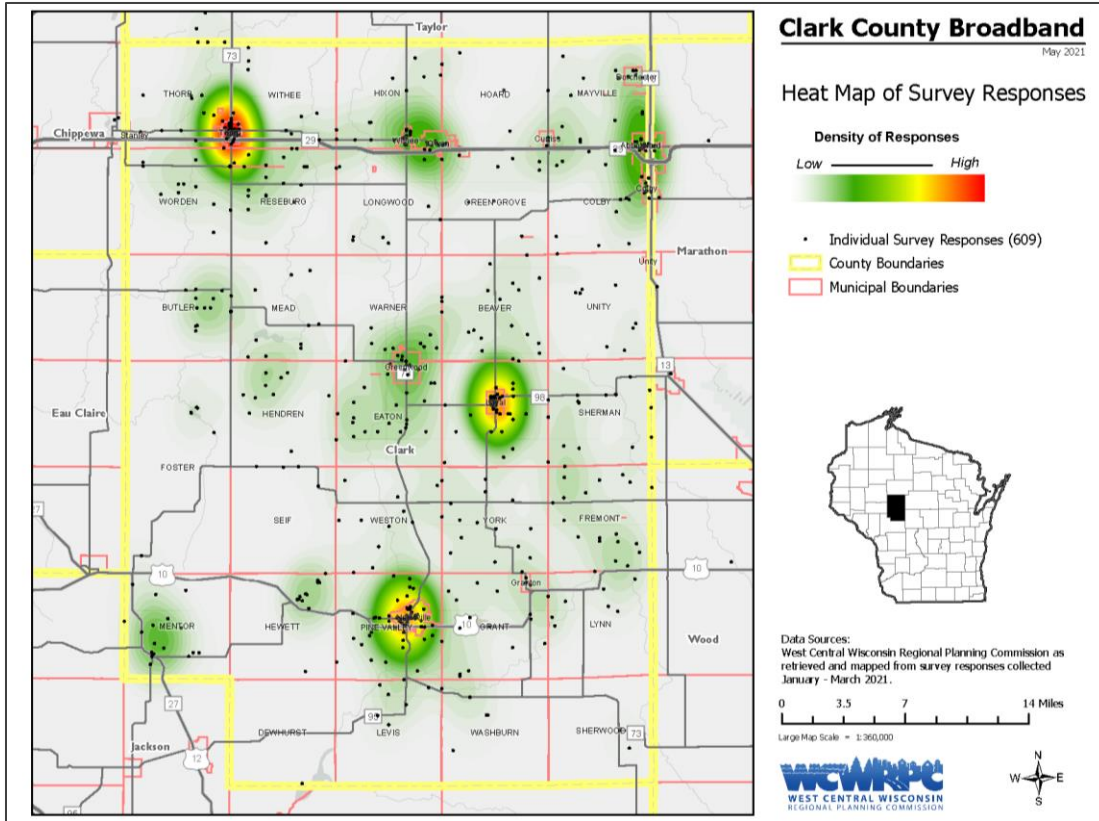
Thank you for your participation!



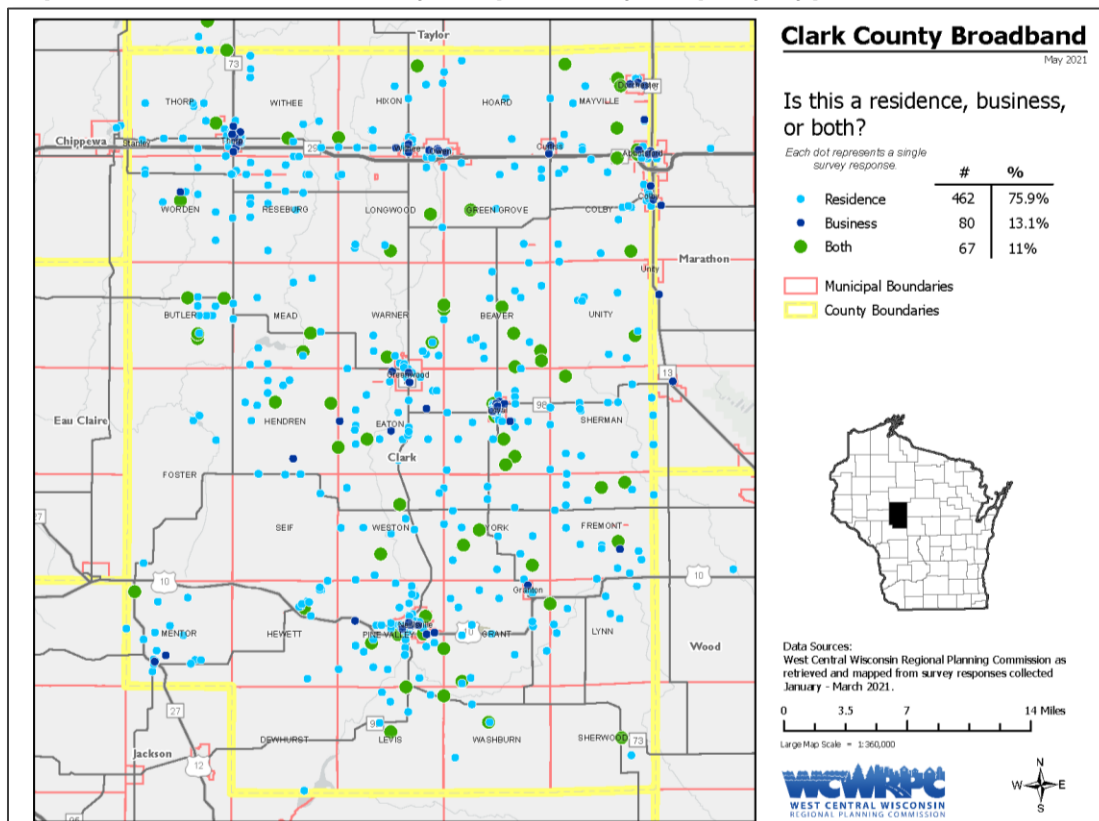
The speed data was collected in the foreground via M-Lab when the respondent actively chose to participate. Section VI.C. discusses some of the considerations when interpreting such web-based broadband performance data tools. Most notably, the speed results can be impacted by things out of an ISP's control, such as hardware, software, # of users, and choice of plans.

Since the reported speeds can vary for many reasons, respondents were invited to complete the survey more than once. A total 596 addresses completed the web-based survey. For those without internet access, a paper survey was made available; 13 paper surveys were returned. Of the responses, 76% were residences, 13% were businesses, and 11% were both. **Map 16** on the following page shows the concentrations of survey responses. **Map 17** shows the distribution of responses by type of property. While concentrations of completed tests were in the cities and villages, 67% of all tests were completed at properties in the unincorporated towns.

Map 16. Heat Map of Survey Responses



Map 17. Distribution of Survey Responses by Property Type



Some key lessons learned from the survey that may help when considering future surveys were:

- If a community or county is considering a public survey with a built-in speed tool, such as M-Lab or GEOspatial Engineering & Optimization, such an effort requires strong advertising and local champions in order to achieve a good response rate. Commit the needed resources and time. For example, one town in Eau Claire County had a particularly high response rate when a group of residents took the initiative to go door-to-door to promote their 2020 survey; this data was later provided to ISPs and resulted in two successful broadband expansion grants.
- It may be beneficial to perform an initial analysis of other available data, then focus intensive outreach to promote the survey in areas suspected of having greatest need or areas where the level of broadband service is uncertain.
- The results to the mobile wireless/cell plan question were unreliable and its results are not included in this study. We suspect that the question was not understood by some respondents. This question should be asked differently or avoided in future survey efforts.
- In retrospect, we regret asking why respondents were not satisfied (e.g., speeds, consistently/reliability of service, costs). However, we did gain some insights from the comments.

B. Survey Findings

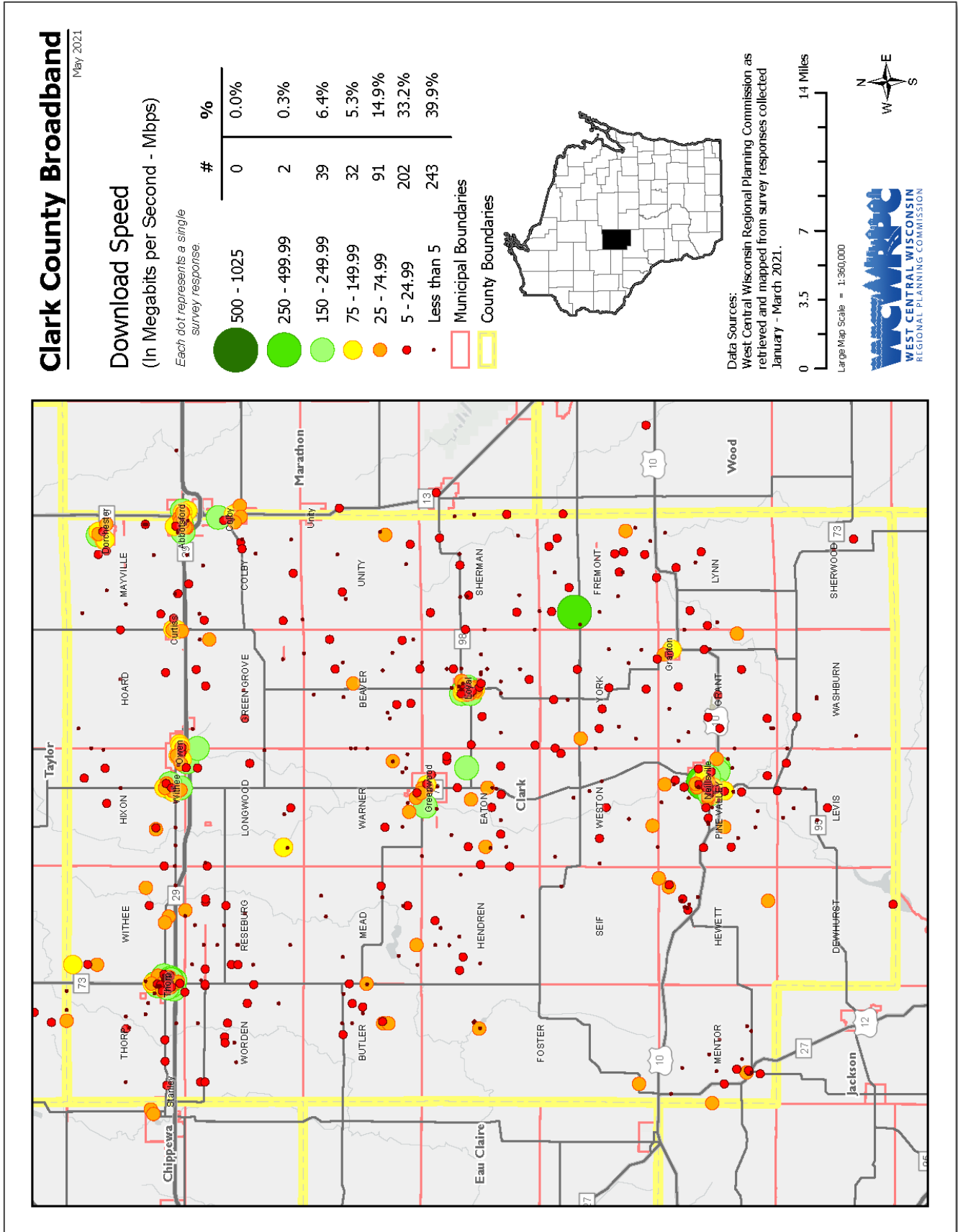
Map 18 on the following page shows the average download speeds for each location with a survey response. Each dot equals one location; the size of the dot changes for visual purposes only and does not represent the number of tests. Over 73% of the locations (the red dots) had speeds less than the FCC minimum definition of broadband, which is 25+ Mbps. Only 48 of the 609 survey locations (7.9%) had download speeds greater than 100 Mbps, which the PSC’s 2025 goal.

Map 19 shows satisfaction by municipality. Overall, 82% of locations were not very satisfied with their internet service. As reflected by the map and table, satisfaction was much lower in the unincorporated towns compared to the cities and villages, though some towns fared better than others. Somewhat surprising is that satisfaction among places of businesses did not fare much better than the overall response.

	Very	Somewhat	Not
Overall Satisfaction (all respondents)	18%	42%	40%
Satisfaction in Unincorporated Towns	9%	37%	54%
Satisfaction of Businesses/Mixed-Use	26%	39%	35%

All residents and businesses were encouraged to participate in the survey regardless of their satisfaction with their current internet service. However, it should be acknowledged and expected that a higher percentage of respondents to such a survey are likely households and businesses who are less satisfied with their internet service. This fact should not discount that there are substantial numbers of households (393) and places of business (109) who took the time to participate in the survey and express that they were not very satisfied with their current level of service.

Map 18. Distribution of Survey Responses by Property Type



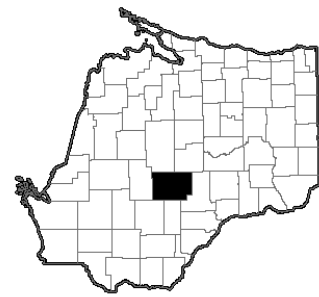
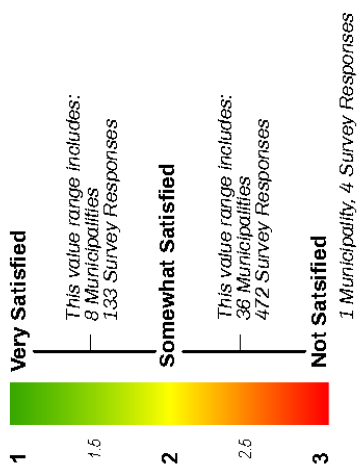
Map 19. Internet Service Satisfaction by Municipality

Clark County Broadband

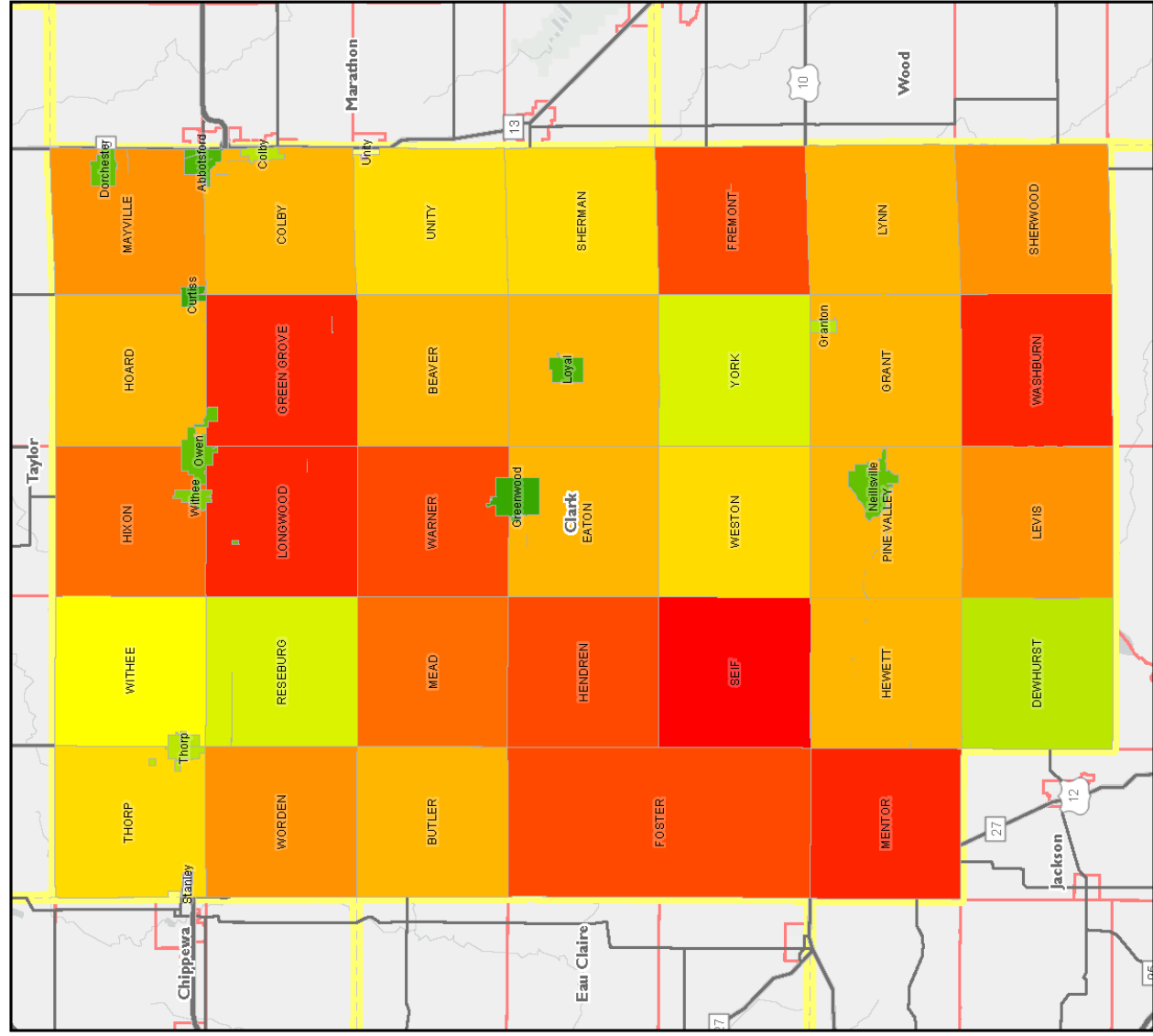
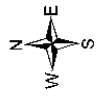
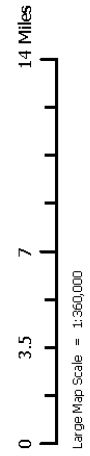
May 2021

How satisfied are you with your internet service?

Weighted Response Values

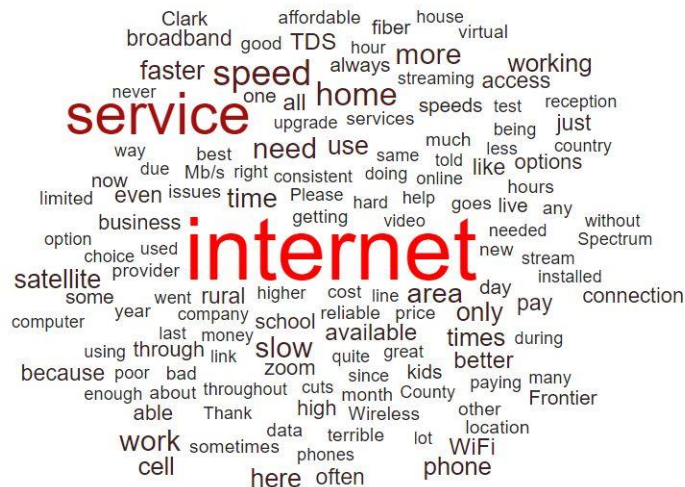


Data Sources:
West Central Wisconsin Regional Planning Commission as retrieved and mapped from survey responses collected January - March 2021.



The comments provide some insight into satisfaction. Speeds were the most frequently mentioned concern or issue. Over half (63%) of those who were *Not Satisfied* or *No Service Provided* mentioned the following concerns (or an equivalent) in their comments:

- Speed – 42%
- Inconsistent service or service interruptions – 29%
- Lack of alternative internet services or options – 24%
- Cost – 7%
- Service is bad or improvement needed (no details) – 5%



The following are a few select comments from business owners:

- “The lack of internet speed has a direct effect on our business and not being able to be efficient and competitive in some instances. Also, it is almost impossible to be able to work from home due to the SLOW internet.”
- “Slow. The best we can get is through wireless provider. When we reach a certain amount of data use it slows way down even with unlimited plan.”
- “I have used every service provider available...as well as all cellular carriers. Only a few carriers will work, and this is still intermittent. Our business counts on internet and we need zoom calls.”
- “Internet speed is so variable and unreliable. Although we are paying for 15mb/s, it occasionally gets above 12, but usually falls below that. Case in point, it was barely existing right now. This makes it unreliable to do zoom, webinars.”
- “Our business is restricted from new technology due to poor internet access. Business Software programs are not going cloud based but we don’t have strong enough internet to reliably access. We cannot participate in zoom meetings.”
- “We have little to no service and it is a shame that we cannot get any they have got to seriously work on getting broadband out here in the country where we need it just as bad as the people in cities do. It’s almost like discrimination against the country.”
- “Speeds greater that 100 Mb/s would be great if possible.”
- “Availability and cost of internet options are limited in our area. As a business, having an affordable backup/alternative is not a cost effective option. So, we have one provider with some service problems and it can negatively impact our business.”
- “We tolerate the internet speed here, but it would be much better if it was faster. It hinders our production throughout the day at work and sometimes quits altogether when usage is high.”

Some respondents commented that fiber was available nearby, but they were unable to or didn’t know how to connect to it. Complete comments from the 2021 survey are provided in Appendix A.

VI. Ookla[®] Speedtest Intelligence[®] Data

Ookla trademarks used under license and reprinted with permission.

A. Background

Ookla is the company who provides what is probably the most well-known internet tests (Speedtest[®]), which is a free service available at www.speedtest.net. Every day, over ten million unique tests are initiated by users through the Speedtest web browser tool or a Speedtest app. And each time a user takes a Speedtest, a snapshot of the internet is captured for that given time, place, device, and network. Ookla and Speedtest are not owned by an internet service provider and the data captured are based on the experiences of the test users (not reported by ISPs like the PSC's broadband map data).

According to www.speedtest.net website:

"Ookla is the global leader in fixed broadband and mobile network testing applications, data and analysis. As the company behind Speedtest and Downdetector, Ookla has the most comprehensive analytics on worldwide internet performance and accessibility. The company's flagship enterprise product, Speedtest Intelligence, is a vital research tool used by ISPs, carriers, businesses, universities and government agencies alike who trust Ookla's commitment to quality and neutrality.

Speedtest by Ookla is the definitive way to test the speed and performance of your internet connection. Every day, over ten million unique tests are actively initiated by our users in the locations and at the times when their connectivity matters to them. Since our founding in 2006, more than 25 billion consumer-initiated tests have been taken with Speedtest."

Unlike the M-Lab data discussed previously in Section V, access to Ookla data via their web-based Speedtest Intelligence analysis tool is a subscription service. As a pilot project, WCWRPC entered into a short-term, limited agreement with Ookla, which allowed WCWRPC use of the Speedtest Intelligence tool and collected data for this study at no cost. WCWRPC is very grateful to Ookla for this unique opportunity and their support. This opportunity allowed access to thousands more test samples for Clark County to supplement the 609 surveys completed as part of the 2021 Clark County Broadband Survey summarized in Section V.

B. About Speedtest Intelligence

The Speedtest Intelligence data portal allows companies, governmental bodies, and other organizations to better understand and monitor the speed and quality of internet services and networks. Given the scope of this study, the data provided in this section provides only a partial glimpse of the capabilities of this tool. Some example additional capabilities include:

- The web-based tool has built-in charts, table, and a mapping feature for quick analysis and monitoring or you have the ability to extract data to create your own tables, charts, and maps such those created by WCWRPC in this report.
- Available metrics include download speed, upload speed, latency/ping, jitter, and packet loss as well as some Ookla-created metrics such as a consistency score and a speed score.
- Data is available for each test result and these can be tied to latitude/longitude coordinates. The exception is that some types of Ookla cellular data is only available at the zip code level. In accordance with the terms of our agreement, we have aggregated data geographically within this study so that individual users or locations cannot be identified. The data does not include any

test results from test taken on a device using a virtual private network (VPN), since the actual location cannot be determined.

- Data is available by internet service provider (ISP). In accordance with the terms of our agreement, this study does not provide the names of individual ISPs. However, it is worth noting that Speedtest Intelligence could be a very useful tool for a governmental or regulating body that desires to evaluate a broadband expansion project that involved public financing (e.g., broadband grant, FCC reverse auction).
- Data is available by type of provider (e.g., fixed, mobile, all) as well as type of device or platform. For this study, we primarily focused on all fixed and excluded cellular/mobile broadband. The type of fixed technology (e.g., fiber vs. cable modem vs. DSL vs. satellite) is not available in the Ookla data. However, this is sometime obvious if you are familiar with the ISP and location. Latency can also provide insight to the type of service (i.e., a low latency consistently less than or equal to 16 milliseconds is more likely to be fiber or cable modem).
- Comparisons can be quickly made between geographies and ISPs.
- Speedtest Intelligence and a companion tool called Cell Analytics allows for a much deeper dive into mobile or cellular network performance, including wireless service quality, RF measurements, data usage, user density (both indoors and outdoors), cell site locations. and much more. As discussed previously, this study focuses on fixed (non-mobile) technologies.

C. Regarding The Data in this Section

The tables, charts, and maps in this section were based on WCWRPC analysis of Ookla of Speedtest Intelligence data from April 2020 to May 2021. As discussed in Section V, it is important to keep the following in mind when considering this data:

- A variety of factors at the user’s location not related to the ISP’s level or quality of service can influence broadband test results, including the age and capabilities of the software, and hardware as well as the quality of physical connections of wires/cables, signal interference, and the number users online at the same time at the location. And it is important to keep in mind that some users will not purchase the highest level of service available.
- Ookla’s Speedtest servers that collect the test result data are not located at the user’s ISP data server, so the data being transferred must “hop” from the user’s device to their ISP then to the closest Ookla server. Generally, more accurate measurements of maximum achievable speeds will be captured with shorter distances (fewer hops and bottlenecks). Ookla has over 10,000 test servers with numerous servers in Wisconsin, including in the nearby communities of Eau Claire, Wausau, and Wisconsin Rapids; it should be expected that the Ookla results should yield slightly faster speeds and better quality compared to the Clark County survey results in Section V given that the nearest M-Lab service is located in Chicago.
- Ookla’s consumer initiated test operates in the foreground; the user decides to take the test. Some companies have tests that operate in the background (e.g., hidden inside other apps). By operating in the foreground, this more accurately measures internet performance capability because it is able to use enough data to flood the internet connection and measure the full capability of both the network connection and the device. The M-Lab-based results in Section V were also based on a foreground test. It should be noted that Ookla’s cellular coverage data is collected in the background.

- There will be outliers in the data or data “noise” (e.g., really high or really low results) that may not be accurate or represent the normal, consistent, or available service levels due to unusual circumstances, user error, hardware glitches, etc.
- The average (or mean) of test results may slightly underestimate speeds and service quality since there may be times when a Speedtest is performed when a user is experiencing trouble or dissatisfaction with their service.

It is for many of the reasons listed previously that **the focus of this analysis is on overall trends and relative performance, not on data outliers or “noise”**. The purpose of this study is to identify general levels of services and to measure relative performance within and between geographic areas. We want to understand the experience of the majority or most Clark County internet users.

It is also for these reasons that **the charts in this section are most frequently expressed as a median (not an average or mean)**. A few outliers or “noise” can skew the results when using averages. The median, or equivalently the 50th percentile, of a list of numbers is the center-most value found by arranging all the observations from lowest-valued to highest-valued. This median is not skewed by the outliers and better reflects the typical experience.

D. Speedtest® Results for Clark County

Clark County vs. Wisconsin Comparison

The three tables on the following page compares monthly median speeds and latency for Clark County versus the State of Wisconsin for all fixed internet technologies. Fixed internet includes all platforms (e.g., fiber, cable modem, DSL, satellite), except mobile cellular. Some key findings from these charts:

- While the April 2021 State median download speed is over 100 Mbps, the Clark County median (28.5 Mbps) barely meets the FCC’s minimum standard to qualify as broadband (25 Mbps).
- While Wisconsin’s monthly median download speeds have been steadily increasing over the past year, there are no significant trends for Clark County.
- While there is less difference between the State and Clark County in terms of monthly median upload speeds, Clark County’s speeds were less than half of those of the State in April 2021 (5.66 vs. 11.42 Mbps). As a reminder, the FCC’s current minimum upload standard for broadband is 3 Mbps.
- Clark County has experienced noticeable improvement in latency over the past year and in April 2021 had results comparable to those of Wisconsin (22ms vs 19ms).

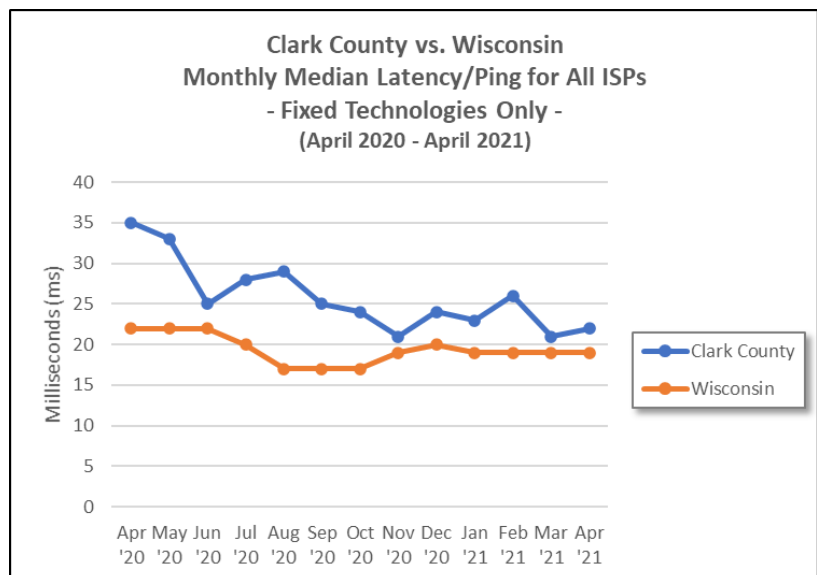
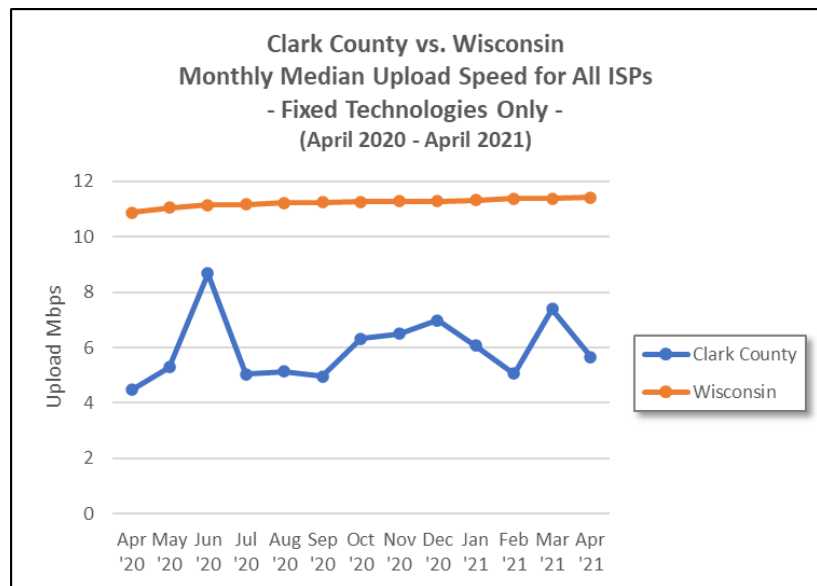
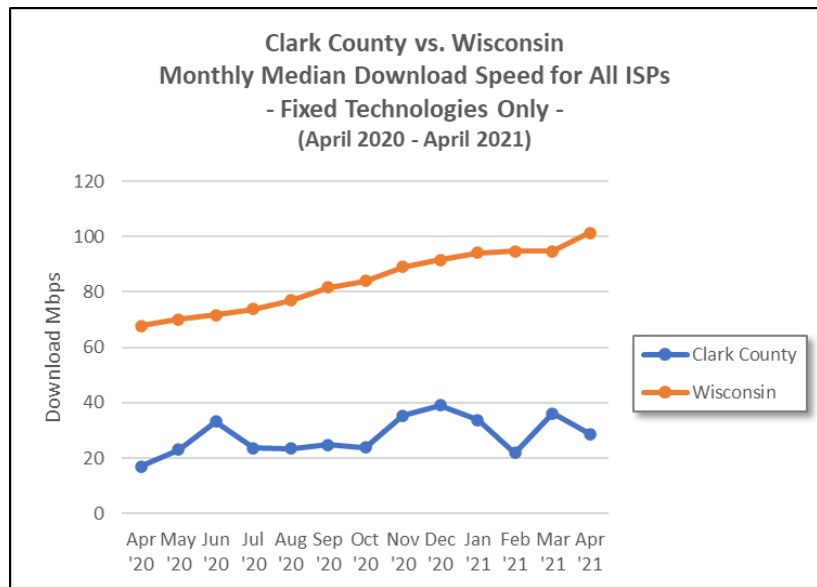
These charts demonstrate that Clark County very significantly lags behind Wisconsin as a whole. This is even more troubling when you consider that one April 2021 report ranked Wisconsin as having the 41st faster average download speed among the 51 states in our nation.²⁶ Clark County’s digital divide in relation to Wisconsin will be discussed more in Section VII.

²⁶ <https://www.highspeedinternet.com/resources/fastest-slowest-internet>

Fixed Internet Speed and Latency Charts

Comparison of Clark County vs. Wisconsin

The charts in this section were created by WCWRPC based on WCWRPC analysis of Ookla® Speedtest Intelligence® data



Performance of the Top Fixed Internet ISPs in Clark County

The three charts on the following page shows the monthly median speeds and latency for the five internet service providers (ISPs) providing fixed internet (wireline, fixed wireless, & satellite) in Clark County that had the most samples²⁷ between April 2020 through April 2021. The “Top 5” account for 95.7% of the 3,471 samples for fixed technologies during the time period and appear to be the most commonly used fixed ISPs in Clark County, but this does not mean that they necessarily cover the most geographic area in the County. There are six other fixed ISPs for which test results were captured during the time period, but the sample sizes were relatively small, which raised concerns for WCWRPC if the results should be reliably included here (e.g., 4 of the 6 had ten or fewer samples).

While it is generally accepted that most homes and places of business in Clark County can access some level of internet service (if they can afford it), these charts suggest that the median level of service for many of the ISPs operating in the County do not meet or barely meet the FCC’s minimum definition of broadband, keeping in mind those factors previously discussed in subsection C. Some key findings from these three charts:

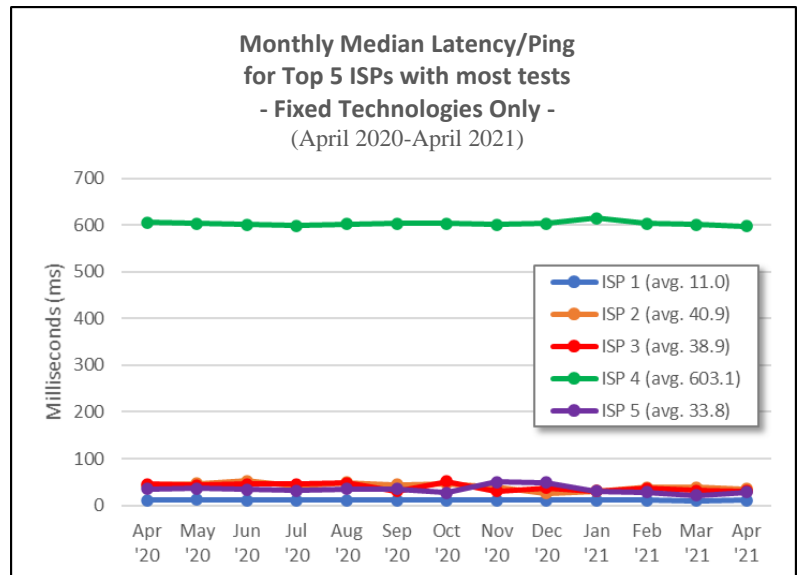
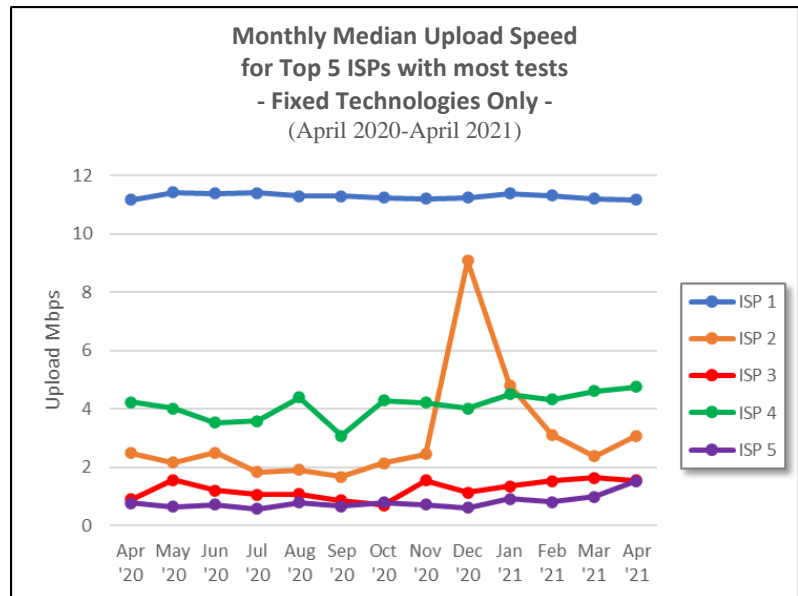
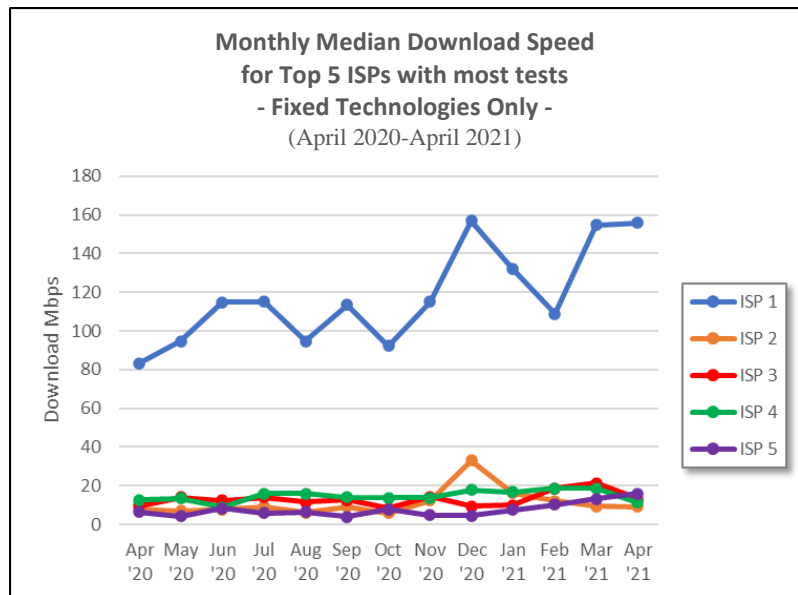
- ISP 1 is strongly outperforming the other four top ISPs with speeds and latency numbers exceeding the State averages; their download speeds also appear to be improving over the time period. ISP 1 also accounted for the most completed tests during the sample period (41% of all samples), which boosted Clark County’s results in the charts on the previous page.
- None of the median monthly numbers are symmetrical (or near symmetrical). While ISP 1 did have some median monthly download speeds exceeding 100 Mbps, its upload speeds fall short of the Public Service Commission’s goal of covering 75% of Wisconsin with 100 Mbps down and 20 Mbps up by 2025.
- None of the other four ISPs shown had both monthly median download or upload speeds that consistently the FCC’s current minimum of 20 Mbps down and 3 Mbps up.
- All but ISP 4 had monthly median latencies below the FCC’s 100ms latency standard.

²⁷ Samples account for duration and are not the same as number of tests. To ensure fair representation, each user contributes one sample per network per time period when describing Performance and Quality. When describing Availability, each user contributes one sample per network, per day.

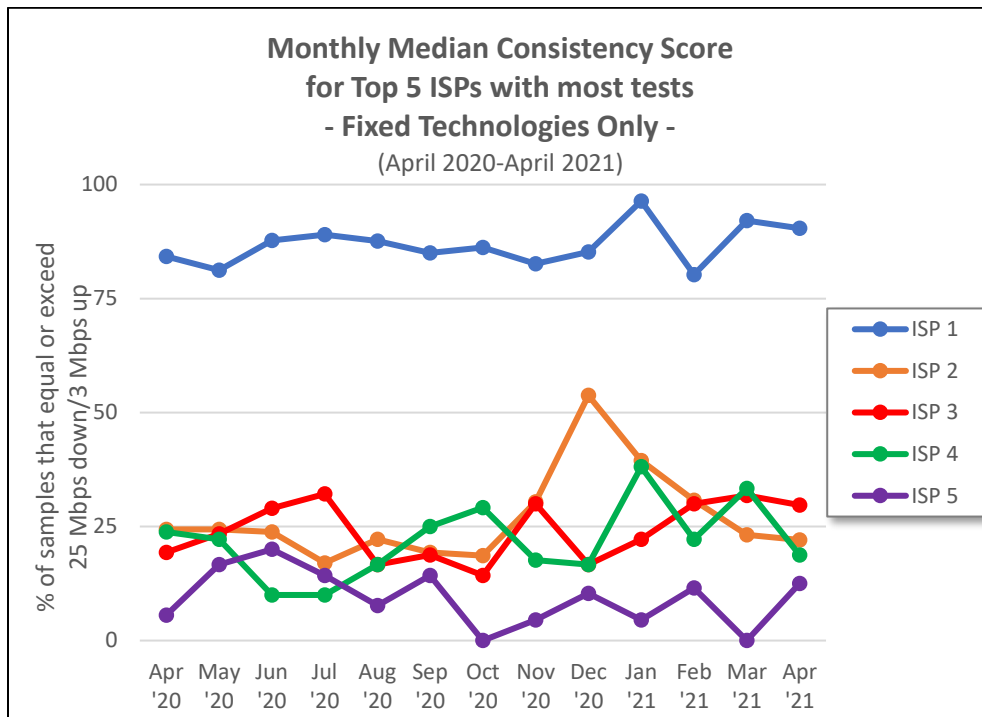
Fixed Internet Speed and Latency Charts

Top 5 ISPs with most completed tests in Clark County

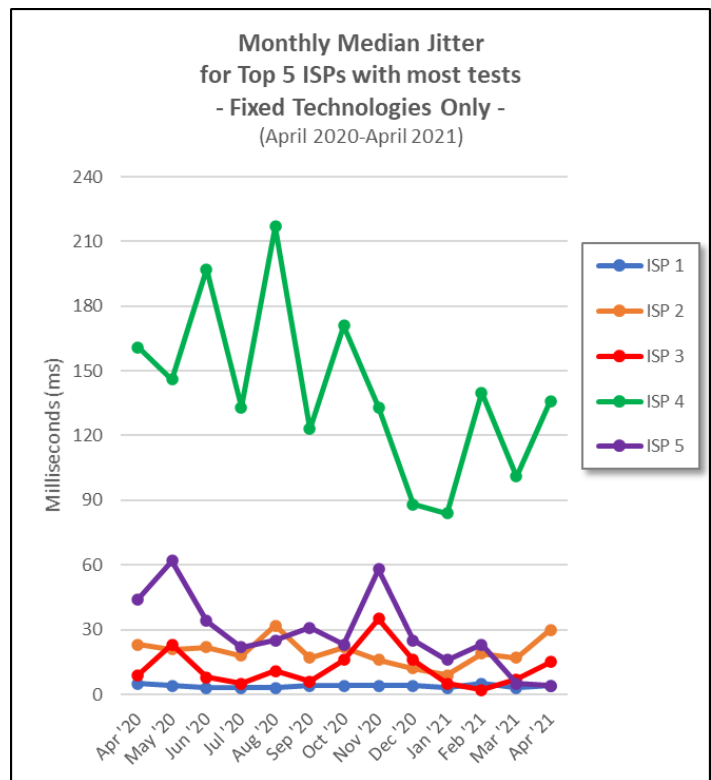
The charts in this section were created by WCWRPC based on WCWRPC analysis of Ookla® Speedtest Intelligence® data



The chart below provides insight into the consistency of the download and upload speeds for the “Top 5” ISPs. The consistency score shows what percentage of an ISP’s samples equaled or were above 25 Mbps down/3 Mbps up. Of the five, ISP 1 was the only fixed provider that consistently had a majority of samples that met the FCC’s minimum threshold to qualify as broadband.



Related to latency/ping is **jitter**, which is sometimes called Packed Delay Variation (PDV). Jitter is a measure of the variability or fluctuation in latency/ping over time and, like latency, is measured in milliseconds (ms). Generally, the longer it takes for data packets to arrive, the more that jitter can result in data loss and negatively impact video and audio quality. High jitter is most often due to network congestion, interference in wireless signals, and/or poor or aging hardware. There is not a firm standard for acceptable levels of jitter, but levels below 30ms are often referenced as being tolerable for most users. The chart to the right is based on WCWRPC analysis of Ookla Speedtest Intelligence data for monthly median jitter for the Top 5 ISPs. ISP 1, again, outperformed the other four, though ISPs 2 & 3 were also near or below 30ms in most months and ISP 5 has shown improvement. It is not surprising that ISP 4 had the highest jitter given its very high latency numbers.



Speed Maps for Fixed Internet in Clark County

Maps 20 & 21 at the end of this section were created by WCWRPC based on WCWRPC analysis of Ookla Speedtest Intelligence data. The fixed download speed and fixed upload speed maps do not show specific locations or points, but instead show a general representation of areas with internet speeds based on locations with two or more completed tests between May 2020 through April 2021. The maps were created using a GIS kernel density algorithm, similar to a heat map, but without density. In other words, the map shows potential speeds in an area, but does not reflect the number or density of tests. The maps also do not reflect a median or average. For example, the maps show a general area where high speeds occurred, but we do not know if these speeds occur consistently.

The colors (speeds) are overlaid, with the highest speed results (green) on top and slowest speed results (red) on the bottom. This approach suggests the highest level of service that may be available. For example, there were multiple tests in Abbotsford that had download speeds in all three speed categories, though the map suggests that 150+ Mbps download speeds are available within the City, even though some test results fell into the yellow and red categories. The areas in white had no test results, but may or may not have internet connectivity.

Due to confidentiality, this kernel density approach generalizes or “buffers” the speed results for an area in a manner that slightly exaggerates the geographic availability of service, especially for the higher speeds (yellow and green); **the actual geographic availability of 25+ Mbps service is smaller than shown and not all areas shown in yellow or green have that level of service.**²⁸ For public planning and analysis, it is important that the information in this section be compared and considered in the context of the other available data sources in this study.

Some key findings from these maps are:

- As discussed previously, most of Clark County has some level of internet service, but there are large areas in red or white (and likely some yellow) that lack fixed broadband (25+ down/3+ up).
- Not surprising, the highest levels of service are within the cities, villages, unincorporated “hamlets”, and along major roadways. Again, the yellow and green likely overstate availability.

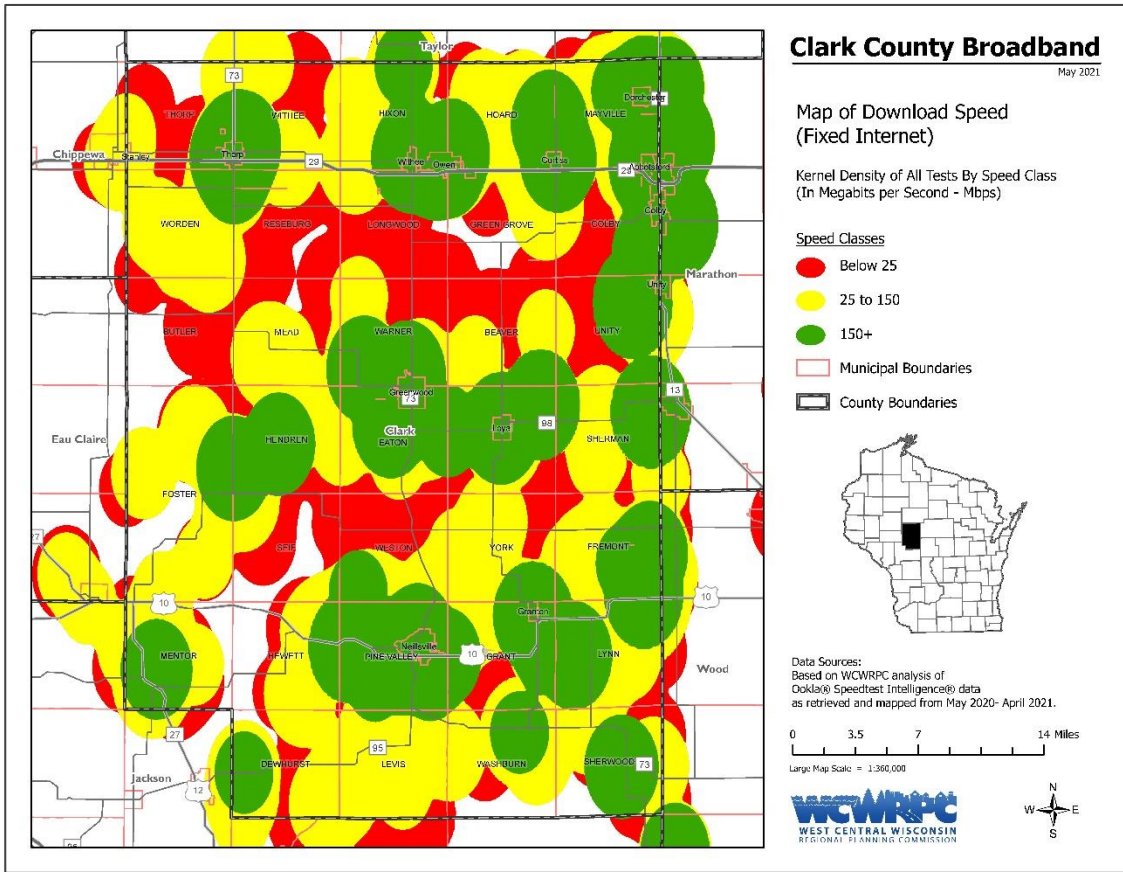
In total, the maps reflect 9,359 total tests. Nearly half of all tests did not meet the minimum FCC broadband standard, keeping in mind that many locations conducted multiple tests:

	Below 25 Mbps	25 to 150	150+
Download Speed	49.3%	32.3%	18.4%

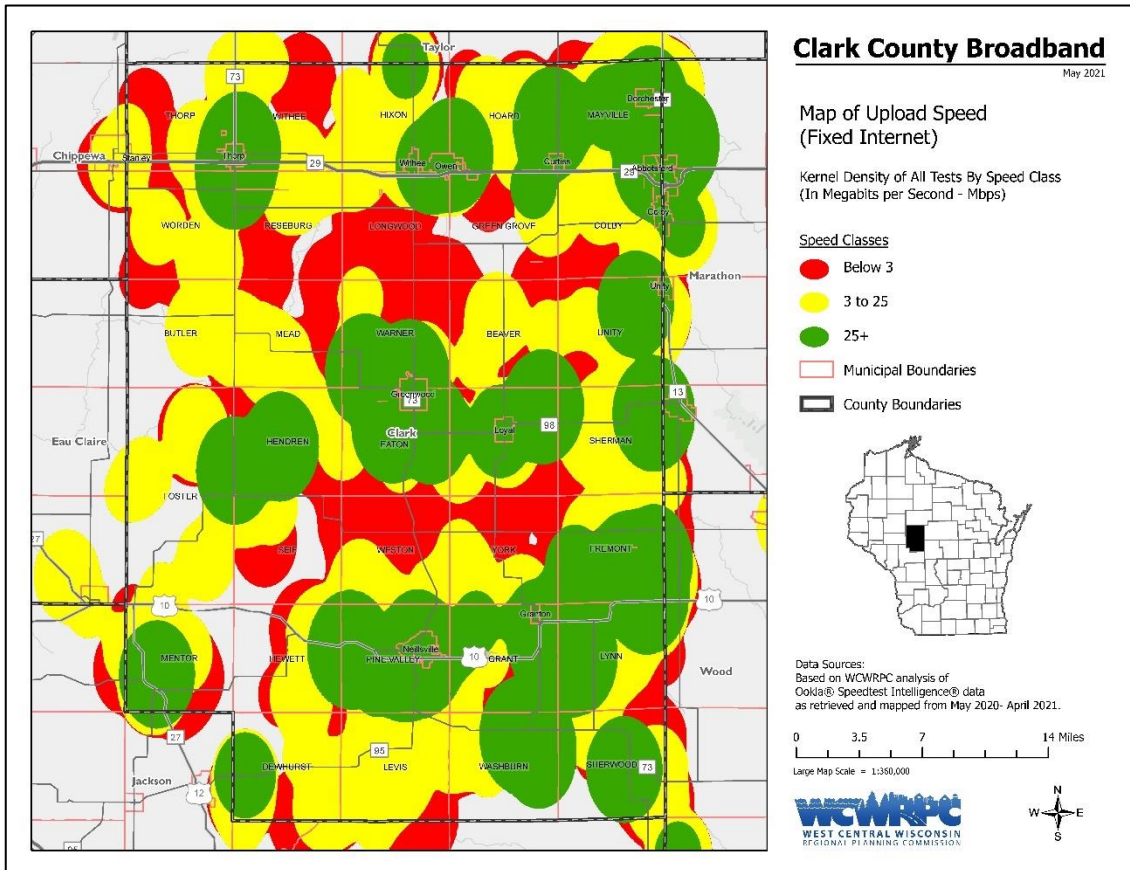
	Below 3 Mbps	3 to 25	25+
Upload Speed	36.3%	52.9%	10.8%

²⁸ The Ookla Speedtest Intelligence portal allows portal users to explore this data in greater geographic detail and by specific ISP, but we are restricted from sharing this information publicly. This poses a dilemma for public grant applications and public planning at smaller geographical levels. While this data is very informative and can be a powerful tool in identifying current levels of service, it is a greater challenge for a local government to use this data in a manner that can be made part of the public record (e.g., demonstrating that an area is underserved for Wisconsin Broadband Expansion Grant eligibility as discussed in Section IV. A.).

Map 20.



Map 21.

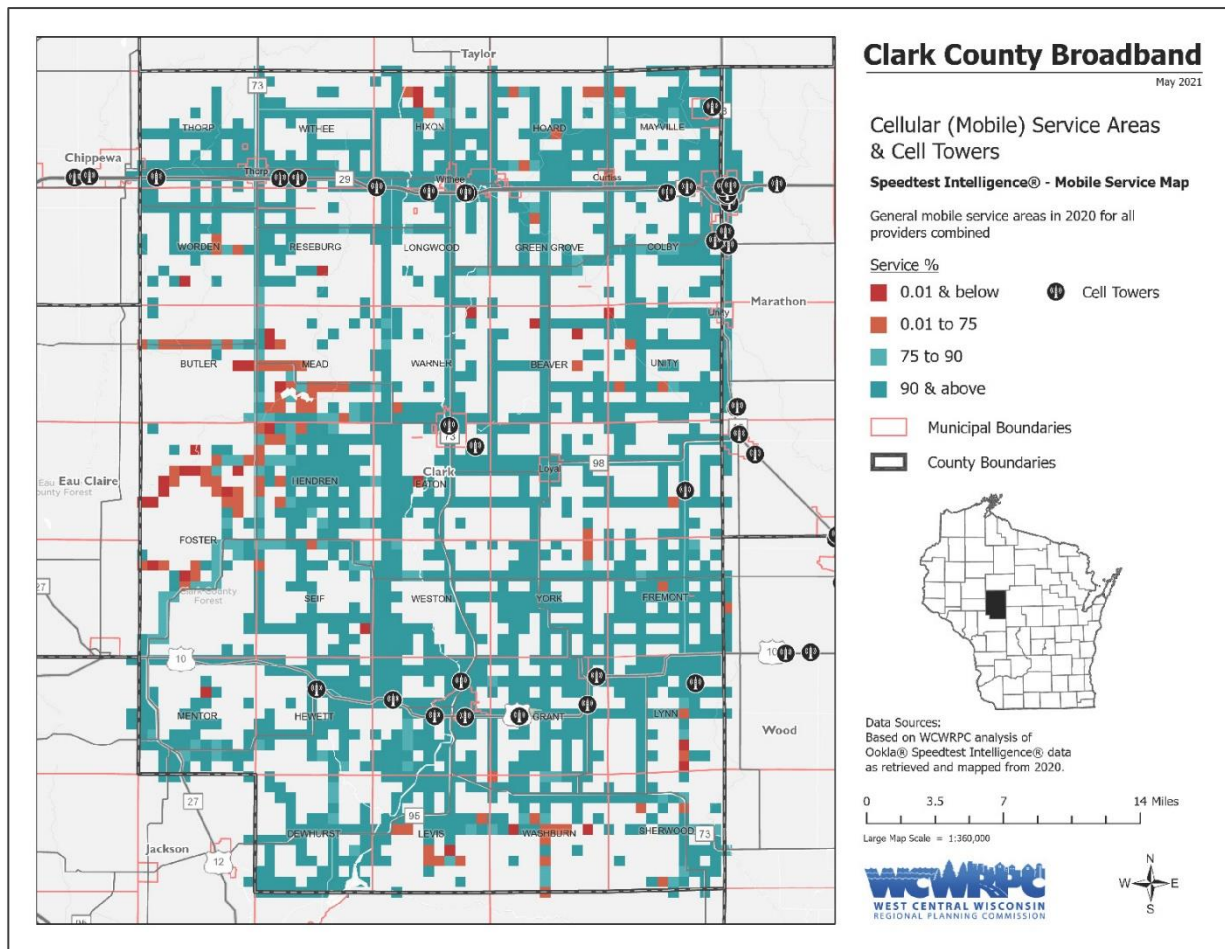


Cellular (Wireless or Roaming Mobile) Service Levels and Cell Towers

As stated previously, this study focuses on fixed wireless and wired broadband technologies and generally does not analyze cellular or mobile service. However, Ookla's Speedtest Intelligence web-based portal tool (and its companion Cell Analytics tool) has a wealth of information on cellular service. Given this opportunity, we have included a map below showing the cellular service levels and cell towers on Clark County.

Following the above two referenced maps is a third map created by WCWRPC based on WCWRPC analysis of Ookla Speedtest Intelligence data. The map shows the variation in cellular service percentage across Clark County and cellular tower locations for a cellular service providers combined in 2020. **Service %** is how likely, on average, a user is to have mobile cellular service available in a given location.

The service areas on the map generally show where mobile devices were located when connected to cellular towers; this data is collected in the background and not as part of a user-initiated Speedtest. This map does not show the full geographic extent of all available cellular service, but just shows where data has been received. For example, the service areas shown often follow roadways due to mobile devices connected to the internet while travelling, though other nearby areas without color (no data available) may have similar service levels. The map suggests that cellular service is good for most of Clark County, though service gaps exist especially in the Mead Lake-Rock Dam area and some southern areas of the County; there is also a lack of towers in these areas.



VII. Other Broadband Data

A. Wisconsin DPI & School District Data

The Wisconsin Department of Public Instruction (DPI) has become a State leader in internet/broadband data collection in recent years. DPI partners with local school districts and public libraries for data collection. The DPI Digital Equity Gap webpage (<https://dpi.wi.gov/broadband>) includes a variety of resources and DPI has partnered with M-Lab to collect data on internet connections speeds across Wisconsin.

DPI staff provided data support to provide additional insights into internet speeds and connectivity for Clark County households with students in public schools using their 2020-2021 Digital Equity Survey results. DPI had not received data from the Neillsville, Spencer, and Osseo-Fairchild Districts, though some of these areas are represented in the data due to open enrollment. In all, there were 1,930 responses for Clark County. Of the respondents:

- 92% had internet access. 5% stated it was not available and 3% not affordable.
- 55% could stream video without interruption. 37% stated that streaming was inconsistent. 8% could not stream video without interruption.

Maps 22, 23, and 24 were produced by WCWRPC using data provided by DPI. For privacy protection, DPI only shares data for geographic areas with five or more responses. For the maps, Clark County was divided into a nine square-mile grid and averages for those grids are provided; grids with fewer than five responses are excluded, keeping in mind that not all school districts reported. Reliability in Maps 23 and 24 reflect the ability to stream video (and fully participate in remote learning) without interruption.

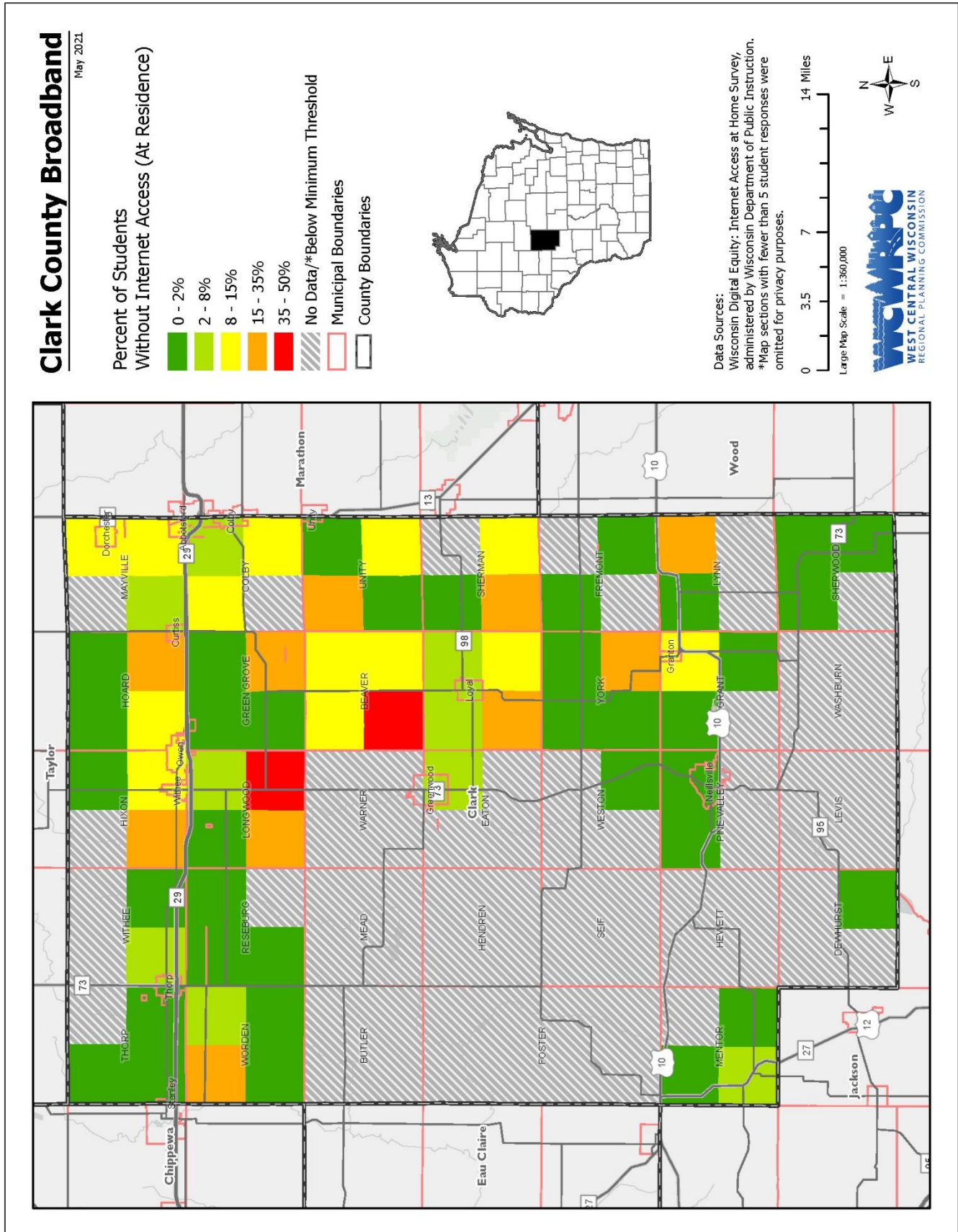
DPI maintains interactive maps using their Digital Equity Survey data at their webpage as referenced above.

DPI also has a Bridge to Broadband Mapping tool available to school districts to assist the districts in visualizing student connectivity data.

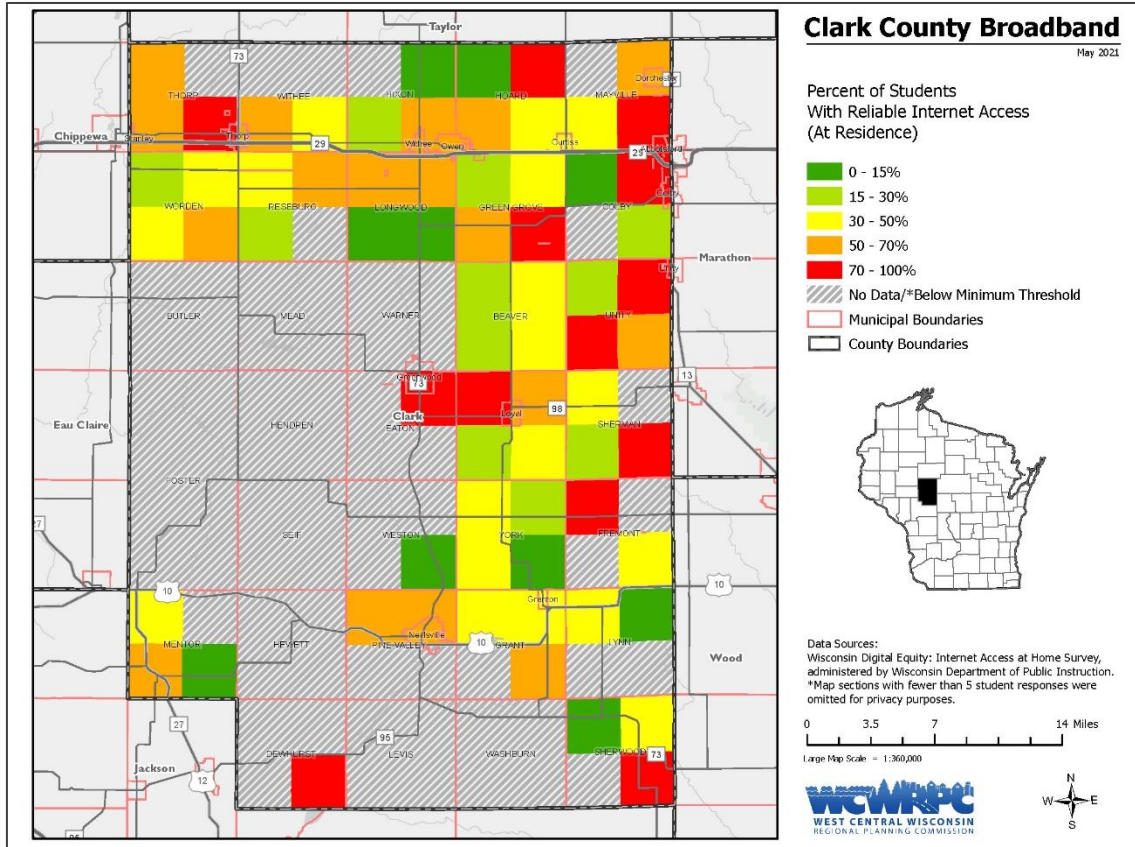
This sub-section serves as a reminder that school districts, public libraries, and DPI, as well as post-secondary educational institutions, are important partners when addressing local broadband needs.

The screenshot shows the 'DPI Digital Equity Gap' webpage. At the top left is the Wisconsin Department of Public Instruction logo. A search bar is located at the top right. The left sidebar contains a menu with items like 'ECF Emergency Connectivity Fund', 'Expanding Broadband', 'Funding Quick Reference Guide', 'Digital Equity Data', 'Public Digital Equity Dashboard & Maps', 'Public Speed Test Dashboard & Maps', 'Broadband Speed Test', 'Webinar Recordings', 'Secure Mapping Tool', 'Project 10Million', and 'Broadband Events Calendar'. The main content area has two buttons: 'Students & Families' and 'Districts & Libraries'. Below these are links to 'Wisconsin Digital Equity Dashboard on the WISEdash Public Portal', 'Wisconsin Public Digital Equity Map', and 'Indicators of Broadband Need Nationwide Map'. A section titled 'Improving Digital Equity in Wisconsin' explains the importance of closing the digital equity gap and lists initiatives led by the Department of Public Instruction.

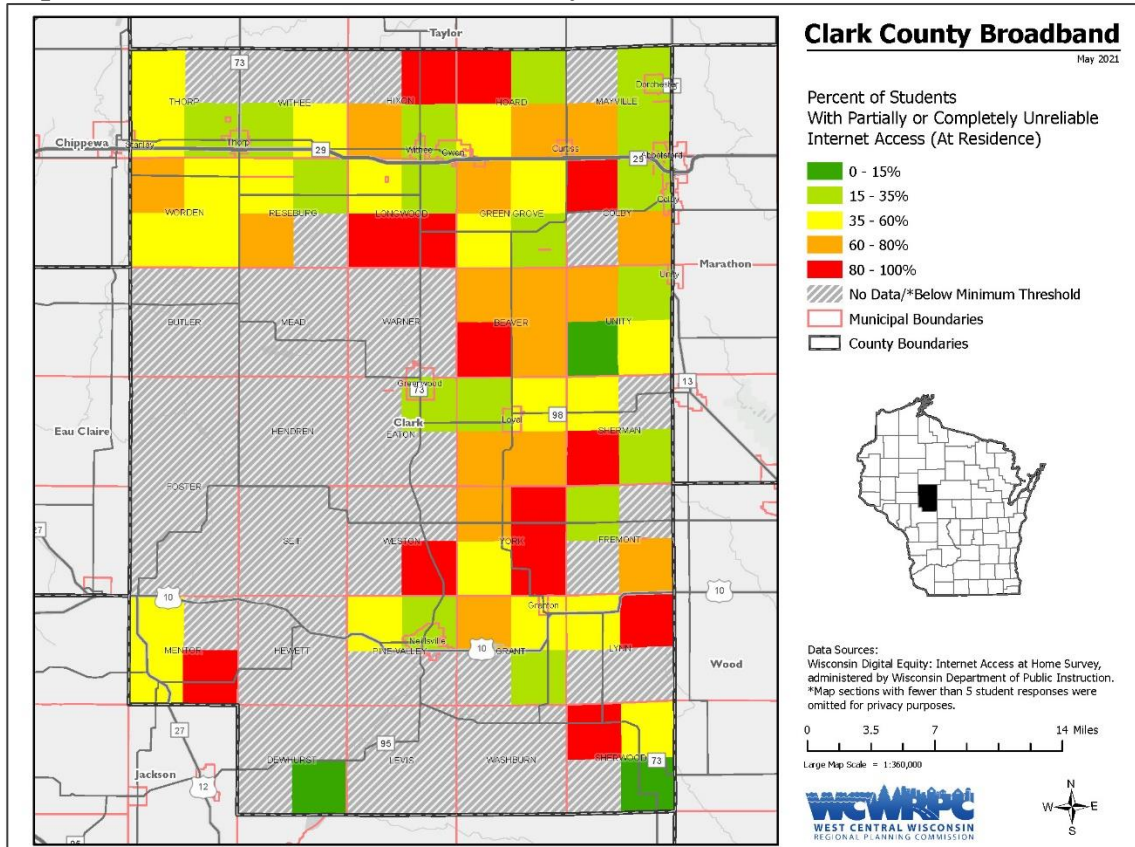
Map 22. Percent of Students without Internet Access



Map 23. Percent of Students with Reliable Internet Access



Map 24. Percent of Students with Partially Reliable or Unreliable Internet Access



B. Internet Subscriptions by Demographic

The U.S. Census Bureau’s American Community Survey (ACS) offers some insights in internet use by county, municipality, or other census-defined area. Since the ACS is a average sample over a five-year period, care must be taken when using the numbers for smaller populations given the potential for a sizable margin of error.

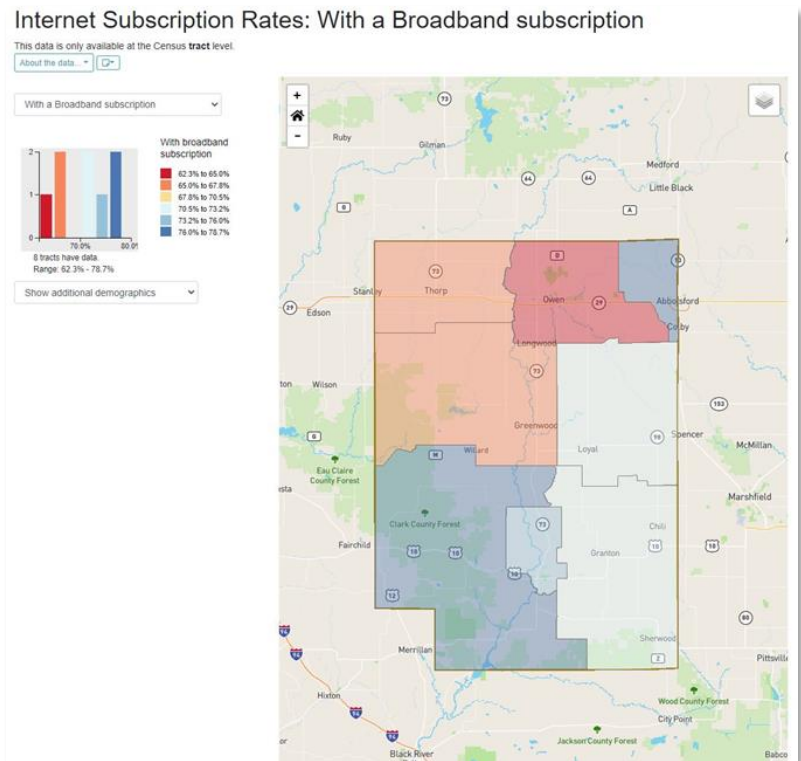
According to the 2015-2019 ACS, 71% of Clark County households had a broadband internet subscription. In this case, broadband simply denotes a high-speed internet service as identified by the respondent; it is not based on a minimum download speed. In comparison, 82.5% of Wisconsin households stated they had a broadband internet service subscription. The following table further summarizes internet subscriptions in Clark County.

Clark County ACS 2015-2019	Less than \$20,000 in 2019 Household Income	Population 65+ years	Household population 25+ years with less than high school graduate or equivalency	Unemployed or Not in Labor Force	White alone	Non-White
With dial-up Internet subscription alone	0.8%	3.4%	0.4%	2.0%	N/A	N/A
With a broadband Internet subscription	46.5%	54.4%	41.8%	59.9%	69.1%	92.0%
Without an Internet subscription	52.7%	8.0%	7.4%	7.7%	6.3%	2.2%
No computer	N/A	34.1%	50.4%	30.4%	23.7%	5.5%

C. I3 Connectivity (www.i3connect.org)

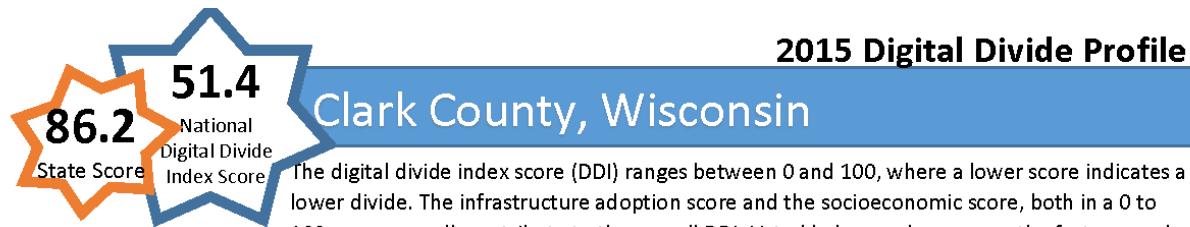
The I3 Connectivity Explorer is a free web-based tool hosted by The Center for Internet as Infrastructure, LLC. However, this service may be discontinued in the near future. The tool gathered and combined federal data sources (FCC, ACS) with public sources such as M-Lab to localize internet connectivity data by county, municipality, school district, or census-defined places. The I3 tool yielded the following additional insights for Clark County as of May 2021:

- 62% of Census blocks have no wireline broadband (25/3 Mbps) connection.
- The County has a 76.3 digital distress indicator, which is a reflection of the percentage of households with internet subscription and the percentage with broadband access. A score greater than 50 is considered distressed.
- An estimated \$17,747,513 in annual economic benefit could be realized if 75% of households had broadband access and could make more purchases at lower costs.

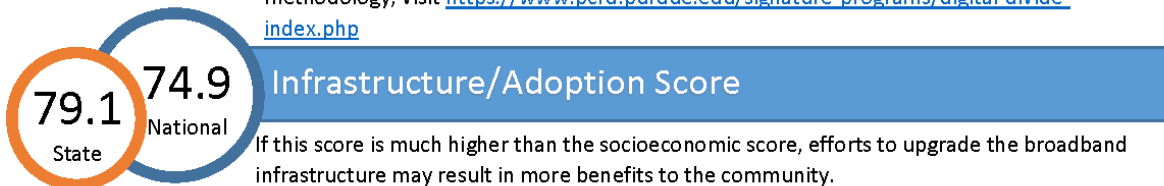


D. Clark County's Digital Divide

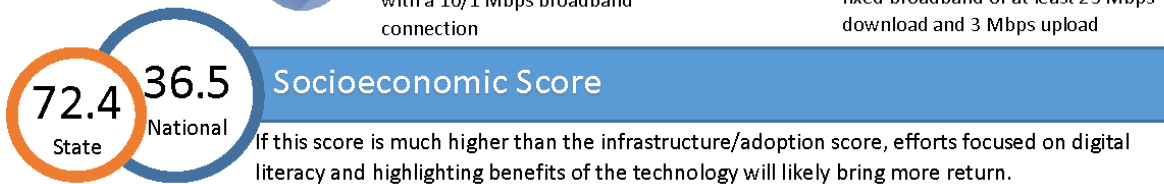
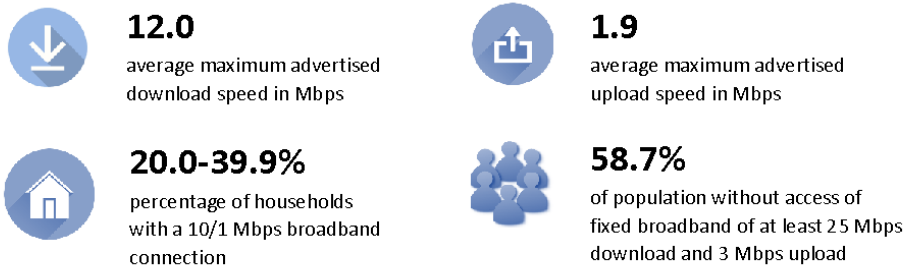
In 2015, the Purdue University Center for Regional Development conducted a digital divide analysis, which the University of Wisconsin-Extension used to prepare the following summary:



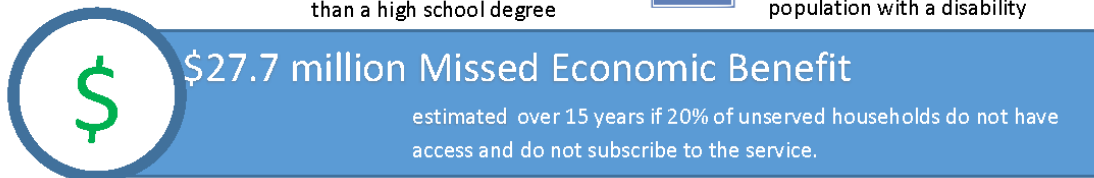
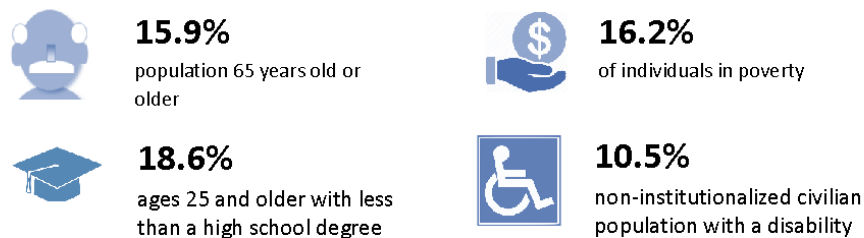
The digital divide index score (DDI) ranges between 0 and 100, where a lower score indicates a lower divide. The infrastructure adoption score and the socioeconomic score, both in a 0 to 100 range as well, contribute to the overall DDI. Listed below each score are the factors used. These scores were calculated by looking at the geographic units (Census tracts, counties) and comparing them with their peers. For this reason, scores are not comparable across different geography tiers (Census tract versus counties versus states). For more information about the methodology, visit <https://www.pcrd.purdue.edu/signature-programs/digital-divide-index.php>



If this score is much higher than the socioeconomic score, efforts to upgrade the broadband infrastructure may result in more benefits to the community.



If this score is much higher than the infrastructure/adoption score, efforts focused on digital literacy and highlighting benefits of the technology will likely bring more return.

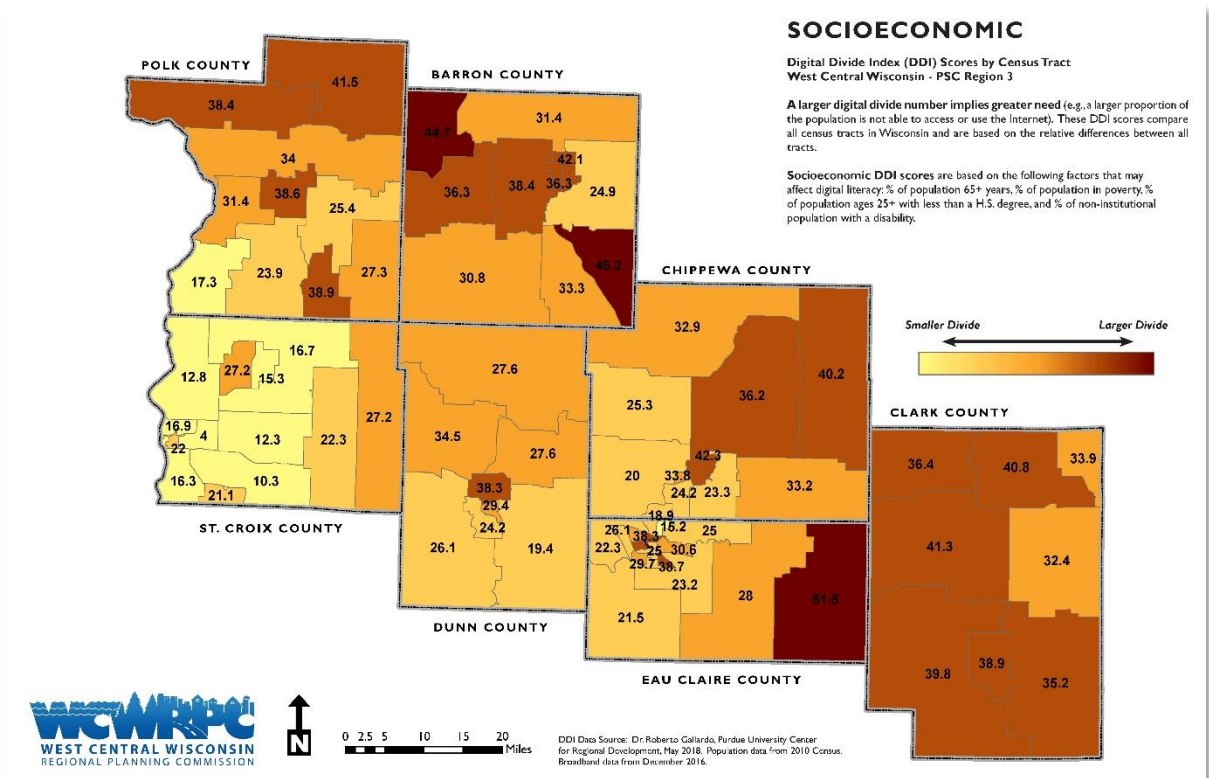
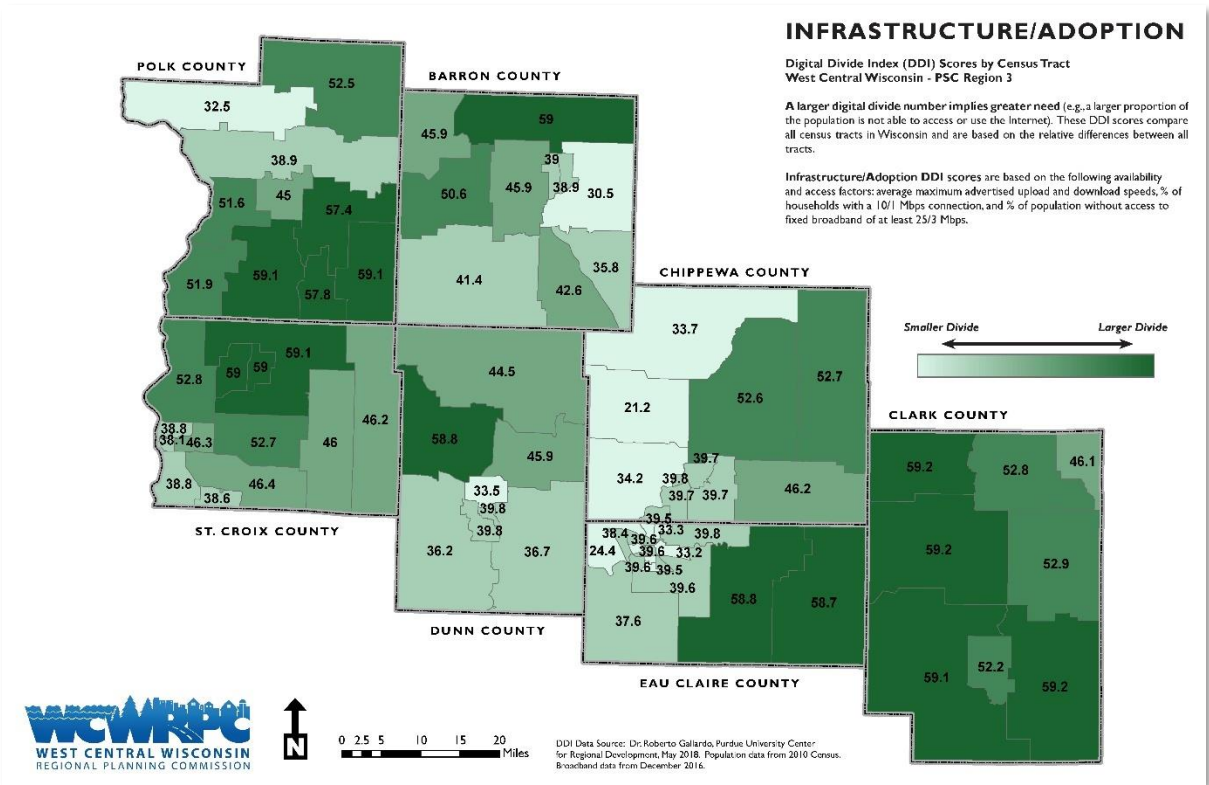


For more information, contact the UW-Extension Broadband & E-Commerce Education Center at wibroadband@uwex.edu

Digital Divide Index produced by Dr. Roberto Gallardo, Purdue University Center for Regional Development and Extension Community Development Program; September 2017.



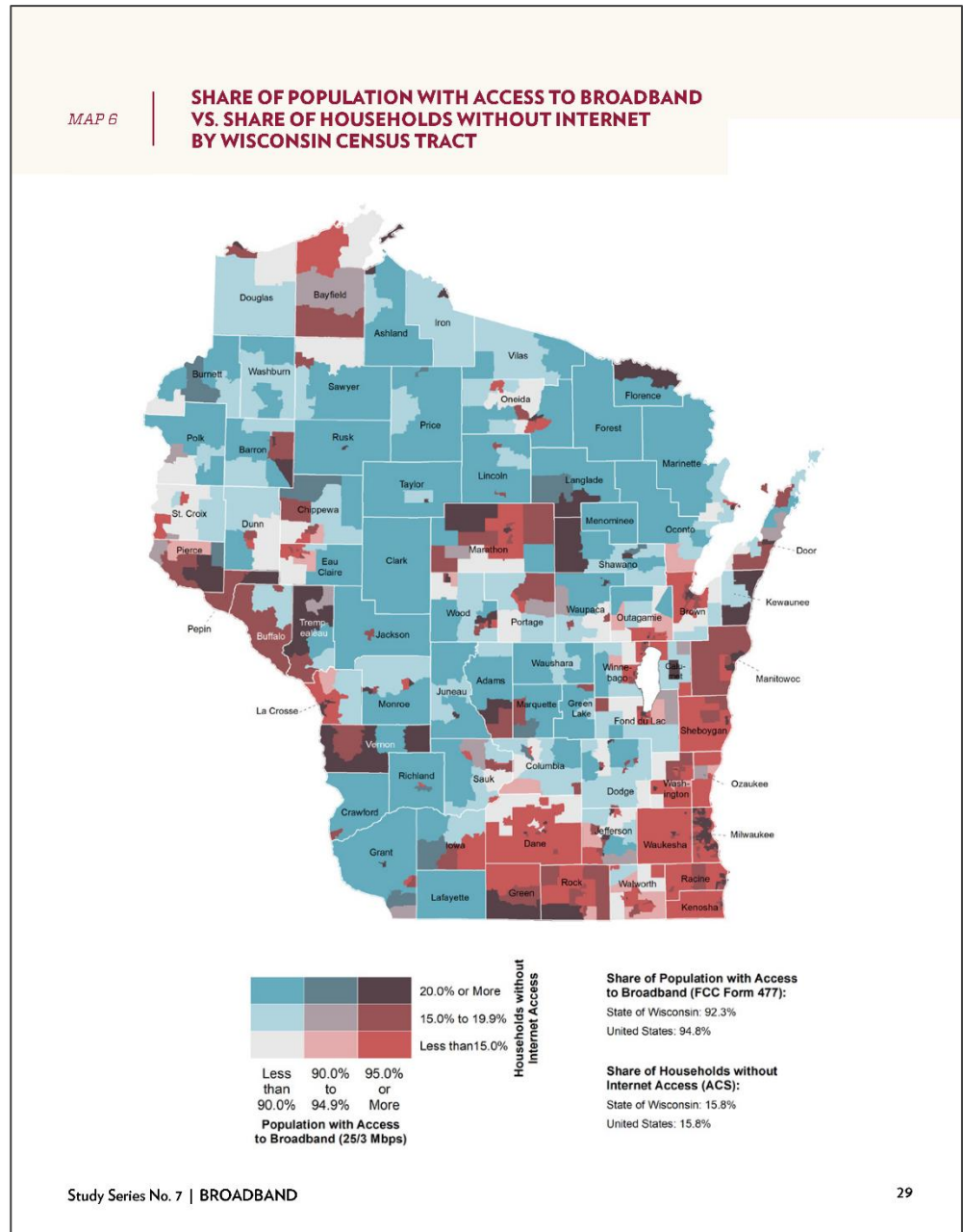
WCWRPC contacted the Purdue University Center to obtain their dataset and produced the following maps comparing the infrastructure/adoption and socioeconomic scores for the RPC's seven-county region:



In January 2021, the University of Wisconsin-Madison Extension released a report entitled “Broadband and the Wisconsin Economy” as referenced in the introduction. This report includes a review of the FCC Form 477 data and Census ACS data to show that Clark County has a relatively high proportion of its population without broadband (25/3 Mbps) access and a relatively high share of its households without internet access. The map below, excerpted from the Extension report, compares these two factors by census tract.

The Extension report also included its own broadband index using these two previous factors plus the shares of households that use each satellite and cellular only for access to the internet. Based on this index, Clark County and Forest County overall had the lowest scores in Wisconsin and were ranked near the bottom 10% of all U.S. counties. Clark County’s score was 2.6% compared to Dane County’s score of 44.5%, which was the best in Wisconsin.

It is worth noting that the report also shows that Wisconsin has some of the greatest State barriers for the provision of broadband service by municipalities. Instead, the State encourages partnerships between the private- and public-sectors as reflected by the requirements of the PSC’s Broadband Expansion Grant Program.



VIII. Broadband Gap Analysis

Taken as a whole, the previous data shows that Clark County is significantly under-served compared to most of Wisconsin and the Nation. While most businesses and households have internet service, the majority of Clark County lacks even the minimum 25 Mbps download/3 Mbps upload speeds to qualify as broadband. And far fewer areas have access to 100+ Mbps download speeds, which is the PSC's 2025 goal. Further, the data suggests that many customers in the County are experiencing broadband speeds that are lower than the speeds reported in the FCC Form 477 data, thus the actual need may be even greater. And 82% of all respondents to the County's 2021 Broadband Survey were not very satisfied with their internet service and dissatisfaction was higher in the unincorporated towns. In short, current supply is not meeting demand, especially if the County is looking to the future with the increasing role of technology and the Internet of Things in our daily business, services, and life.

Map 25 on the following page shows that 79.6% of Clark County had no confirmed wireline ISP offering 25+ Mbps download speeds:

- In pink are those census blocks for which no wireline ISP reported offering 25+ Mbps down, which is about 60.2% of the County. This included fixed wireless as well, until the most recent fixed wireless reporting as reflected in Map 11b.
- In darker red are those census block which were reported by an ISP as having 25+ Mbps down available, however no other data sources reviewed during this study (e.g., 2021 County Survey, Ookla) were able to confirm these speeds. The 19.4% of the County in darker red are unconfirmed.

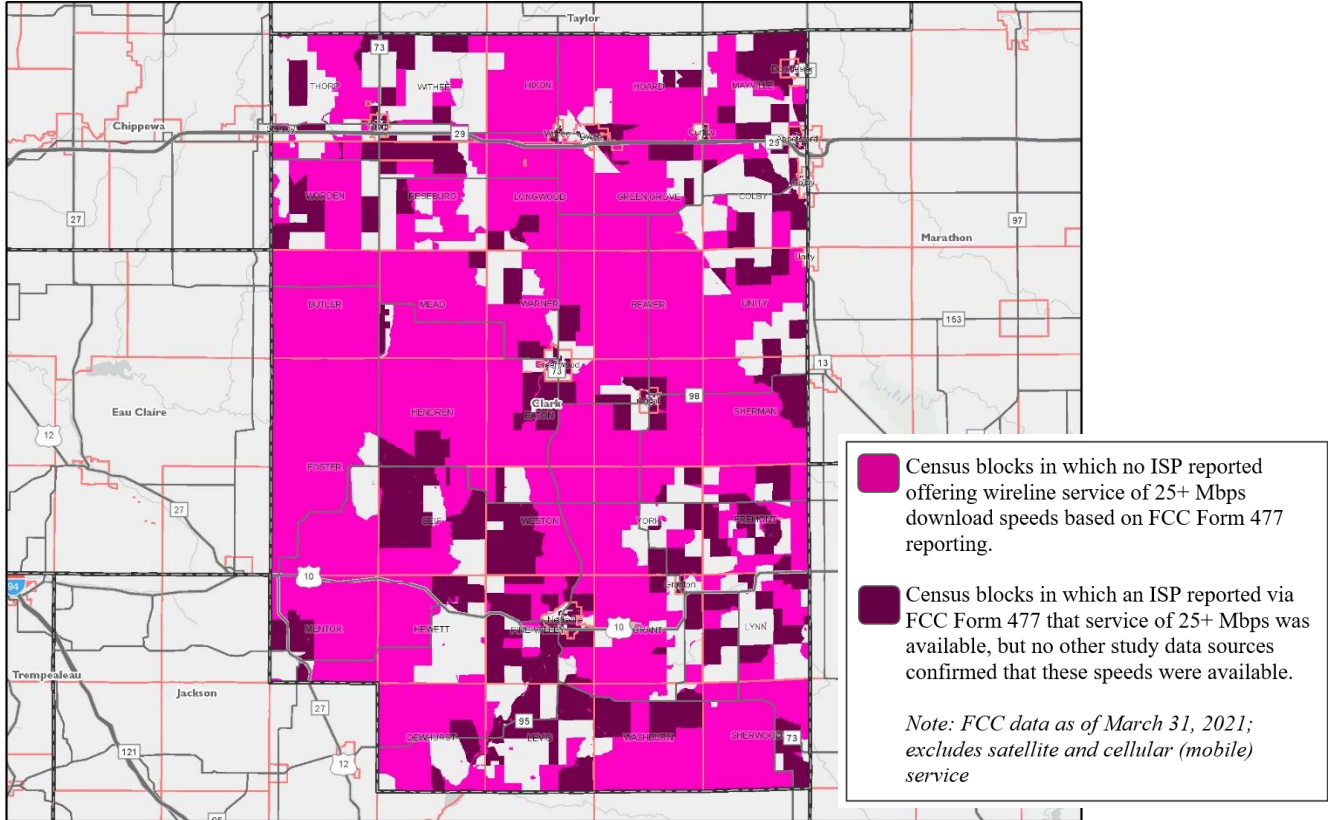
Map 26 takes a similar approach, but increases the download speed to 100+ Mbps. Overall, the map shows that 92.1% of Clark County had no confirmed wireline ISP at 100+ Mbps download speeds:

- The 81.8% of the County in blue are those census blocks for which no ISP reported offering 100+ Mbps down, including the latest fixed wireless reporting.
- The 10.3% in purple are census block in which an ISP reported that 100+ Mbps down was available, but the study was unable to confirm these speeds.

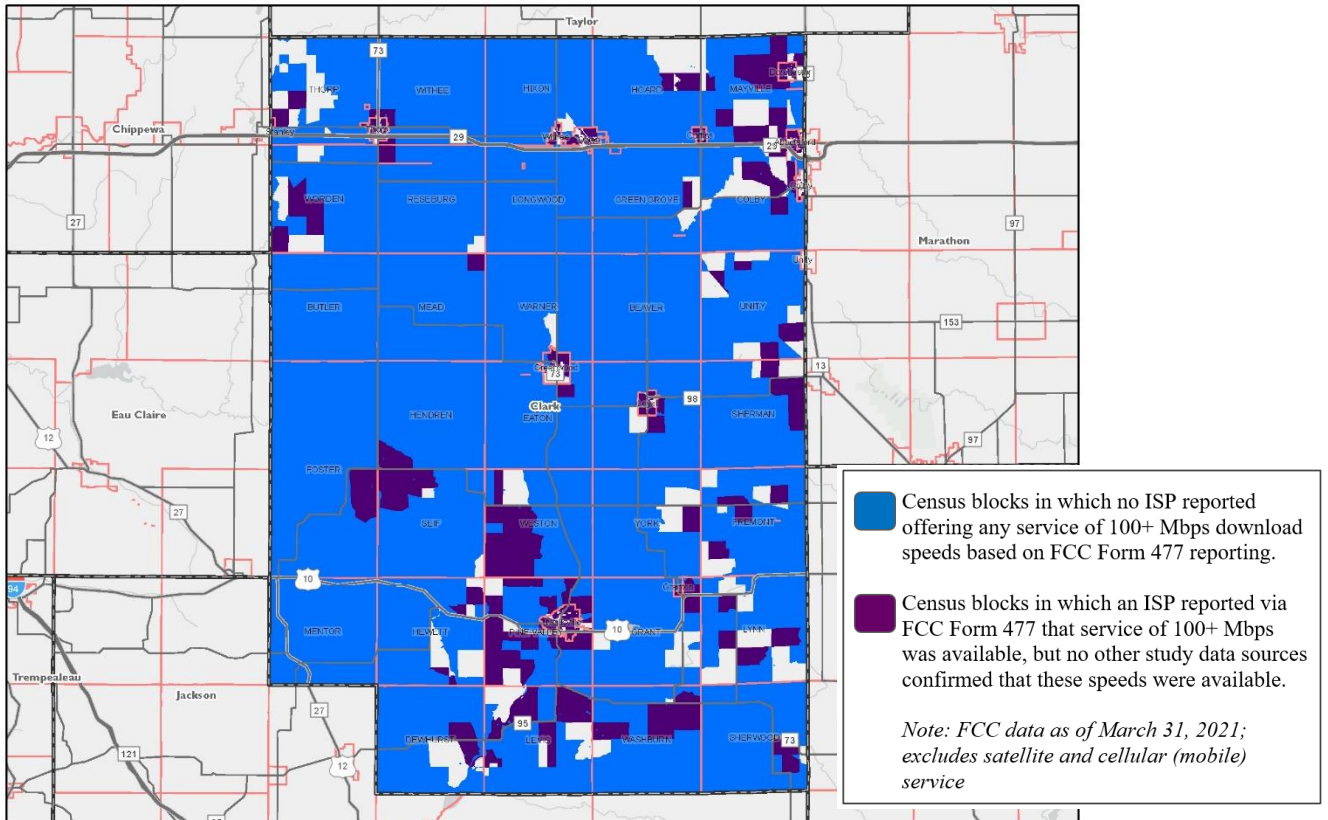
When considering these maps and the data in this report for planning purposes, a number of factors and unknowns must be considered and are worth monitoring:

1. Keep in mind the various short-comings in the various sources of data. For example, the FCC 477 data represents advertised speeds by census block as reported by the ISPs. And for the web-based speed testing, there are factors that can impact the speeds that are outside the control of the ISP.
2. The latest fixed wireless FCC Form 477 map (Map 11b) includes some areas of Clark County that are now advertised at 25+ Mbps, but these appear to be newer services and may not yet be reflected in the other survey or speed data. It may be worth monitoring Bug Tussel in particular, since both Wood and Jackson counties have partnered with this ISP to expand broadband service (or are exploring such partnerships).
3. The tentatively approved RDOF awards (Map 15) could significantly improve broadband service. Once approvals are finalized and details confirmed (e.g., areas served, types of service, minimum speeds), there may be opportunities to focus on other un/under-served areas of Clark County.

Map 25. PSC & WCWRPC Comparison – Less than 25 Mbps Download



Map 26. PSC & WCWRPC Comparison – Less than 100 Mbps Download



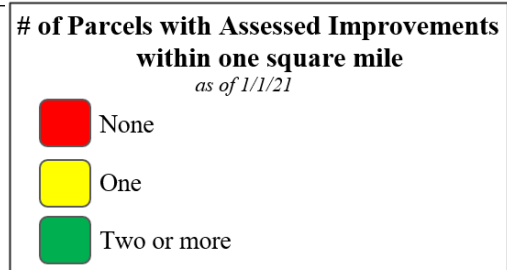
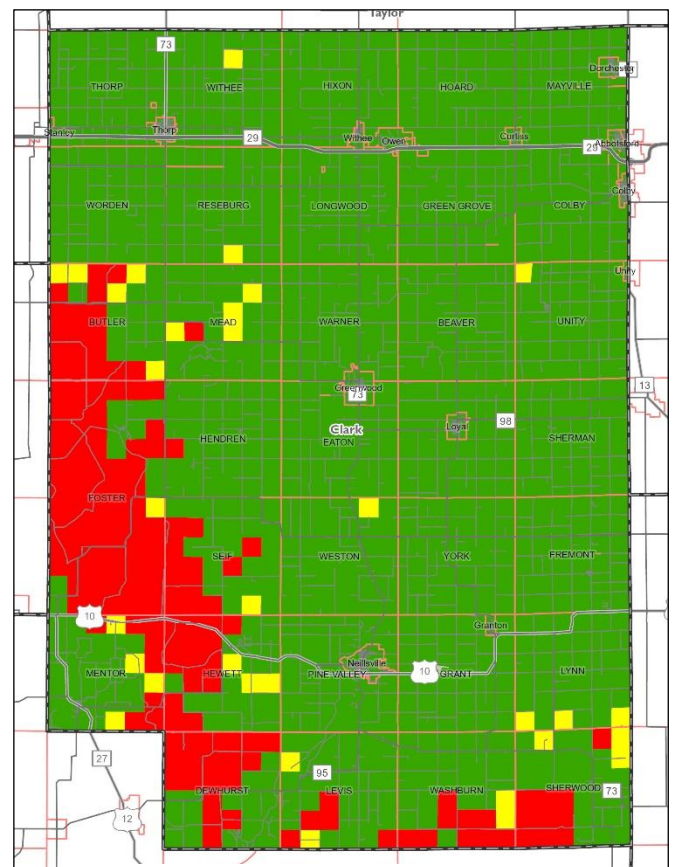
4. While fiber is currently the long-term “gold standard” when cost feasible, it would be beneficial to stay informed on emerging technologies to help provide last-mile broadband in less populated areas, including potential improvements in fixed wireless as well as TV white space internet. This includes monitoring the SpaceX Starlink pilot projects (e.g., speeds, latency, reliability) as more customers are added, especially for wooded and hilly rural areas.
5. Within the past week, Badger Telecom, LLC (d/b/a TDS Telecom) has applied to the Wisconsin Public Service Commission for two Wisconsin ARPA Broadband Access Grants for the Greenwood and Neillsville areas. If funded, these projects, upon completion of construction, should provide a service to the project area designed to reliably meet or exceed a symmetrical speed of 100 Mbps download speed and 100 Mbps upload speed (100/100 Mbps). In instances where a 100/100 Mbps service is not practicable, the application may propose to provide a service designed to reliably meet or exceed a 100 Mbps download speed and between 20 Mbps and 100 Mbps upload speed, and be scalable to a minimum 100/100 Mbps as transmission capacity improves.

As a hypothetical, WCWRPC identified in the map to the right those 1-square mile areas of Clark County that had no improved parcels (red) and only one improved parcel (yellow); the remaining areas in green had 2+ improved parcels. For this exercise, improved parcels had an assessed improvement value of \$10,000 or greater on the property tax rolls as of 1/1/21.

In all, 8,270 improved parcels in Clark County were located within the green areas, but also:

- Are located in the unincorporated towns. Cities and villages are excluded since they generally have access to adequate broadband service based on the 2021 survey satisfaction results (or are more likely to receive upgraded service in the future due to population density).
- Are located in the blue or purple areas of Map 26 with less than 100 Mbps download service.

These 8,270 improved parcels may be located in areas that are more feasible for a wireline connection due to the 2+ improved parcels/sq. mile density, if public cost-sharing is available. In all, the 8,270 parcels are located along 1,951 miles of public roadway, which suggests a very hefty price tag for all of these parcels. We also don’t know exactly where fiber may already exist within the green area that may offer an opportunity. But given the County’s size and population density, providing broadband service to every resident and business will likely require a mix of technologies, at least in the short-term.



IX. Putting the Study into Action

A. Community Broadband Toolkit and Resources

As an appendix to this study, WCWRPC collaborated with the West Central Wisconsin Broadband Alliance to update a broadband expansion toolkit that was first created in 2018. The toolkit offers a brief overview or checklist of potential tools and resources that counties, municipalities, and local organizations may explore and implement in their efforts to expand broadband infrastructure. The toolkit shows that communities can indeed have a role in planning, advocating for, and achieving broadband expansion, often in partnership with the private sector. The toolkit was used in identifying the initial recommendations later in this section.

B. June 2021 Broadband Workshop

It was a goal of this study to initiate, energize, and support community discussion on broadband in Clark County, not provide a plan or detailed recommendations. Such discussion began with a WCWRPC-facilitated virtual workshop on June 28, 2021, which included:

- A presentation from Greg Whelan, Greywale Advisors, on Architecting the Future of Broadband Communities and considerations for Clark County. This presentation stressed the importance of large-scale planning, treating broadband as critical civic infrastructure, and providing fiber to all reasonable locations.
- A review of Key Findings from this study.
- A review of different broadband expansion approaches and models from Wisconsin, including a conversation with Mike Bub, Taylor County Board of Supervisors.
- And a discussion of next steps for Clark County.

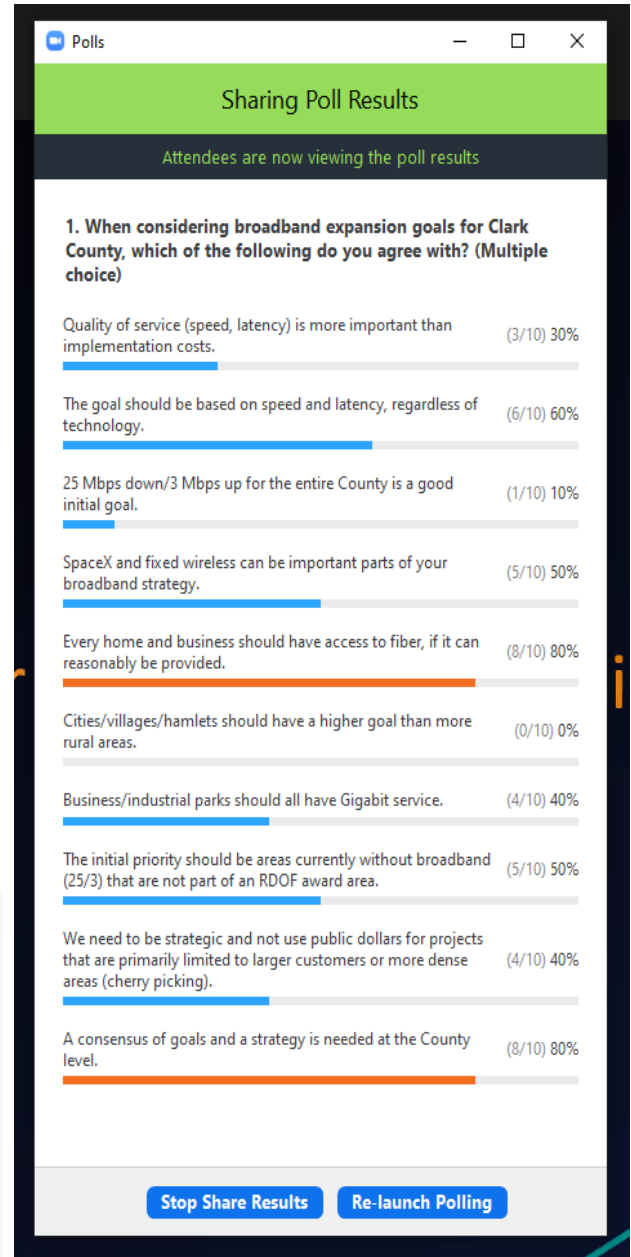
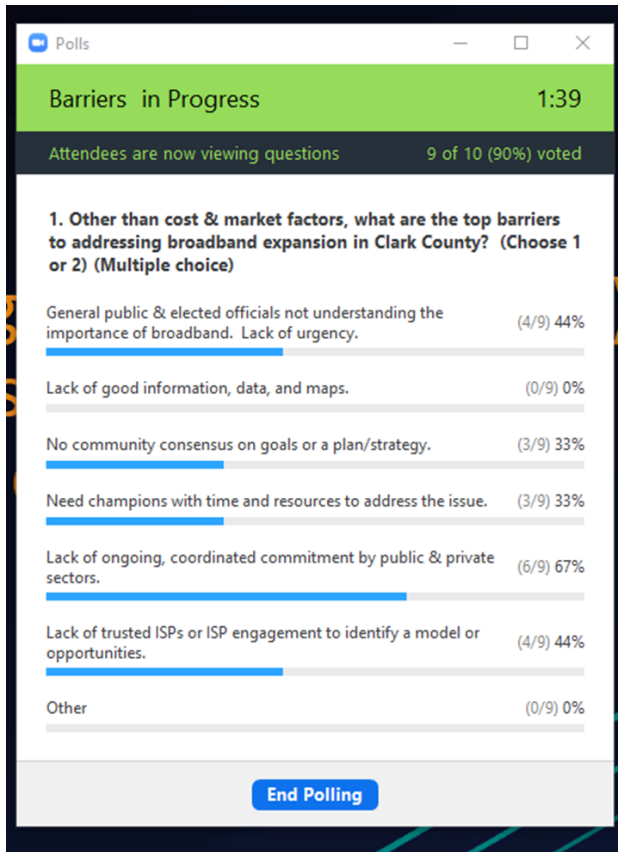
Workshop Attendees	Company or Organization
Thomas Lange	Chippewa Valley Technical College
James Schmidt	City of Colby
Dave Williams	City of Loyal & County EDC
Riley Hebert	Clark County Young Professionals
Peter Kaz	CCEDC
Sheila Nyberg	Clark Co. Economic Dev. & Tourism
Natalyn Jannene	AbbyBank
Greg Glisczinski	Clark Co. Economic Dev. & Tourism
Mitch Weber	Clark County
Terry Domaszek	Clark County

During the workshop, attendees completed two polls, the results of which are on the following page. Attendees identified the **lack of ongoing, coordinated commitment by public & private sectors** as the top barrier to addressing broadband expansion in Clark County. The **need for consensus on shared broadband goals and a strategy** and **providing fiber to every home and business, if reasonable**, were the highest ranked goals. Attendees also felt that 25/3 Mbps service should not even be considered as a goal and that fiber technology is the best long-term investment for the public-sector.

Attendees were particularly interested in the Taylor County presented by Mike Bub as a potential model for Clark County. Mr. Bub explained that no ISP was able to provide fiber service and make a reasonable return on their investment, so the public-sector stepped in. In 2020, Taylor County approved a \$9.5 million bond to create a 74.6-mile, middle-mile fiber network to connect key public facilities and essential services around the county. They then issued an RFP and selected WANRack to help develop, market, and manage the network. The network will have \$8,029,286 construction costs, including

electronics. WANRack will receive \$149,976/year to maintain the system, including managing breaks or relocations, as part of a 5-year renewable agreement. The project will connect businesses within 500 feet for free. This would be an open network and other ISPs can affordably lease access to the fiber to extend last-mile service to other unserved areas. The County also recently applied for \$580,000 in grant funding for 23.78 miles of fiber to connect towers, further expanding Taylor County’s broadband efforts.

Poll Results from the Broadband Workshop



SOME WAYS TO USE THIS STUDY

- Continue the local conversations, which began during the June 2021 Workshop
- Educate and inform community members and elected officials (local, State, & Federal) on the importance of broadband and Clark County’s broadband needs
- Build a business case for broadband investment and engage with ISPs to identify solutions and act
- Develop a Clark County broadband strategy to address broadband gaps and monitor progress
- Use the data to show need and pursue grant funding

The broadband expansion models and approaches discussed during the workshop demonstrated that there is no “silver bullet” and the solution will likely require a mix of partners and broadband technologies.

C. Potential Next Steps

The following are potential actions or next steps that were identified by WCWRPC and/or attendees during the June 28th workshop. Many of these concepts are explored further in the attached toolkit.

Educate, Foster Urgency, and Nurture Champions

1. Workshop participants agreed that re-engaging County committees on this issue is a logical first step. This could include sharing the key results of this study and the Taylor County model.
2. The County Board could consider a re-affirmation of the 2015 broadband support resolution, perhaps with a more active commitment and role, rather than just an endorsement. The County Board should consider what coordination support and resources it is willing to provide to such an effort (e.g., is the County a participant or will the County lead, is this a new programmatic activity).
3. Applying for Wisconsin Telecommuter Forward! and Broadband Forward! status are two ways to foster urgency and demonstrate commitment. Clark County has commenced with some initial discussion on these certification programs. Also evaluate local policies regarding allowing use of public right-of-ways for underground or aboveground fiber and consider “dig once” policies.
4. As reflected by the workshop polling, more education and urgency is needed. This starts with messaging—broadband is essential infrastructure and is an investment in the future. This could include additional community meetings, a P.R. campaign in area newspapers, and/or creating a broadband white paper like Pierce County.
5. The very act of having these conversations, sharing data (such as key findings in this study), and publicizing that the County and its communities are exploring alternatives sends a message to existing and potential ISPs that a potential market exists as well as potential public-sector partners to explore grants and cost-sharing opportunities. Use these conversations to “light a fire” among the ISPs in the market.
6. Planning at the county-level is important and a county-level work group is needed. This could be a re-energizing or a re-vamping of the Clark County Broadband Consortium endorsed by the County in 2015 or it could be a fresh start. Again, the County Board will need to decide if the County government should take a lead role in facilitating and supporting such a work group. Bring in facilitation help if needed in developing your strategy. However, it may be beneficial to establish some specific expectations, deliverables, and timelines for such a work group, perhaps as part of any updated County Board resolution. Identify local experts and persons who are passionate about addressing broadband to participate on the work group.

Obtain a Consensus on Shared Goals and Develop a Strategy

1. The following are some initial goals for consideration, based on the workshop discussion:
 - The current FCC broadband standard (25/3) is outdated. Strive for a minimum of 100/20 Mbps, with a latency of less than 100 ms.

- Fiber service should be the goal countywide, whenever reasonably possible. However, while fiber may be the desired dominant technology, the low population densities in some areas of Clark County make it likely that DSL and wireless technology (e.g., fixed wireless, SpaceX Starlink) will be part of the solution.
2. Involve Clark Electric Cooperative (and other cooperatives?) in planning. During the workshop, it was noted that electric cooperatives are a natural partner when forming a new ISP, since the cooperatives have the organizational infrastructure and local knowledge of the community in place. If possible, also invite anchor institutions and private-sector businesses to be part of the work group.
 3. The workshop participants believed that the Taylor County approach could be a good fit for Clark County. Inviting Mike Bub to speak to County committees and/or a county-level work group may be a good first step. A work group could then consider optional models and develop a scope for its own RFP. Explore:
 - What role(s) could the County take in infrastructure investment? Would it be limited to passive infrastructure (e.g., install conduit or dark fiber) vs. active infrastructure (e.g., managing the system, installing electronics)?
 - Where might a middle-mile fiber backbone for Clark County be most needed? Can the fiber backbone be looped (rings) for better reliability and redundancy? How do you balance this with “fiber to all reasonable locations”? For example, the County could strive for fiber to the premises (FTTP) in areas with sufficient customers, then fill gaps with fixed wireless and, maybe, Starlink; public-sector cost sharing can expand those areas that can support FTTP investment.
 - Fiber is the “gold standard” for speed and scalability; as a 30+ year infrastructure, it is a long-term solution. It makes sense that any public-sector investment in broadband should focus on fiber technology if possible. However, it is more costly. Is it feasible for some fiber service to be provided above ground?
 - Strive for a single network, not many isolated networks.
 4. Reach out to potential partners who are not part of the County work group in an organized, planned manner. Once goals are set, identify a strategy with next steps. The strategy may be incremental and may be more about prioritizing areas and identifying potential resources, rather than specific solutions; identify what you want to do, then approach potential ISPs and partners to develop a solution.
 5. Related to #5, build a business case for broadband investment as discussed on pages 6-7 of the appendix. Share the results of the 2021 survey and this study with potential ISPs to discuss projects. This is similar to the approach that the Town of Drammen took in Eau Claire County, which contributed to two successful PSC Broadband Expansion Grants in 2020. Obtaining a strong pre-commitment from potential customers, possibly including a financial commitment, also sends a strong message to ISPs. However, as page 7 of the toolkit cautions, be strategic and “big picture” in selecting which projects to support. Take caution not to further perpetuate the current digital divide within Clark County.
 6. To build a business case, additional data collection may be needed. Build on the maps and data in this study when opportunities allow. For example, it may be useful to attempt to map existing fiber within the public right-of-way; the survey results suggest that fiber is in the ground but may not be available. It may also be beneficial to encourage all school districts to participate in

Wisconsin DPI data collection efforts and continue to monitor DPI results. Further, the broadband picture is complicated and quickly changing; additional data can help evaluate trends and progress. However, any such efforts should be strategic and well supported. For example, it may be more useful to use this study to focus additional data gathering efforts on areas that are likely under-served or unserved. Obtaining a commitment from local champions in these areas to help raise awareness and collect information can also be key. Section V.A. identifies some key lessons learned from the 2021 broadband survey that should be considered prior to any additional survey efforts. But most importantly, **do not allow the lack of detailed data prevent or unnecessarily prolong potential action.**

Monitor Project Implementation and Trends

Between A-CAM, RDOF, rural 5G, SpaceX, and the potential for new technologies, there is certainly much to remain aware of. Part of a County work group's role could be actively engaging ISPs and the PSC to monitor progress on grant awards and pilot projects. A few items in particular were discussed during the workshop:

1. Understanding the plans for RDOF awardees in Clark County is important, but there are many unknowns at this time.
2. Monitor the SpaceX pilot projects currently taking place. Clark County could explore its own SpaceX pilot project if desired for a nominal investment similar to the one occurring in Eau Claire County.
3. Frontier Communications has a sizable footprint in Clark County, but is currently being sued by the FCC and six states, including Wisconsin, for not delivering speeds as promised. This should be monitored in case there changes in service or future opportunities.
4. Within the past week, Badger Telecom, LLC (d/b/a TDS Telecom) has applied to the Wisconsin Public Service Commission for two Wisconsin ARPA Broadband Access Grants for the Greenwood and Neillsville areas. If funded, these projects, upon completion of construction, should provide a service to the project area designed to reliably meet or exceed a symmetrical speed of 100 Mbps download speed and 100 Mbps upload speed (100/100 Mbps). In instances where a 100/100 Mbps service is not practicable, the application may propose to provide a service designed to reliably meet or exceed a 100 Mbps download speed and between 20 Mbps and 100 Mbps upload speed, and be scalable to a minimum 100/100 Mbps as transmission capacity improves.
5. It is important to continue to express to State and Federal program and elected officials the importance of monitoring and evaluating the performance of grant awards in terms of the geography and number of customers served, actual speeds and latency, and costs to customers. Similarly, continuing to advocate for improved broadband data and mapping would be of tremendous assistance to planning and funding efforts at the local, state, and federal levels. Certain economies of scale can be gained if data-gathering and analysis is occurring at the regional, state, and federal level versus individual communities and counties conducting their own surveys, mapping, etc.

APPENDIX A:

Comments from the 2021 Clark County Broadband Survey

(sorted by location type, then zip code)

Web or Paper Survey	Download Speed	Upload Speed	Zip Code	Are you submitting for a residence, business, or both?	How satisfied are you with the quality of your current internet service?	Additional Comments
Web	1.43	0.56	54405	Residence	Not_Satisfied	Our frontier use to be good but the past 2 years its sucked. Its affordable so we have kept it but if we could we'd find a new company thats affordable we would.
Web	0.31	1.02	54420	Residence	Not_Satisfied	I pay for 25 GB and this is what I have during peak hours. I am a remote worker and always have been and always will be. We have never been able to stream a movie without it buffering.
Web	3.49	0.3	54420	Residence	Not_Satisfied	I would like to have more available options. I have been working from home and care barely host a meeting. I have contacted TDS and they have not been of any help. We have had very bad service with limited options since we live in a rural area. When one device is hard wired we can barely load a video from the web without buffering multiple times.
Web	2.07	0.074	54420	Residence	Somewhat	It would be nice to have higher WIFI speeds and an actual choice in carriers. Also it's 2021. Why do we still live in a cell dead zone only 15 miles from a city?
Web	9.49	0.49	54420	Residence	Somewhat	Need a more cost effective option.
Web	1.26	0.28	54420	Residence	Not_Satisfied	Please help improve
Web	2.45	1.5	54420	Residence	Not_Satisfied	Very slow! Cannot connect to more than 1 device at a time.
Web	1.44	0.48	54420	Residence	Not_Satisfied	We definitely need improvement in wireless capabilities in the rural areas especially with more kids and adults doing school work and regular work now from home.
Web	26.66	3.83	54420	Residence	Not_Satisfied	We frequently have grandchildren that require internet for school work. It is very frustrating to not have high speed internet!
Web	411	0.71	54420	Residence	Not_Satisfied	WORK FROM HOME AND WOULD LIKE BETTER INTERNET SPEED
Web	7.21	1.89	54421	Residence	Not_Satisfied	Can't get consistent speed
Web	2.67	0.66	54421	Residence	Not_Satisfied	For more than one year I have been experiencing very unreliable internet connection. Several times each and every day my connection is disrupted while I am working on the internet. These disconnects last varying amounts of time. Some are brief, but many
Web	0.42	0.09	54421	Residence	Not_Satisfied	I live 1 mile from city of Colby and Frontier service is horrible...I pay to have internet and phone and have no internet or weak internet more than I have internet access....
Web	0.71	0.33	54421	Residence	Not_Satisfied	Internet is very slow and drops off all the time
Web	27.08	10.54	54421	Residence	Somewhat	lose connection and provider say there is no problem in area
Web	5.73	0.7	54421	Residence	Somewhat	Runs slow or goes out completely at least weekly (on average.)

Web	6.12	0.67	54421	Residence	Somewhat	We use Frontier for our broadband internet and have a landline phone with them. Why is our taxes and extra fees that we pay add up to about 25% of our total bill. This is a ripoff of the public and it seems that the state doesn't care. Thank you.
Paper	NA	NA	54421	Residence	NA	Yes! We have very limited options, and we live 1/2 mile out of the city limits in Colby and within 1/2 mile of the Colby School District. The carriers are so slow that we use a hotspot through our cell provider. We'd like to have an internet provider that is fast and reliable.
Web	5.35	0.41	54422	Residence	Somewhat	It drops, disconnects, some times quite a bit in streaks. Other times there's no issue. But its affordable.
Web	16.53	1.37	54422	Residence	Not_Satisfied	It's terrible. Can't get service out here. With the hot spot it goes on and off continuously. Luckily we do not have anyone that has to do schoolwork on line here.
Web	79.94	10.5	54422	Residence	Somewhat	our first form of internet was dialup that was a nightmare. I have also heard many complaints about satellite internet in the area we got lucky that the business next door helped to bring us fairly dependable internet
Web	23.04	4.48	54422	Residence	Not_Satisfied	You didn't make this survey easy. The local TV station had an announcement about it last night and you could find out more information on their web page. I went to the page and clicked the link which just got be a bunch of non related stuff about broad
Web	64.13	12	54425	Residence	Very	Spectrum is by far the best internet company in area...
Web	169.12	10.5	54425	Residence	Somewhat	The internet cuts out fairly often and when it does we lose cell service because we require a signal booster that runs through the internet to function. We have Spectrum for service.
Web	11.55	0.93	54436	Residence	Somewhat	I am lucky that I am close enough (just on the edge) to have TDS DSL. While it is much better than my neighbors it is VERY costly compared to what my colleagues in Marshfield have to pay for even faster service. We desperately need better internet servi
Web	9.47	0.71	54436	Residence	Not_Satisfied	Need consistency in data speed. It varies hour by hour sometimes down to 2mb. Will be looking to switch since I will be working from home more often.
Web	4.73	0.5	54436	Residence	Somewhat	Our internet service could be better, I'm thinking. Just my idea - not really terribly upset with it.
Web	19.49	3.7	54436	Residence	Somewhat	The price! It is way too expensive and you are locked into contracts and bundles you don't need to get any kind of decent discount. I also use internet for work from home and my employer does not contribute to help cover the cost.
Web	4.3	0.45	54436	Residence	Somewhat	Would like higher speeds and more reliability.
Web	10.51	1.27	54436	Residence	Somewhat	Would like to have faster speed.
Web	3.82	0.48	54437	Residence	Somewhat	Frontier is limiting our speed. We should be getting 7Mb/s and can't get it.
Web	0.24	0.61	54437	Residence	Not_Satisfied	I have been waiting for broadband or fiber optics so I can work from home. Satellite is not reliable for my children's virtual learning or my work place. Please help us to get reliable internet for work, school, and streaming that doesn't keep buffering .
Web	1.52	0.42	54437	Residence	Not_Satisfied	I hope this helps. This is the worse test I've ever had!! Clark County, please....we need better service!! TDS rep told us that's the best we can get...nothing better than up to 5 mb even though the fiber optic line was just ran right in front of our house. We need more options. Thank you!

Web	36.54	4.88	54437	Residence	Somewhat	I just upgraded my service so it's not bad now. But before it was available the service was horrible. Went out all the time.
Web	42.42	5.21	54437	Residence	Somewhat	I think I am fine with internet at this location. Rural Clark county really needs faster internet.
Web	21.43	1.36	54437	Residence	Very	I went with home hotspot from AT&T because I was warned about the slow speeds of TDS and the other local services and needed faster, better internet for telecommuting from work.
Web	4.51	0.47	54437	Residence	Somewhat	Limited choice of providers here in rural WI
Web	8	1.06	54437	Residence	Not_Satisfied	There are times when we have zero internet. Not a happy camper.
Web	3.98	0.5	54437	Residence	Not_Satisfied	There have been times when I had less than 1 Mb/s download speed.
Web	3.37	0.72	54437	Residence	Somewhat	There is absolutely no reason for internet access to be this expensive
Web	6.89	1.59	54437	Residence	Not_Satisfied	There is not enough towers in my area
Web	0.40	0.57	54437	Residence	Not_Satisfied	We have been customers of TDS since we built our home in 2001. No upgrades have been made to our service since then. Even though we are paying the same as everyone else getting much better service, we are too far from the nearest hub for them to do any
Web	17.93	0.3	54437	Residence	Somewhat	We only have mobile phone internet service available to us
Web	10.86	1.28	54437	Residence	Somewhat	We would like faster service especially when using more than 1 laptop and phones connected via WiFi.
Web	2.75	0.71	54437	Residence	Somewhat	While the results shown here are optimal (when being serviced, we were told the speed would be around 3 Mb/s), they may often be much less during the day time. This was taken at 8:49 PM, Monday 3/15. With just a few users/applications this number can also
Web	8.99	0.22	54437	Residence	Not_Satisfied	Would like information on the best solution or supplier for our residential area. Have been told we are in a dead zone to get high speed internet.
Web	3.38	555.88	54446	Residence	Somewhat	Access to more affordable high speed internet is definitely needed! Thank you!
Web	13.54	9.82	54446	Residence	Very	I think my internet service is overpriced but in order to have some quality it had to be spectrum.
Web	1.51	0.32	54446	Residence	Not_Satisfied	I would love to have a new better internet service that would be on all the time and not on and off 4 - 5 times while trying to look at emails.
Web	1.86	2.53	54446	Residence	Not_Satisfied	If the cost is affordable and doesn't have a contract that goes up every year, that would be great.
Web	2.64	0.53	54446	Residence	Somewhat	i have Frontier internet service
Web	1.32	0.35	54446	Residence	Not_Satisfied	Internet works on & off. It is not consistent.
Web	0.62	0.53	54446	Residence	Not_Satisfied	It takes so long to even do simple checking account and paying bills. Now with internet shopping it is so hard to open up a new page to look at an item. I need to do grocery shopping from home have them delivered weekly so need to look up the store and
Web	0	0	54446	Residence	Not_Satisfied	Live in a woods hard to get good internet service
Web	0.58	0.64	54446	Residence	Not_Satisfied	Location comes up Chicago
Web	1.02	1.56	54446	Residence	Not_Satisfied	No good options in our area
Web	85.92	8.32	54446	Residence	Somewhat	Spectrum wants more money for faster service and I say we have the same old wires or Cables coming into the house more money will not help.
Web	5.8	0.56	54446	Residence	Somewhat	The internet connections and phone connection is horrible in this area. Thank you for digging deeper into our internet issues!

Web	0.7	0.15	54446	Residence	Not_Satisfied	We've tried several other services but can't get their service by us. Frontier is all we could get and it's awful.
Web	153.44	18.61	54446	Residence	Somewhat	Wifi is very inconsistent and tends to go down often
Web	4.1	0.31	54456	Residence	Not_Satisfied	Bad internet speeds
Web	200	12	54456	Residence	Somewhat	Coverage seems to drop daily
Web	3.54	0.91	54456	Residence	Not_Satisfied	Exede Satellite Connection
Web	25.28	1.26	54456	Residence	Not_Satisfied	Had to go to cell phone service through pandemic because we had 3 college students and 2 teachers in the house. I called because we could not use our satellite service internet. They told us it's not the service it's the broad band width that is available
Web	10	10	54456	Residence	Not_Satisfied	I am working from home now with very limited WiFi options
Web	11.25	1.8	54456	Residence	Very	I tried Hughesnet and it was terrible! I have CS Wireless and it's fantastic! but I have a clear shot of their tower at the airport, which he said was very important for it to work.
Web	2.74	0.31	54456	Residence	Not_Satisfied	I would like to have the option to download programs without delay.
Web	0.62	0.59	54456	Residence	Not_Satisfied	Internet for Rural WI is very poor and does need to be installed for all residents.
Web	3.39	0.69	54456	Residence	Not_Satisfied	It is extremely important that broadband be available to all. Rural areas are underserved and pay high prices for DSL and Satellite service.
Web	3.18	3.21	54456	Residence	Not_Satisfied	It would be awesome to get a stronger internet. I also operate a business, out of town, and have difficulties getting a decent signal. My customers are not always happy, ie, I lose business because of it. (Operate a motel)
Web	3.65	0.52	54456	Residence	Not_Satisfied	Just had TDS out to our place because our internet is so bad. I do a weekly Facebook Live and if I can make it through a 30 minute presentation it is a miracle. I have a good phone, and switch it over to TDS as the Verizon is even worse. It is slow, the p
Paper	NA	NA	54456	Residence	NA	Probably
Web	5.02	0.36	54456	Residence	Somewhat	Speed is very inconsistent depending on the time of day. Often have service drops. Cannot get any faster speed at this location.
Web	3.35	0.12	54456	Residence	Not_Satisfied	Strongly wish to have reliable streaming capability at a reasonable price.
Web	15.08	59.75	54456	Residence	Not_Satisfied	TDS has been paid far too much by the gov and by the people for way too long. If they cannot maintain their network here instead of putting the money they are paid into Stevens Point and Wausau, then something else needs to be done. This is ridiculous t
Web	4.97	0.53	54456	Residence	Not_Satisfied	The Internet service at this address is terrible. We need to have fiber installed. My kids come home and laugh at how slow the Internet is.
Web	9.29	0.59	54456	Residence	Not_Satisfied	The service here continually buffers, shuts off and is spotty at best, pauses quite a bit on an hourly basis.
Web	43.01	5.64	54456	Residence	Somewhat	There is a delay when typing on my laptop
Web	30.76	4.4	54456	Residence	Somewhat	There is some inconsistency. I think I'd get very different readings at different times. This is 12:20 on a Friday as I test it.
Web	10.83	0.9	54456	Residence	Not_Satisfied	This speed is often slower. It was taken on a Saturday morning. As more users get on the network it slows down immensely. There is typically no way to use it for video conferencing or streaming.

Web	7.76	6.75	54456	Residence	Very	Up until I spent the extra money to have a faster internet access. I had tds which was slow as could be. There were times I would sit for a hour to do simple task like balance my checkbook. Then my wife got cancer. The internet has proven to be a very
Web	0.76	0.49	54456	Residence	Not_Satisfied	Way too slow. I have to quit the computer for a time , I get so frustrated.
Web	1.57	0.69	54456	Residence	Not_Satisfied	we have no fiber optics in this area and sattelite inter limits our usage , we can only use hd streaming streaming services here for 2 hours and then we are pretty much out of gigs for the rest of the month
Web	4.8	0.53	54456	Residence	Somewhat	We have TDS. We are grateful for the service, but always thought it was slow for the considering the price we pay each month.
Web	1.14	0.29	54456	Residence	Not_Satisfied	We need more of an option for Wi-Fi in this area
Web	11.42	1.08	54456	Residence	Somewhat	We pay for higher than what we receive and it's gotten worse over the years.
Web	4.75	0.71	54456	Residence	Not_Satisfied	we would pay more to have faster internet. we have the fastest available in our specific rural location
Web	0.77	0.38	54456	Residence	Not_Satisfied	When it takes 2 1/2 hours to fill out tax forms that should only take about an hour, that tells you our internet is very, very slow. What if we had kids using the internet for school work, they would never keep up. This is disgusting in this day and time.
Web	3.85	0.17	54456	Residence	Somewhat	Would benefit from higher speed
Paper	NA	NA	54456	Residence	NA	Yes. Also would appreciate tech support (local) if possible. Woule like internet access especially when caring for our grandchildren when they attend school virtually.
Web	181.05	15.54	54460	Residence	Not_Satisfied	After living in other counties previously. My move to clark county as far as broadband service has been extremely disappointing and appalling. Especially with the covid pandemic and the shift of doing more online. Kinda hard to do when broadband internet
Web	2.84	2.77	54460	Residence	Somewhat	I did this survey from my iPhone I also did one from my iPad with DL of 2.84 and UL of 2.77, both using WI-FI.
Web	213.36	9.68	54460	Residence	Very	I got free internet last spring from Spectrum, then went ahead and ordered it. I got a discount, but don't know what I will do when it goes up in price this spring again.
Web	17	2	54460	Residence	Not_Satisfied	I use a phone system on my computer for telecommuting which uses A LOT of data. My plan through Verizon does not last 10 business days. Then I use the hotspots off the cell phones in my household, sometimes going through 3-4 phones. HELP!!
Web	89.04	10.3	54460	Residence	Somewhat	Internet is poor at high peak hours.
Web	1.06	0.34	54460	Residence	Not_Satisfied	Internet is very slow, we get cut off quite often
Web	0	1.65	54460	Residence	Not_Satisfied	Need something done here. Internet/ phone recption here is zero. .landline is unreliable. Service tech says line needs to be replaced. Phone company will not do it because everyone is using cell phones. Pdoblem. No cell reception here. Not even with a fiv
Web	0.03	1.73	54460	Residence	Not_Satisfied	Our internet service is TERRIBLE. Even though Frontier recently installed fiber optic cable in front of the house, nothing has improved. I'm glad we don't have kids at home, I don't know how they'd ever do their schoolwork. Often service is down or not
Web	1.87	3.36	54460	Residence	Somewhat	Satellite internet is our only option here, would be nice to have a choice.
Web	92.57	1.41	54460	Residence	Very	the cost for high speed internet in rural communities, if available, is very high versus cities

Web	4.66	0.49	54460	Residence	Not_Satisfied	The first attempt at speed check dropped our connection. We have new fiber installed at out property line, but no information from the company about how to be added to their service. We would be interested in high speed service.
Web	3.29	0.34	54460	Residence	Not_Satisfied	The service is ridiculously so slow they should pay us for our wait time. It's a farce.
Web	0	2.38	54460	Residence	Not_Satisfied	this hot spot is not reliable, we have checked a couple companies they can not assist with in our area
Web	24.56	3.09	54479	Residence	Somewhat	Frontier has fiber 1/2 mile from me, copper to the house.
Web	4.74	1.7	54479	Residence	Not_Satisfied	I am unable to work from home due to my internet speed not being fast enough to support the software needed. Access to broadband would be a great improvement.
Web	5.38	0.39	54479	Residence	Not_Satisfied	I think we all know internet and cell phone services in rural Clark Co are very poor. As such it would be nice to see the political follow through to bring rural Clark Co into the 21st century.
Web	4.76	0.87	54479	Residence	Somewhat	I'm very supportive of any increase we can have in Clark County.
Paper	NA	NA	54479	Residence	NA	No access to broadband in Riplinger. Have to use cellular for everything! Told it has to do with trees.
Web	4.83	1.25	54479	Residence	Not_Satisfied	Our service receives a signal from my neighbors silo. The service speed varies wildly throughout the day. The service is Selk from Chili.
Web	0.54	0.56	54479	Residence	Not_Satisfied	We are unable to run multiple devices on our current internet service or stream video without interruption. Not worth the money we pay a month.
Web	2.43	0.9	54479	Residence	Not_Satisfied	We feel our wifi is insufficient. We cannot have more than one device on at the same time, which made things especially difficult during the school covid shutdown last spring when we had two students at home who needed wifi. Our ISP told us had we not bee
Web	0	0	54484	Residence	Not_Satisfied	There is limited poor quality and expensive internet ability and almost no cell phone coverage available. It is very dangerous in emergencies to have to drive to have the ability to make a 911 call
Web	2.18	0.81	54488	Residence	Somewhat	Fairly reliable, but it is either working or not working. Zoom calls are an issue and are constantly cutting in and out for us. If it is not working then it will be several hours or at least a day before it works again.
Web	2.54	1.11	54488	Residence	Somewhat	Sometimes downloading is quite fast at other times we have to sit and wait
Web	11.01	3.37	54488	Residence	Somewhat	Would like to have more choices. What we currently have is about all there is available to us, outside of very restrictive satellite connections. There needs to be less monopoly of services, more choices and with better speeds. The national average for b
Web	6.95	0.74	54493	Residence	Not_Satisfied	I don't know what those numbers mean, but numbers mean nothing when the internet just goes down/doesn't work at all, which happens very frequently. It just so happens to be working right now for me to complete the survey. Bottom line, our internet service
Paper	NA	NA	54493	Residence	NA	I have internet at the above location but it is a cabin and closed down for the winter. Phone and internet are on seasonal service and I am at a different location. When the internet was operating last fall the highest download speed was about 1mb. Very, very limited service.

Web	0.47	0.56	54493	Residence	Not_Satisfied	I used a wireless router & did it on my mini iPad
Web	2.14	0.36	54493	Residence	Not_Satisfied	Internet service is just awful!!!!
Web	0.56	0.33	54493	Residence	Not_Satisfied	It is impossible for three of us to complete virtual school. I am a teacher and have two students who need the internet and It doesn't always work for us. We are unable to watch videos or upload videos from our teachers or to our students. We also have
Web	40.25	3.13	54493	Residence	Somewhat	Satellite Internet Service
Web	2.72	0.52	54493	Residence	Somewhat	Surprisingly these low numbers are a big improvement since a recent TDS "upgrade" in our area and we can actually stream programming acceptably now, even though we were supposedly getting the same mb/s prior to the upgrade. That upgrade now costs us \$10 m
Web	0.42	2.1	54493	Residence	Not_Satisfied	The internet and cell reception in this area is awful. Cell reception is non existent by our home and surrounding area.
Paper	NA	NA	54493	Residence	NA	This is a weekend residence. Yes we would subscribe in order to have remote control of heating and security systems, and services when in residence.
Web	0.54	0.43	54493	Residence	Not_Satisfied	We truly need faster more reliable internet access in our area.
Web	29.6	0.049	54493	Residence	Not_Satisfied	With homeschooling this year our current Internet didn't do the job needed.
Paper	NA	NA	54493	Residence	NA	Yes we would consider subscribing.
Paper	NA	NA	54493	Residence	NA	Yes, would subscribe. Would be able to work from home.
Web	2.1	0.24	54498	Residence	Not_Satisfied	I would love to have access to broadband! It is difficult to do any work from home right now unless we use an additional hotspot.
Web	40.09	1.82	54498	Residence	Not_Satisfied	PLEASE offer Clark county residents more internet options.
Web	0.64	1.09	54498	Residence	Somewhat	There is a big Mennonite community here who do not use internet services. BUT, this should not prevent the rest of us from enjoying faster internet speeds.
Web	1	0.64	54498	Residence	Not_Satisfied	We are only able to get satellite wifi here. It is not the greatest when everyone is home and using it.
Web	0.62	0.4	54498	Residence	Not_Satisfied	We need some decent internet service in our area
Web	14	2	54498	Residence	Not_Satisfied	We need to have at least one truly unlimited high speed internet options available for residents in rural Withee, WI. Currently it is impossible to work from home, learn from home or stream anything from home in our location due to data and speed limitat
Web	5.88	0.29	54498	Residence	Somewhat	Would like information on the broadband in Withee. We go through Clark Electric for our current satellite internet and am looking at new plan. I will be working from home either until the end of June or maybe permanently.
Web	29.92	4.34	54741	Residence	Not_Satisfied	This is the only internet we have. We have a child with autism in the home and all the available plans we can access have data limits which makes virtual learning very difficult. The connections we can use are not reliable and our cell phone data is deple
Web	3.62	0.47	54746	Residence	Not_Satisfied	CenturyLink is terrible service. For a year now it randomly stops working every single day. Makes it hard to do zoom calls.
Web	4.12	0.45	54746	Residence	Not_Satisfied	I have always had slow internet/spotty since we moved here no matter what service we have
Web	11.76	0.89	54746	Residence	Somewhat	I wish it was a lot faster. It also cuts out quite often. Century-link should do a lot better for the price.
Web	27.8	1.39	54746	Residence	Not_Satisfied	Need faster internet please

Web	6.15	0.69	54746	Residence	Not_Satisfied	The internet drops and freezes constantly. Century Link says only speed available here is 3 MBs. We pay too much for what we get and they never stick it back into upgrades.
Web	0	0.82	54746	Residence	Not_Satisfied	Used a Verizon Wireless Modem card
Paper	NA	NA	54746	Residence	NA	Yes, if the signal was strong and dependable.
Paper	NA	NA	54746	Residence	NA	Yes.
Web	1.29	0.21	54747	Residence	Not_Satisfied	Very disappointed in my service. Provider said nothing they can do. My dr has tried to do FaceTime/ video conference and unable to hold connection. My concern, because of sporadic connection and dropped calls, I may have medical emergency and not be able
Web	43.53	11.26	54768	Residence	Very	None
Web	3.63	0.49	54768	Residence	Not_Satisfied	Slow internet seriously reduces my quality of life. It is past time to implement HS internet access in rural areas.
Web	12.57	0.84	54768	Residence	Not_Satisfied	We have speed issues all of the time. This is actually faster than normal.
Web	5.25	0.7	54771	Residence	Not_Satisfied	I don't believe we are getting what we are paying for! Our service SUCKS!
Web	4.67	2.91	54771	Residence	Not_Satisfied	Better internet options in my area would be life changing. Pls bring fiber to the home, we have to use satellite internet and it's terrible.
Web	7.76	1.01	54771	Residence	Somewhat	Century Link service
Web	0	0.23	54771	Residence	Not_Satisfied	centurylink is our internet provider
Web	217.23	9.34	54771	Residence	Somewhat	Have Internet issues when I am working kids can't connect to virtual classes
Web	12.53	0.98	54771	Residence	Not_Satisfied	I am currently working from home and am getting by. However, we have the highest speed available to us and really is not enough to handle online video meetings and with my kids do virtual learning sometimes and have ZOOM meetings we sometimes have issues
Web	2.97	1.99	54771	Residence	Not_Satisfied	I don't have any broadband service available at my address. I am forced to use satellite which is less than desirable.
Web	4.53	0.06	54771	Residence	Not_Satisfied	I'm in desperate need of internet service because I live out in the country. I only use my hotspot because nobody offers high speed internet for us. We would have to buy satellite which we did at one time and we always went through our allowance and would
Web	3.24	9.31	54771	Residence	Somewhat	In addition to studying availability, perhaps you can also study affordability. Having access to internet service but not being able to afford the high cost is part of the problem in our area.
Web	167.43	8.21	54771	Residence	Not_Satisfied	Internet is never consistent and I'm in town which shouldn't happen.
Web	19.59	1.93	54771	Residence	Somewhat	Internet is Not consistent.
Web	16.68	1.08	54771	Residence	Somewhat	It would be nice to have faster internet service in our area at a more reasonable price.
Web	3.64	0.59	54771	Residence	Not_Satisfied	Just because we don't live in town doesn't mean we shouldn't be allowed good internet service.
Web	3.57	0.33	54771	Residence	Somewhat	Most of the time we are satisfied with our internet service, but are frustrated with the number of times that we haven't had service at inopportune times (during online schooling and working from home).
Web	24.59	3.55	54771	Residence	Very	My cell phone reception is terrible. No towers, I use a booster and I still have only minimal cell phone reception

Web	4.65	0.84	54771	Residence	Not_Satisfied	My only choice is Viasat satellite through Clark Electric Coop. My download speed is often less than in this test.
Web	0.56	0.92	54771	Residence	Not_Satisfied	My WiFi at my house through century link is no where near adequate for three kids and a teacher (my wife) when they were all home last year from school. One person can almost zoom if no one else is on the WiFi. The WiFi is very, very slow.
Web	78.19	9.07	54771	Residence	Not_Satisfied	Not happy with the speed and functions I get with our internet for the monthly price I pay.
Web	2.94	0.54	54771	Residence	Not_Satisfied	Our internet service is currently the worst it has ever been. Our service goes out regularly throughout the day--even throughout an hour. It is frustrating to be doing homework or working online and have it cut out so often. Compared to a year ago, we
Web	5.2	2.95	54771	Residence	Not_Satisfied	Our speeds vary greatly due to us having satellite internet this is at the begining of our new cycle and doesn't show how slow it is mid month and end of month cycle for us
Web	10.72	3.23	54771	Residence	Somewhat	Present cost of \$65 / month could be deciding factor.
Web	2.27	0.05	54771	Residence	Not_Satisfied	Slow. Some hours is not able to get.
Web	3.20	1.59	54771	Residence	Somewhat	Used my cell phone with WiFi ON. 1st test was submitted with WiFi OFF.
Web	0.92	0.51	54771	Residence	Not_Satisfied	Very very very slow
Paper	NA	NA	54771	Residence	NA	We are low income. Service would have to be \$20-\$30 monthly for us to afford, then yes I would get internet.
Web	33.73	0.33	54771	Residence	Not_Satisfied	We are only able to get Hughes Net in our area and it is very slow with 2 kids doing school work and logging into meetings.
Web	12.33	3.19	54771	Residence	Very	We have satellite internet which is great for me working remotely but expensive. If we switch to Roku and get rid of Dish tv it will be a better value.
Web	3.74	2.51	54771	Residence	Very	We have Spectrum internet service and are satisfied.
Web	27.17	0.4	54771	Residence	Somewhat	We live in a wooded area. How well can broadband work?
Web	3.45	1.58	54771	Residence	Somewhat	We often cannot run multiple things at the same time (ex: do homework on the computer and watch netflix on the tv) because it is paused, slowed, or cuts in and out. Some days it's decent; other days we need to log off /shut down and restart to get a bett
Web	4.76	0.47	54771	Residence	Somewhat	We only have 2 choices.... centurylink or satellite. Centurylink internet isn't bad.. Just not always consistent
Web	54.72	5.09	54771	Residence	Very	We paid for wired internet to be brought into our home.
Web	11.5	1.25	54771	Residence	Somewhat	We use a Jetpack through Verizon for our internet service. With this we have unlimited data but it slows down after we reach a certain amount. I am a teacher and do a lot of school work online in the evenings. Also, on days that we provide virtual instruc
Paper	NA	NA	54771	Residence	NA	Yes, but the only service available is satellite. I was quoted \$159 a month for the highest speed and most bandwidth, but streaming is still discouraged.
Web	19.98	4.67	54772	Residence	Somewhat	Need more affordable reliable strong service in the rural areas
Web	162.18	55.64	54405	Business	Very	I wish we had this speed at home. We only live 6 miles from here and we have very slow internet.
Web	2.46	2.04	54405	Business	Somewhat	We only get Satellite service. The current company is in progress of upgrading towers but can't commit to a upgrade date for the tower that i'm connecting to. I would like to have a faster speed but am maxed out until they upgrade the tower.

Web	44.58	39.64	54421	Business	Not_Satisfied	Availability and cost of internet options are limited in our area. As a business, having an affordable backup/alternative is not a cost effective option. So, we have one provider with some service problems and it can negatively impact our business.
Web	45.45	44.85	54437	Business	Very	Public Library; only 1 computer user at time of test.
Web	58.91	726.62	54446	Business	Very	This is from the inside Loyal Public Schools
Web	2.65	0.56	54446	Business	Not_Satisfied	Today is a good day, clear weather, but the most trying part is the location. I'm never in Loyal were the computer is located. Sometimes it say Tomahawk, Milwaukee, Racine or Marshfield but Not Loyal, WI. This if very trying for elections.
Web	12.31	3.71	54456	Business	Somewhat	we have a handful of internet and lost connection issues throughout the day. We conduct meeting thru the week that are virtual that are affected by connection issues.
Web	63.25	3.5	54460	Business	Very	We need better service in the County, just outside city limits is very limited
Web	7.49	1.95	54488	Business	Not_Satisfied	Country wireless but we need higher speeds
Web	2.52	2.14	54493	Business	Not_Satisfied	We run a Sprititual Retreat Center and internet is very important to our success. During the Covid slow-down we have been handicapped by the limited access we have. Service fluctuates with usage in the surrounding area. When there is no internet or insufficient in
Web	6.74	2.19	54498	Business	Not_Satisfied	This speed of internet is fine as long as I am not doing Zoom meetings/classes. When I do those, it cuts out.
Web	8.62	0.71	54746	Business	Not_Satisfied	Our Service is CenturyTel, suppose to be 10Mb/s
Web	185.74	5.16	54771	Business	Very	We are mostly satisfied with our internet service. However, there are numerous times throughout the year where service is interrupted due to outages. Usually services returns within a matter of hours. Speed is good when service is working.
Web	38.91	10.68	54771	Business	Somewhat	We tolerate the internet speed here, but it would be much better if it was faster. It hinders our production throughout the day at work and sometimes quits altogether when usage is high.
Web	3.14	0.48	54436	Both	Not_Satisfied	A lot if the time if someone is using the internet, everyone else has to shut theirs off on cell phones or other devices or it freezes and glitches.
Web	38.98	1.69	54437	Both	Not_Satisfied	I have tried several providers but have not enjoyed success which is important to my business
Web	2.08	0.53	54437	Both	Somewhat	new cable being installed all around my location but not at this address. being rural looks like no broadband. very disappointing.
Web	13.09	4.04	54437	Both	Somewhat	Speeds greater that 100 Mb/s would be great if possible.
Web	0.9	1.66	54437	Both	Somewhat	Wish there were more options for unlimited data internet service in our area.
Web	0.61	0.26	54438	Both	Not_Satisfied	Never ever have the upload or download speed we pay for
Web	10.94	2.59	54446	Both	Not_Satisfied	I have used every service provider available, Country Wireless, Selk Electronics and Satellite Services as well as all cellular carriers. Only a few carriers will work, and this is still intermittent. Our business counts on internet and we need zoom calls
Web	1.23	1.71	54446	Both	Somewhat	I use Selk Electronics as my wifi provider
Web	2.61	0.62	54446	Both	Not_Satisfied	We are on Frontier DSL-copper. Frontier fiber backbone has been buried right across our frontage. When will it be implemented?
Web	60.17	7.88	54446	Both	Somewhat	We have unexplained periods with no servic.
Web	0.68	0.23	54446	Both	Not_Satisfied	WiFi not strong enough to open link

Web	5.65	1.39	54446	Both	Very	Wi-fi was used from cell phone
Web	4.04	0.31	54456	Both	Not_Satisfied	I am paying for 15!!!
Web	2.53	0.86	54456	Both	Somewhat	I use zoom, whenever I attend a zoom meeting the signal breaks up. Then it say unsteady unstable internet connection. On weekends or on night its always slower.
Web	0.45	0.1	54456	Both	Not_Satisfied	Internet speed is so variable and unreliable. Although we are paying for 15mb/s, it occasionally gets above 12, but usually falls below that. Case in point, it was barely existing right now. This makes it unreliable to do zoom, webinars (my husband als
Web	1.94	1.26	54456	Both	Somewhat	Slow for watching hulu and netflix. Also slow when all kids were home from school trying to upload their homework to Google docs. only one kid could be on the internet at a time when uploading docs.
Web	10.06	1.6	54456	Both	Not_Satisfied	TDS Internet is bad cuts out many times a week have to reset router multiple times a week.
Web	11.4	0.96	54456	Both	Not_Satisfied	upset that I pay TDS \$110 per month for this
Paper	NA	NA	54456	Both	NA	Yes I would, currently TDS only offers a speed that is so ridiculously slow that it is not worth any amount. Not having internet is especially difficult when school is virtual. Thank you for conducting this survey.
Web	5.16	0.82	54460	Both	Not_Satisfied	TDS Telecom has been promising faster internet for 10 years. Tech support has told us they have too many people on the network. Have issues with reliability. Not able to connect at times. WIFI stops working. Not able to stream even short videos without
Web	5.01	0.61	54460	Both	Not_Satisfied	Weather conditions have an impact on service. Security issue concerns.
Web	1.32	0.34	54466	Both	Not_Satisfied	we have TDS DSL We have also used Clark Electric dish and this was the best of the two options.
Web	1.35	0.29	54479	Both	Not_Satisfied	I work from home and require a strong internet connection. My children also supplement their school education with activities on the internet, including homework. There are many times that the service is slow, quality is not acceptable, and applications
Web	2.51	0.49	54493	Both	Not_Satisfied	I'm not sure how TDS figures they can give a good internet service with telephone wires that were installed 60 years ago. What have they been doing with all the money they get from the government and the rate payers?
Web	2.91	0.97	54493	Both	Not_Satisfied	The lack of internet speed has a direct effect on our business and not being able to be efficient and competitive in some instances. Also, it is almost impossible to be able to work from home due to the SLOW internet.
Web	12.58	3.29	54498	Both	Not_Satisfied	Our speed is even slower during prime time evening hours. Streaming is often impossible.
Web	7.44	7.99	54498	Both	Somewhat	The cell phone hot spot is the only thing we found that can give reasonable internet speed in the country.
Web	0.16	0.14	54746	Both	Not_Satisfied	Our business is restricted from new technology due to poor internet access. Business Software programs are not going cloud based but we don't have strong enough internet to reliably access. We cannot participate in zoom meetings, our children don't have s
Web	14	0.83	54771	Both	Somewhat	Frustrating to not be able to have clear, consistent zoom or meet video. Outages frequent following storms. Unacceptable to have to wait for prolonged time for sites to load.
Web	0.82	0.41	54771	Both	Not_Satisfied	I can't even get satellite internet here. Would love a choice of companies. And a faster speed. I work from home, even when it is not Covid. I have no options for internet. Thank you for this opportunity.

Web	0.77	0.56	54771	Both	Not_Satisfied	Our internet is sketchy at best. It works but goes in and out on a regular basis.
Web	15.91	0.88	54771	Both	Somewhat	PLEASE GET BROADBAND!!! We have only WiFi so when it's out we have to drive down the road or to maybe go to end of driveway to get Cellular service because we don't have Cell service here! Broadband would be Great! Thanks
Web	26.98	17.84	54771	Both	Not_Satisfied	Slow. The best we can get is through wireless provider. When we reach a certain amount of data use it slows way down even with unlimited plan.
Web	0	0.12	54771	Both	Not_Satisfied	We have little to no service and it is a shame that we cannot get any they have got to seriously work on getting broadband out here in the country where we need it just as bad as the people in cities do. It's almost like discrimination against the country

APPENDIX B:

Broadband Expansion Tools for Local Communities

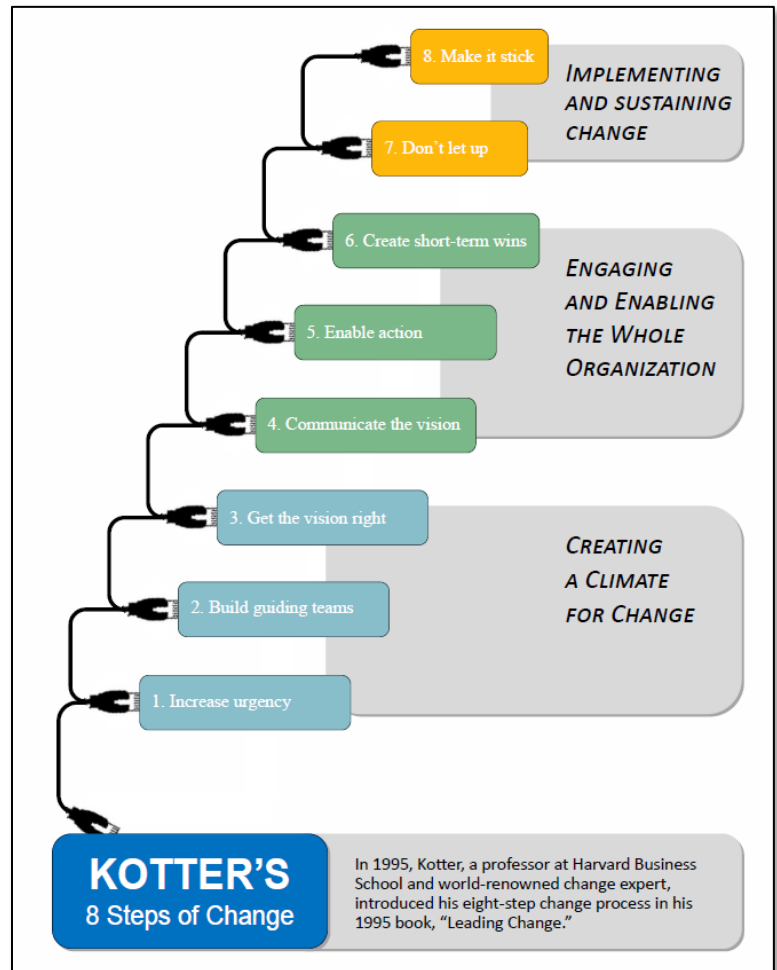
Broadband Expansion Tools for Local Communities

This document is a brief overview of potential tools that counties, municipalities, and local neighborhoods may use to encourage the expansion of broadband infrastructure. This is a checklist and does not offer detailed descriptions or case studies of each tool; additional research will often be required. The document is loosely organized by the *Kotter's 8 Steps of Change*, which has been highlighted during Wisconsin Broadband Boot Camps conducted by the now defunct UW-Extension's Broadband & E-Commerce Education Center. The order of your community's actions may vary and there is some overlap between tools.

Increase Urgency, Awareness & Capacity



- As an advocate, start by understanding what broadband is and why it is important to your community. Treat broadband as essential infrastructure. The graphic on the following page provides a great starting point for such discussions. Pierce County Economic Development Corporation (EDC) has prepared an excellent “white paper” on this topic.
- Use press releases, newspaper ads, flyers, presentations, websites, etc., to educate the public and elected officials on topics such as:
 - What is broadband?
 - Why is broadband essential infrastructure for community & economic development?
 - Why is broadband important to local businesses, workforce attraction, and tourism?
 - Why is broadband important to health care, education, and emergency services?
 - How is broadband changing our quality of life? What is the Internet of Things?
 - How can I be more cyber-secure?
 - What are the potential impacts of broadband availability on home and property values, home equity, and the property tax base of local communities?
- Adopt a broadband support resolution that affirms importance of broadband and identifies initial actions. Make it an issue and take ownership!



Broadband

The Fourth Utility



For communities to thrive
in a global economy, broadband must join
electricity, water, and natural gas as required utilities.
The stakes couldn't be higher...

<p>Between 2010 and 2016, overall population declined in rural U.S. counties for the first time in history. Lack of broadband is a contributing factor.¹</p>	<p>With higher rates of chronic illness and overall poor health, rural communities could benefit from telehealth services.²</p>	<p>Only 32.6 percent of rural libraries report having a fiber broadband connection, compared to 62.3 percent of their urban counterparts.⁴</p>	<p>66 percent of individuals age 35 and under living in MDUs get about half of their video content online.⁵</p>
<p>7 out of 10 teachers now assign homework that requires internet access, creating a homework divide where broadband is not present.³</p>	<p>Smart communities require robust broadband for applications like precision agriculture, e-government, next-generation public safety (FristNet), smart grids, and smart connected homes.</p>	<p>If communities are to keep pace with evolving mobile wireless technology, or 5G, an extensive fiber-based backbone network will be required.</p>	<p>FTTH-available communities enjoy 46 percent better new business formation compared to communities without fiber broadband services.⁷</p>

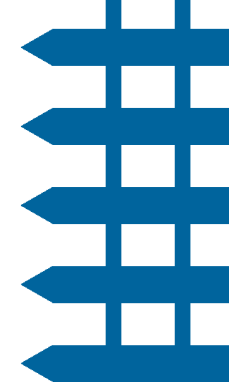
Broadband services enabled by robust fiber networks can make a difference,
often making or breaking a community's ability to survive over the long term...

<p>Between 2005 and 2016, output in the digital economy grew 5.6 percent per year. Annual growth in total U.S. GDP, by contrast, was just 1.5 percent.⁶</p>	<p>Since the Sevier County School system in TN instituted a telehealth program, 84 percent of students treated via telehealth remain in school.⁹</p>
<p>Thanks to a broadband grant from the U.S. Economic Development Agency, the Eastern Kentucky Concentrated Employment Program (EKECEP) saved 142 jobs and created 25 new ones.¹⁰</p>	<p>Fiber-based broadband correlates with higher property satisfaction.⁸</p>

When available, rural markets enjoy better average take rates (63 percent) for fiber broadband than urban (50 percent) or suburban (43 percent).⁷

The average revenue from a home-based business using FTTH (\$75,000) far exceeds cable broadband (\$43,000), DSL (\$38,000), and wireless (\$25,000).⁸

Let's connect on your vision of a brighter future for your community.
www.corning.com/muni



¹ Rural Economy and Population, USDA
² Rural Health Disparities, Rural Health Information Hub
³ Bridging a Digital Divide That Leaves School Children Behind, American Library Association
⁴ The Digital Divide in America, American Library Association
⁵ PDA, LLC
⁶ Defining and Measuring the Digital Economy, Bureau of Economic Analysis, U.S. Dept. of Commerce
⁷ Fiber Broadband Association
⁸ The Tangible Value of Advanced Broadband to MDUs - PDA, LLC
⁹ Health Care Hub: The Future of Telemedicine and Broadband
¹⁰ Building the Broadband Economy, Broadband Properties Magazine
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Corning Optical Communications, LLC in Charlotte, NC created this excellent graphic that reinforces the necessity of broadband as the fourth utility—on par with water, gas, and electricity—in today's world. In this context, treating broadband as a utility suggests that reliable, affordable broadband access is a right; it is not suggesting that broadband be made a public utility.

- Your project needs one or two passionate champions or a specific organization/department that will take the lead, facilitate communications, and keep your efforts moving forward. Identify and nurture community leaders and advocates to fill that role. Delegate and empower individuals or a group to take action on broadband expansion for your community by motion, resolution, etc.
- Bring diverse stakeholders together to form a guiding coalition, advocacy group, or technology committee to take the lead on broadband planning and advocacy. Such groups can start out informal, or can be formalized and incorporated such as the Northwoods Broadband & Economic Development Coalition.
- Build the capacity of residents at a local or neighborhood level to take action. This can include providing data, maps, broadband tools, resources, and how to build broadband partnerships. Create and provide a resource hub for broadband information.
- The West Central Wisconsin Broadband Alliance maintains a web-based Broadband Library via Dropbox with informational articles, studies, data, example surveys, sample support resolutions, and other resources. Contact WCWRPC (www.wcwrpc.org) for more information.



Inventory and Assess Broadband Supply & Demand



- When exploring data, keep in mind that most homes and businesses have some type of internet access, but this does not mean they have affordable, reliable broadband. Some key public data sources include:
 - Wisconsin Broadband Office’s (WBO) data and maps, including the State Broadband Map and maps of areas awarded subsidies by the FCC (e.g., CAF-2, ACAM, RDOF)¹.
<https://psc.wi.gov/Pages/Programs/BroadbandData.aspx>
 - The U.S. Census Bureau’s American Community Survey (ACS) has data on computer ownership, internet subscriptions, and cell phone use as well as various socio-economic data. <https://data.census.gov/cedsci/>
 - The National Telecommunications & Information Administration (NTIA) conducts an internet use survey as a supplement to the Census Bureau’s annual Current Population Survey.
<https://www.ntia.doc.gov/category/data-central>
 - Wisconsin Department of Public Instruction’s Digital Equity Gap Survey.
<https://dpi.wi.gov/broadband>
 - The Center for Community & Economic Development within UW-Madison Extension has conducted some analysis and prepared related reports and fact sheets, including a broadband index that is a “mash-up” of ACS and FCC data.
<https://economicdevelopment.extension.wisc.edu/broadband-internet-and-the-wisconsin-economy/>

¹ The data and maps available through the WBO include or incorporate most key broadband maps available from the Federal Communications Commission (FCC), including the National Broadband Map (<https://broadbandmap.fcc.gov/#/>).

- Consumer-initiated data sources, such as those provided by M-Lab and Ookla®, obtain data generated by users of certain web-based applications, such as online speed tests. M-Lab data is publicly archived and freely available, while Ookla data and their web-based tools may require an agreement. The end user should understand any differences, strengths, and weaknesses of these data sources.
- I3 Connectivity Explorer is a free, web-based tool that draws data from various federal sources and M-Lab to allow users to compile and analyze the broadband situation in their community. <https://i3connect.org>
- Conduct a community and/or business survey on perceptions, use/adoption, needs, and barriers for use.
 - Some communities, such as Dunn County, have conducted mail surveys. Some example surveys are available in the Broadband Alliance’s web-based library.
 - More recently, Eau Claire and Clark counties have both conducted GIS-based surveys over the internet with a built-in speed test.
 - An additional option is to use a service, such as GEOspatial Engineering & Optimization, to utilize specialized software to guide and support your web-based data collection and conduct detailed analysis based on the results. Such services may also be a valuable option if you wish to monitor or evaluate broadband expansion projects awarded to providers, including the FCC subsidy programs (e.g., CAF-2, ACAM, RDOF).
- Engage in discussions with the business community, emergency services/communications providers, and critical facilities on broadband needs, plans, and opportunities.
- Expand upon the WBO’s broadband surveys and maps to collaborate on local maps with additional information on broadband supply (e.g., providers, type of service, upload/download speeds) and demand. This could include a review of public right-of-way permits to identify the owners of existing fiber that may be underutilized or dark.
- Share your broadband data and mapping needs with neighboring jurisdictions, the WBO, and elected officials. For instance, if you are interested in data from a fee-based service or analytical tool, such as Ookla or GEOspatial mentioned previously, it can be much more cost effective to subscribe as multiple counties or at the state level as well as providing the needed staffing resources to effectively use these services.

Broadband Planning—General

- Identify and build relationships with local broadband providers and any existing community area networks. Tell them what you need and explore opportunities. See next sub-section.
- While implementation typically occurs locally, activities such as planning, policies, information sharing and leveraging resources often begin at the county or regional level. Reach out to your school district and neighboring jurisdictions to learn what they’ve done. Identify shared needs and partnership opportunities. Explore case studies from other communities. Participate in the West Central Wisconsin Broadband Alliance meetings for a regional perspective and to share resources. For technical assistance, contact the Public Service Commission’s Wisconsin Broadband Office (WBO) or the NTIA’s BroadbandUSA program.
- Using WBO or FCC maps/data, determine if your community is in an area to be served by a FCC auction/subsidy program. If you are in an award area, reach out to the internet service



provider (ISP) to determine their plans and explore partnership opportunities. These FCC programs include:

- Connect America Fund II (CAF-2), which was limited to larger price-cap carriers
 - Alternate Connect America Cost Model (A-CAM) for smaller, rate-of-return carriers
 - Rural Digital Opportunity Fund (RDOF)
- Integrate broadband conditions, needs, and strategies into your community’s comprehensive plan, often as part of the Utilities & Community Facilities element or as a standalone element. Some communities have made broadband a centerpiece of their economic development strategy, including for tourism, attracting/retaining workforce, and for marketing to potential residents, entrepreneurs, and businesses.
 - Your local school district, technical college, and public library can be key partners in broadband education, data gathering, and planning. Educating youth on the importance of broadband, beyond gaming, can help attract/retain young workers. Young people can also be a good resource to assist with your outreach and planning efforts.
 - Develop a standalone broadband plan or strategy that assesses supply and demand, with recommendations. Look ahead—what you need today may be very different than what you will need in the future. Your broadband strategy may need to prioritize goals and actions based on need and opportunity. If needed, obtain technical assistance from qualified consultant to drive the effort and provide an objective, “outside” perspective.
 - As part of capital improvements planning and official mapping, discuss road & right-of-way projects with local providers to identify opportunities for installation of fiber, conduit, etc.
 - Inventory and create a vertical assets database of structures (e.g., silos, water towers, tall buildings) where ISPs could locate wireless antennas and other equipment. Check the list of WDNR decommissioned fire towers. Make this database available to ISPs.
 - Strive to become a Smart City/Community, a Gigabit Community, a US Ignite Smart Gigabit Community, a WEDC-recognized Gigabit Business Park, or similar.
 - As you explore solutions, understand that more than one type of broadband service may be needed to meet the needs of your community. The high-speed transmission of data can be physically provided in a variety of ways, including:
 - Digital Subscriber Line (DSL) through landline phone networks
 - Cable Modem
 - Fiber optic or Fiber-to-the-Premises (FttP)
 - Fixed Wireless
 - Satellite, including the Starlink project that is in testing
 - Broadband over Powerlines (BPL) - very limited use to date
 - TV White Space - emerging wireless option sometimes called Super Wi-Fi²
 - Mobile, Non-fixed/Roaming Wireless (Cellular Phone Networks)³

² Connect Americans Now (<https://connectamericansnow.com/>) is a national coalition n advocacy organization advocating for more federal funding and reducing regulatory barriers to allow a mix of technologies to address the broadband divide, including TV white space. Some Wisconsin communities and organizations have joined this Coalition.

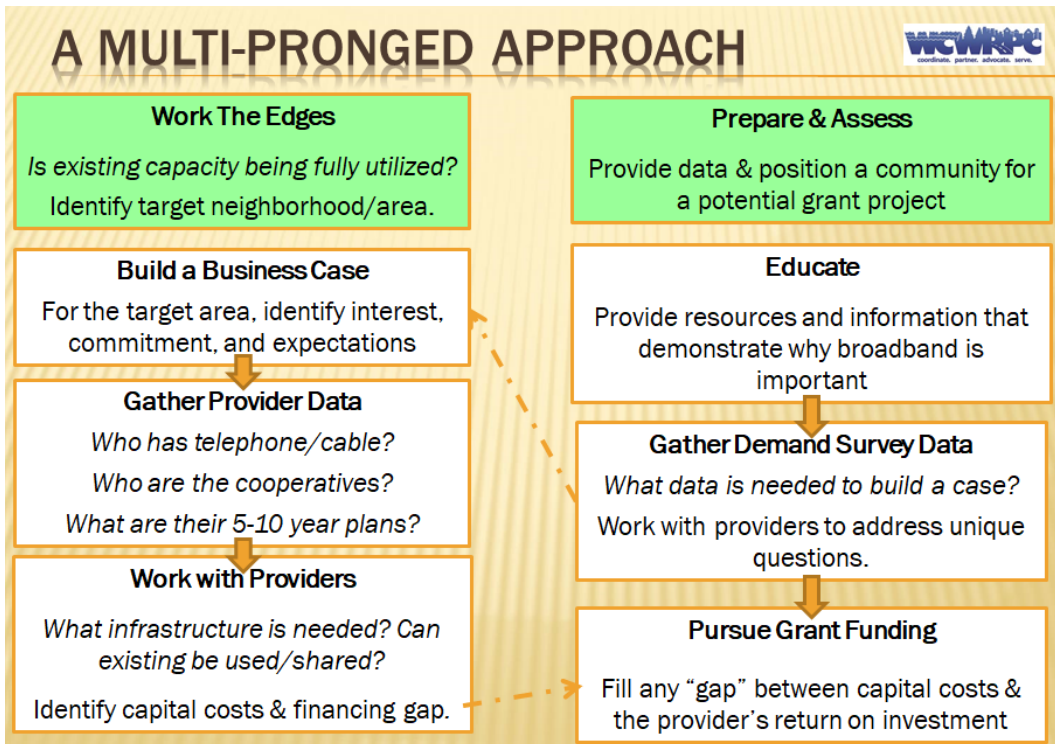
³ Mobile wireless phone networks are generally optimized for larger numbers of non-stationary or non-permanent users, but this can be at the sacrifice of speeds, latency, and costly data plans. For such reasons, non-fixed internet service has sometimes

- A combination of the above technologies (e.g., installing fiber to a DSL repeater or a fixed wireless tower).

Keep in mind that each broadband type has strengths and weaknesses. Your solution will be influenced by factors such as: available infrastructure and broadband providers, capital costs, topography, potential sources of interference, current community adoption, and existing and future broadband needs (e.g., costs, reliability, speeds, use). For example, DSL may be effective up to 2-3 miles maximum, while fixed wireless towers may be effective up to 5-10 miles, if there is good line-of-sight.

Broadband Planning—A Multi-Pronged Approach

Most broadband service is provided by a private Internet Service Provider (e.g., for-profit company, cooperative, private-public partnership). When exploring solutions, engaging area ISPs will be one of your first steps. However, you may first need to do some homework. The multi-pronged approach below was developed by the West Central Wisconsin Broadband Alliance from discussions with area ISPs.



The left column in the above graphic focuses on setting priorities and engaging providers:

- 1) **Work the Edges.** Broadband expansion projects typically do not encompass an entire county, town, or community. You may need to set some priorities. One communications expediter suggested that communities should “work the edges.” Know where your service is today and grow out from there. Broadband expansion will likely be localized and incremental (by subdivision or “neighborhood” area). In some cases, the target area may cross municipal

not been included as a broadband technology. However, 5G wireless technology is becoming more common with a promise of increased capacity, lower latency, and faster speeds, though it may be a few years before we know if 5G will be an effective broadband alternative for rural areas.

boundaries. However, you should still be strategic in your planning as suggested in the cautionary note at the end of this section.

- 2) **Build a Business Case.** Along the edges, identify a very specific target area (e.g., a number of close subdivisions, a neighborhood that is physically separated by water or topography, along a limited number of roadways), then build a business case for private investment for that target area. Be able to demonstrate and quantify to ISPs that there is demand and commitment for the target area. If you need to target a “sub-area”, local politics can be a challenge, since an expansion project may not immediately be benefiting the entire community. But as service is provided, your edges (target sub-areas) will change.
- 3) **Identify Potential Providers.** Identify area providers and learn about their services and plans. If needed, consider adjusting your target area or adding anchor institutions (potential customers with a large broadband need) to improve your business case for a specific provider.
- 4) **Engage Providers.** Share your business case. If an ISP is open to discussing, they can estimate the capital/infrastructure costs and how much of these costs they can finance given a fair Return on Investment (ROI).

The right column of the previous graphic reflects the information needed to build your business case and potentially pursue grant funding. In this scenario, think of the public funding as “gap financing.” If broadband service is not already provided, there is increased likelihood that a larger capital investment is not feasible based solely on the ROI from customer fees. In such a case, the local municipality or a community group can partner with the provider to explore grants and other financing alternatives to fill the gap between actual capital costs and the provider’s ROI.



Be strategic and “big picture” in your planning. When “working the edges” and engaging ISPs, strive for a holistic approach and consider the ramifications of your decisions. Take caution not to “cherry pick” by identifying a project that is limited to the most profitable areas or largest customers (e.g., hospitals, schools, other large users), especially if your community is contributing to the project. This can create a situation that makes it less desirable and less profitable for a second ISP to provide and manage service to the remaining residents and businesses, especially in rural, less densely populated areas. Further, the second ISP may also lack control or ownership over the “middle mile” in such a scenario, which may limit their options or impact service levels. Instead, is there an opportunity to “work the edges” in a manner that is accessible by other ISPs (e.g., extra capacity, lease options) and makes it more cost feasible to expand to other underserved areas in the future. If you treat broadband as essential infrastructure, it is then equitable that these costs be shared equally over the entire population of a community, county, or region instead of perpetuating or creating a digital divide at the local level.

Remove Barriers and Enable Action

- Adopt dig-once and joint trench-use policies and ordinances. Require that conduit or fiber installation will be allowed in R-O-W and require related notifications. Coordinate with Wisconsin DOT and/or County Highway Department.
- Adopt public rights-of-way policies that waive fees or expedite use for broadband installation.
- Adopt tower ordinances that allow agreements for the installation/co-locating of antennae and equipment.
- Amend zoning, subdivision, and design review ordinances to consider, encourage, or require the installation of broadband. Potentially include design plates or cross-sections with standards.



- Continue to support and advocate for efforts at the Federal and State levels that will provide effective, long-term solutions to addressing rural broadband needs and the digital divide. This includes encouraging more competition in the broadband market place and providing opportunities for smaller or potentially new ISPs, including cooperatives, to enter the market and help meet demand.
- Signal your eagerness for broadband expansion by obtaining Broadband Forward! Community Certification through the Wisconsin Public Service Commission.
- Much of the above could be incorporated into a single, overarching broadband ordinance.
- Provide model ordinances and permitting models to sub-units of government.
- Your community or organization can apply to become a member of Connect Americans Now, which is a Coalition advocating for elimination of the rural divide largely through education and the removal of Federal policy barriers. This organization is emphasizing TV white space as an emerging broadband technology that will be key to addressing rural broadband needs. Visit <https://connectamericansnow.com/>

Other Short-Term Wins & Broadband Adoption



- Conduct and advocate for digital literacy projects and technology trainings. Such efforts could target a population (e.g., seniors, small businesses). Improving digital literacy and related educational efforts can improve broadband use (adoption) and have significant economic impacts, while strengthening your business case for broadband investment.
- Advocate for telecommuting & telehealth. Obtain Telecommuter Forward! Community Certification (new program in Spring 2018) through the Wisconsin Public Service Commission.
- Bring together residents, businesses, and ISPs for community discussions, to educate on available broadband services, and explore opportunities. Show ISPs there is an unmet demand in your community. Such events could include community forums, technology fairs, and educational seminars on broadband topics.
- Once an ISP is committed to a project or has received a grant, encourage them to keep the general public regularly informed on the plans and progress, perhaps using social media.

Implementing Change -What is your Approach?



Similar to the types of broadband, the solution for your community may involve a variety of providers. Your approach will depend on the results of your inventory, local demand/needs, preferred broadband type, and goals. Some existing providers may not provide “last mile” broadband, but can help you get there. Some common broadband provider approaches are:

- **Private For-Profit Providers** - These may be larger price cap telecommunications and cable firms and smaller, local ISPs. These providers are primarily market and profit driven; Federal or State subsidies (e.g., CAF II) are sometimes available. May or may not have shareholders.
- **Non-Profits and Cooperatives** - Organized and controlled by its members for a specific function to meet member needs, typically for a more limited geographic area. Cooperatives may or may not be non-profit.

- **Community Area Networks (CANs)** - CANs are broadband communication networks that are collectively designed and managed. CANs in Wisconsin most commonly serve local units of government, state government, educational institutions, libraries, health care and nonprofits. A CAN may not only build and manage the broadband distribution network, but can include sharing of applications, data centers, expertise, etc. See <https://cincua.org/>
- **Local Government-Owned Infrastructure** - A municipality, a utility/commission established by the municipality, or other public-sector collaborative constructs their own broadband infrastructure for government use or to provide services within all or part of the community. May include Public Wi-Fi for a specific area (e.g., park, downtown) or community wide. Some municipalities (or their utility commissions) are certified by the Wisconsin Public Service Commission as an alternative telecommunications provider, but statutory constraints exist.

As an alternative to acting as an ISP, some municipalities have installed conduit and fiber, then are leasing it out to one or more ISPs. The fiber may initially be dark (unused) or it may be connecting existing (or planned) public uses. Two Wisconsin examples of this approach are:

- Brown County has installed 120 miles of fiber to schools, municipal buildings, etc. They are now working with ISPs to explore ways in which the ISPs can use this fiber to help reach businesses and residents without broadband service.
- Taylor County approved a \$9.5 million bond and, through a request-for-proposals process, selected WANRack to help develop and manage a fiber network that will span 74.6 miles throughout the County. In addition, other ISPs will be able to affordably lease any portion of the new fiber to provide high-speed service to residents.

UW-Madison Extension's *Strategies & Policy Options for Broadband Access Across Wisconsin* discusses some of the challenges and limitations with broadband provided by municipalities and cooperatives. As the public-sector increases their role in broadband expansion and adoption, it not only provides for more public control over access and security, but also provides opportunities for the growth of public-sector IT management jobs.

- **Private-Public Partnerships** - For most partnerships, ISP owns & operates the service and/or the infrastructure with the public-sector providing financial support or access to public infrastructure. Example partnerships include:
 - tower or use agreements and leases for public buildings, water towers, ex-DNR fire towers, property, etc.
 - development or shared resource agreements (e.g., e.g., local government waives permitting processes, allow right-of-way use, assists with planning, engineering or other costs)
 - lease of public-owned right-of-way, easements, or conduit for fiber
 - sale or lease of dark fiber
 - co-apply for grant funding, as required by Wisconsin Broadband Expansion Grants

Implementing Change - Potential Funding Sources

Financing of broadband expansion can be complicated and the best solution may require financing from multiple sources and partners. In some cases, the infrastructure may not be entirely owned by a single, sole service provider (the proprietary model). The following are some of the more common financing alternatives, though the specific programs change over time.

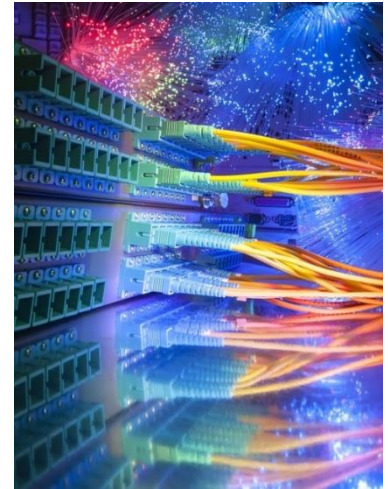


Federal & State Funding

Table 1 on page 12 identifies some of the most common government financial assistance programs for broadband expansion. Additionally, funding may be available if the broadband expansion will serve critical facilities, such as schools, libraries, and hospitals. As of May 2021, new funding opportunities and programs supporting broadband expansion are under consideration, especially at the Federal level, so it is important to stay informed of these changing opportunities.

Coronavirus State and Local Fiscal Recovery Funds

COVID-19 laid bare the rural digital divide as the demand for remote learning, telemedicine, telecommuting, and other broadband use dramatically increased. The American Rescue Plan Act (ARPA), signed into law by President Biden on March 11, 2021, allocated funding to state, local, territorial, and Tribal governments to respond to the COVID-19 emergency. Per ARPA, State and Local Fiscal Recovery Funds must be obligated by December 31, 2024 with projects to be completed by December 31, 2026. Broadband infrastructure that “makes necessary investments to provide unserved or underserved locations with new or expanded broadband access”⁴ is an eligible use of this funding. The U.S. Treasury has provided guidance on the use of funds and specific expectations for project delivery, including: broadband projects must be designed to deliver service that reliably meets or exceeds symmetrical upload and download speeds of 100 Mbps and projects must use “strong labor standards, including project labor agreements and community benefits agreements that offer wages at or above the prevailing rate and include local hire provisions.”⁵ This funding provides a unique opportunity for units of government to undertake investments but it is important that counties and communities understand and follow all of the guidelines and reporting requirements associated with the funding.



State of Wisconsin Broadband Expansion Grant Program

Since 2014, the Wisconsin Broadband Expansion Grant Program administered by the Public Service Commission’s WBO has been a vital source of broadband project funding. West Central Wisconsin has been a leading region in successfully using these grant funds. Applications require a private-public partnership and must expand broadband into unserved or underserved areas. A local match is not required, but is a priority factor in grant scoring; a local match of 50+% is not uncommon. The deadline for applications is often short (e.g., 3 months or less from the announcement date), so it is important to be proactive, start building those partnerships, and begin planning in advance of the grant announcement. There have been multiple application rounds in some years.

This grant program is very competitive. The FY2021 initial grant rounds awarded 58 projects totaling \$28.4 million; a total of 124 applications were submitted totaling \$62.6 million. To strengthen your application, review successful applications from past grant cycles and consider the technical comments from the grant reviewers. For example, project speeds and scalability are important factors, with 50 of the 58 FY2021 grant awards being for fiber broadband projects. Grant applications in which the municipality and other partners (not just the ISP) make a cash contribution towards the project are also scored higher.

⁴ U.S. Department of Treasury, *Coronavirus State and Local Fiscal Recovery Funds – Quick Reference Guide*.
<https://home.treasury.gov/system/files/136/SLFRP-Quick-Reference-Guide-FINAL-508a.pdf>

⁵ U.S. Department of Treasury, *Coronavirus State and Local Fiscal Recovery Funds – Interim Final Rule*.
<https://home.treasury.gov/system/files/136/FRF-Interim-Final-Rule.pdf>

On June 1, 2021, Wisconsin PSC launched a special round of broadband expansion funding with \$100 million from the Federal ARPA. This is the initial batch of Federal funds to be dedicated to expanding high-speed broadband internet access across the State. The very short application acceptance period of June 1 - July 27, 2021, demonstrates the need to plan ahead and be prepared when grant opportunities arise.

Other Financing Mechanisms

- **Private Grants and Foundations.** Private foundation grants for broadband expansion capital are rare. Some foundations may provide private grants for broadband planning, feasibility studies, public education, and adoption. Foundations may target specific areas or demographics of concern. Worth special mention, in 2017 Microsoft initiated the Rural Airband Initiative, which lifted certain patents and has been supporting TV white space projects through grants and commercial partnerships, including a project in northern Wisconsin.
- **Private Equity and Financing** by ISPs, investors/investment banks, developers, and local residents and businesses, including private equity or debt financing, mezzanine funding, private-public development agreements and crowdfunding with patient capital. Private revenue-based financing may also include wholesale dark fiber lease, transmission services, and retail infrastructure lease or connectivity fees.
- **Tax and Assessment-Based Financing**, such as Utility Assessments, Tax Assessment Districts, Property-Assessed Broadband (landowner driven), Tax Increment Financing, Business Improvement Districts, and New Market Tax Credits. May include utility connection or connectivity fees.
- **Municipal Financing**, such as tax-exempt debt financing, general obligation bonds, revenue bonds, industrial revenue bonds, avoided costs, etc.
- **Public Leasing or Tax-Exempt Municipal Lease Financing.** This includes the leasing of public land or structures (e.g., buildings, water towers) for the installation of antennae or other broadband infrastructure by an ISP. This also includes the installation of “dark fiber” where extra fiber capacity is laid by the municipality within the right-of-way that can then be leased to a private entity to cut down on some of their capital and operational expenses.
- **Phased Financing and Expansion.** Early revenues from the operation of a broadband network are used to secure financing for subsequent expansion of the network.
- **Encourage Anchor Tenants.** An anchor tenant is typically a single facility or customer who will require high broadband use, but could be a concentration of users, such as a new subdivision. To help make a broadband investment feasible, the facilities and services of a local government can serve as an anchor tenant for their own networks or for a private network. Likewise, a municipality may identify or encourage additional anchor tenants for areas needing improved broadband service through comprehensive planning, zoning, provision of infrastructure, and other incentives.
- **Cost-Sharing and Partnerships.** When the private marketplace alone provides insufficient return on investment for broadband expansion, collaboration may be needed to leverage resources from multiple partners, including private-public partnerships, intergovernmental agreements, multi-user community area networks, and similar cooperative efforts.

Table 1. Federal & State Funding Sources for Broadband

FUNDING PROGRAM NAME	AGENCY	PROGRAM WEBSITE
ReConnect Loan & Grant Program	U.S. Department of Agriculture (USDA)	https://www.usda.gov/reconnect
Community Connect Program	USDA	https://www.rd.usda.gov/community-connect
Distance Learning and Telemedicine (DLT)	USDA	https://www.rd.usda.gov/programs-services/distance-learning-telemedicine-grants
Telecommunications Infrastructure Loans & Loan Guarantees	USDA	https://www.rd.usda.gov/programs-services/telecommunications-infrastructure-loans-loan-guarantees
Rural Digital Opportunity Fund (RDOF)	U.S. Federal Communications Commission (FCC)	https://www.fcc.gov/auction/904
Universal Service Fund - Schools and Libraries Program ("E-Rate")	FCC	https://www.fcc.gov/consumers/guides/universal-service-support-mechanisms
Rural Health Care Program	FCC	https://www.fcc.gov/general/rural-health-care-program
Healthcare Connect Fund	FCC	https://www.fcc.gov/general/healthcare-connect-fund-frequently-asked-questions
Connected Care Pilot Program	FCC	https://www.fcc.gov/wireline-competition/telecommunications-access-policy-division/connected-care-pilot-program
Public Works and Economic Adjustment Assistance Program	U.S. Economic Development Administration (EDA)	https://www.eda.gov/funding-opportunities/
Trust Fund Loan	Board of Commissioners of Public Lands	https://bcpl.wisconsin.gov/Pages/Home.aspx
Wisconsin Broadband Expansion Grants	Wisconsin PSC WBO	https://psc.wi.gov/Pages/Programs/BroadbandGrants.aspx
Community Development Block Grant Public Facilities Program	Wisconsin Dept of Administration	https://doa.wi.gov/Pages/LocalGovtsGrants/CDBGPublicFacilitiesProgram.aspx

Primary Sources:

This document compiled ideas and insights from various sources, including but not limited to the following:

- Biltonen, Eric. St. Croix County UW-Extension. *Economic Impacts of Broadband Access & Availability*. Powerpoint Presentation. January 2016.
- Straight, Chris. West Central Wisconsin Regional Planning Commission. *Ideas for Broadband Planning*. Powerpoint Presentation. April 2015.
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- UW-Extension Broadband & E-Commerce Education Center. *Collected Broadband Regulations and Policies in Action*. May 2014.
- UW-Extension Broadband & E-Commerce Education Center. *Broadband Policies and Regulations*. June 2015.
- West Central Wisconsin (PSC Region 5) Broadband Implementation Group (now Broadband Alliance) meeting notes and group member input. March 2012 - May 2021.

For questions regarding this Toolkit or the West Central Wisconsin Broadband Alliance, contact Chris Straight, Senior Planner, WCWRPC at chris@wcvrpc.org or 715-836-2918.

