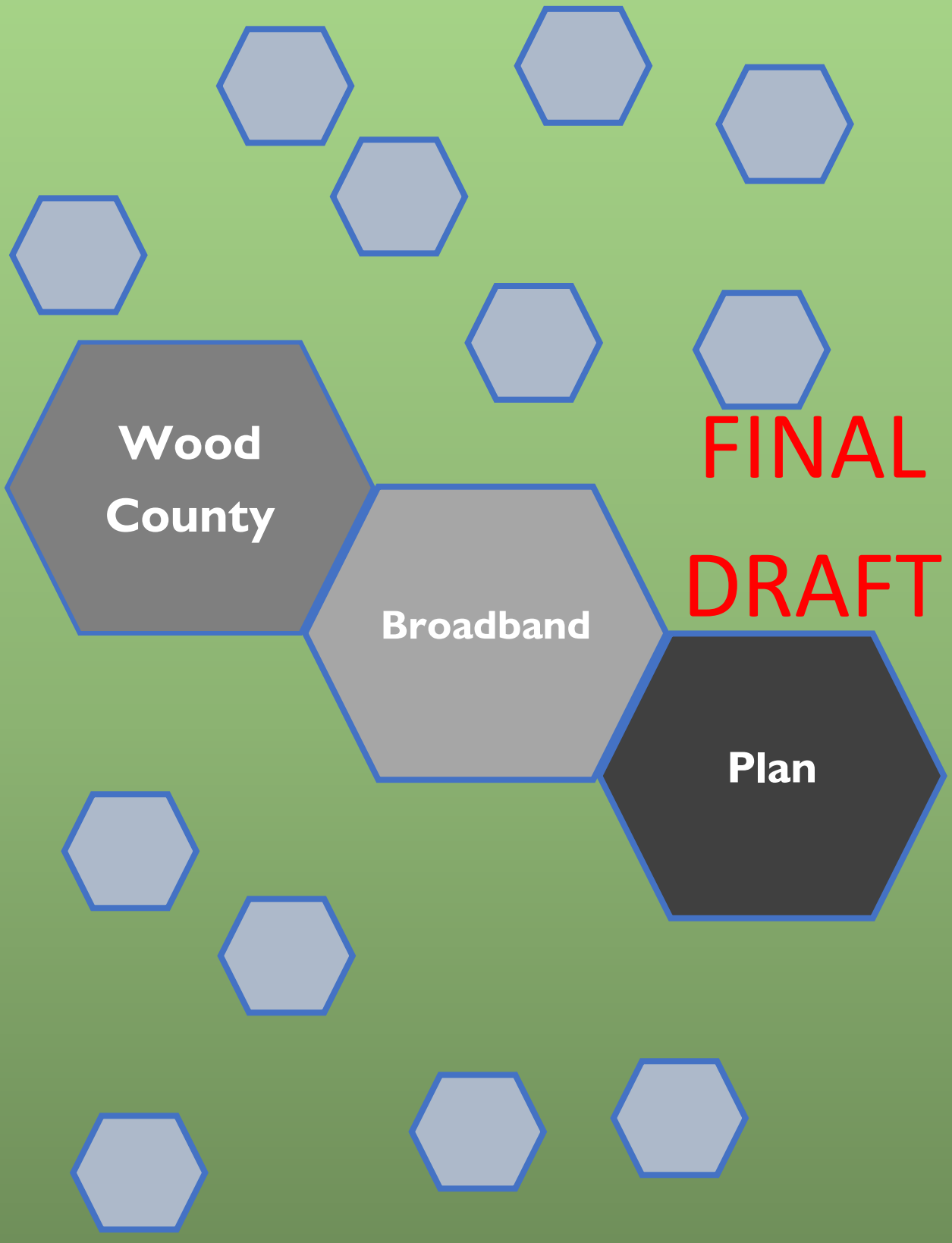


Prepared By: North Central Wisconsin Regional Planning Commission

March 8, 2024

TABLE OF CONTENTS

CHAPTER 1

Background

1. BACKGROUND

Broadband is essential in today's world. Every segment of the population, businesses, and government relies on the integration of the internet. For Wood County to remain competitive, it needs to both expand and improve broadband throughout the county. Both the state and federal governments have established a grant program to help promote the adoption of broadband across unserved and underserved areas.

The Broadband Equity, Access, and Deployment (BEAD) Program will provide $42.45 billion for expanding high-speed internet access by funding planning, infrastructure deployment, and adoption programs in all 50 states. Wisconsin's allocation of BEAD funding is just over $1 billion. To qualify for this funding, local entities must engage in broadband planning to gain insight into each community's vision for broadband development. These local plans may include outreach initiatives, conducting local needs assessment, and developing local or regional broadband plans. Ultimately, these local broadband planning activities will inform the state Five-Year Action Plan which will guide broadband deployment and implementation of the BEAD program.

The broadband plan outlined is a comprehensive strategy designed to bridge the digital divide by increasing connectivity and accessibility of broadband in Wood County. Further, this plan will identify both barriers and goals to infrastructure expansion and broadband adoption. As a result, Wood County will be better positioned to apply and hopefully receive BEAD funding for broadband deployment.

PURPOSE

The objective of the Broadband Plan is to offer insights into the current state of broadband deployment in Wood County. The information presented in this plan aims to help the county understand broadband, thus assisting local officials in making well-informed decisions in supporting the right broadband deployments. The plan is to help facilitate the optimal broadband connections to residents, taking into consideration the cost associated with these deployments. Access to quality and affordable high-speed internet opens new opportunities for economic development, education, public safety, entertainment, and healthcare for Wood County.

PREVIOUS REGIONAL EFFORTS

The North Central Wisconsin Regional Planning Commission has identified Broadband as a foundational pillar critical to a strong economic recovery and increasing economic resilience in the North Central Wisconsin Regional Recovery Plan. This plan acknowledges that Covid-19 magnified the significance of broadband access and the quick shift to a virtual world created significant disadvantages for businesses, workers, and residents alike. Additionally, this plan sought to expand broadband infrastructure and increase both the affordability and performance of broadband.

Specifically, this plan highlighted that most of the North Central Wisconsin Regional area geographically remains unserved or underserved for broadband access, the exception being more urbanized areas. Throughout the Region overall, about 62 percent of households have broadband access. Therefore, the most significant consideration is the establishment of needed infrastructure throughout the Region to allow residents to access broadband. This Plan also recommends an examination of a multitude of factors that influence broadband adoption, including household income, educational attainment, age, and employment status. Other important considerations include the rural digital divide, cost, and digital literacy.

The following **goals** have been identified to be most important to the vision of the broadband future of the Region. When setting the goals top considerations include successfully expanding broadband access to residences, businesses, and institutions throughout the Region, fostering quality broadband service that meets the needs of residences, businesses, and institutions throughout the region, and optimizing digital inclusion, digital literacy, and competitive costs.

- Create universal broadband infrastructure throughout the Region.
- Bring high-performance broadband service throughout the Region.
- Make broadband affordable and competitive.
- Advance digital literacy and inclusion.

PLANNING PROCESS

The planning process for this initiative examined essential background information and data, facilitated the development of broadband deployment, and proposed adoption strategies. To ensure a comprehensive and locally informed approach, the county established a dedicated committee tasked with overseeing the planning process, offering valuable local insights, and ensuring effective oversight.

The process involved documenting broadband objectives sourced from both regional and local perspectives. Furthermore, it entailed a thorough mapping of the existing state of broadband infrastructure, including pinpointing areas of high demand. This mapping exercise will help pinpoint coverage gaps and areas requiring substantial improvements.

In addition to these steps, the initiative involved the identification of potential barriers to broadband expansion and explored various funding options. Detailed cost estimates for infrastructure deployment were also generated. These efforts collectively aim to provide the county with valuable guidance, enabling them to engage with local Internet Service Providers (ISPs) effectively and advance their broadband access goals.

Wood County's Broadband Committee consulted with the North Central Wisconsin Regional Planning Commission (NCWRPC) at three sperate meetings during the planning process. The first meeting on July 20, established the plan's timeline, and next steps, and NCWRPC shared information on the broadband speed test being conducted. The second meeting on September 21, was an opportunity to discuss and review the draft plan format as well as formalize the goals of the Plan. The final meeting included a final review of the plan by the committee before the adoption of the Broadband Plan.

BROADBAND COMMITTEE

Wood County has formed a Broadband Committee to gather data for determining optimal fiber optic cable routing, accessing grant monies to assist with that process, and attracting ISPs to partner with the county on making high-speed broadband accessible throughout the county.

- Al Breu
- Amy Kaup
- Angel Whitehead
- Bradley Russell
- Brian Berres
- Charlie Hoogesteger
- Craig Broeren
- Denise Sonnemann
- Diana Schooley
- Erik Engel
- Felip Lelis
- Jake Hahn
- Jason DeMarco
- Jason Grueneberg
- Jason Knott
- Jenny Resch
- Jerry Minor
- Julie Strenn
- Kayla Rombalski
- Kristie Egge
- MaryAnn Lippert
- Michael Rave
- Paul Bernard
- Phillip Bickelhaupt
- Roland Hawk
- Scott Larson
- Shawn Becker
- Staci Kivi
- Sue Smith
- Tammy Hardinger

CHAPTER 2

Broadband: What It Is and Why It Matters

2. BROADBAND: WHAT IT IS AND WHY IT MATTERS

INTRODUCTION

Broadband accessibility has become a requirement, and not just a luxury for communities, businesses, workers, and residents in today's world. The benefits of broadband access and the drawbacks of a lack of access are quickly making broadband an essential utility. Broadband accessibility is a vital resource for businesses to operate and stay competitive in an increasingly digital economy. Broadband accessibility is also critical for residents, as those who lack access to high-speed internet have a harder time accessing jobs, healthcare, education, job and skills training, and services.

For most Americans, broadband is commonplace in professional, personal, and social environments. Yet, broadband is the country's most inequitable infrastructure with around 15 percent of households not having subscriptions to any form of "broadband" internet service. Many residents and businesses in Wood County do not have access to adequate broadband, while others have no access to broadband at all, and are thus not able to use broadband internet service, putting them at a disadvantage as the world's reliance on the internet grows.

WHAT IS BROADBAND?

Broadband is the provision of a high-speed connection to the internet via the transmission of data through wide bandwidths, allowing for multiple signals to be transferred at once, as opposed to dated dial-up technology where only a single-line of data can be transferred. Broadband internet access is always on and is faster than dial-up access. The Federal Communications Commission (FCC) defines broadband as any of the following high-speed technologies: fiber, cable, fixed wireless, or satellite.

The standard for reliable broadband internet access is defined by the FCC as internet access with a download speed of 25 Mbps and an upload speed of 3 Mbps. Generally, these speeds are the minimum speeds where video streaming and a few in-home devices can work simultaneously. However, higher internet speeds are becoming increasingly important as broadband demand and data traffic rates continue to increase.

Benefits of Broadband Connectivity

- **Economic Development**

  Broadband connectivity enables communities to develop, attract, retain, and expand job-creating businesses. Without reliable access to broadband, businesses and workers will likely be located where there is broadband.

- **Education**

  Broadband access provides students and educators with vast amounts of educational resources, enables online/remote education, and facilitates real-time collaboration and communication.

- **Healthcare**

  Broadband plays a crucial role in transforming healthcare and offers numerous benefits to patients and healthcare providers. Broadband enables telemedicine and remote consultations with doctors which is particularly valuable for patients in rural or underserved areas.

- **Public Safety**

  Broadband connectivity greatly enhances public safety by enabling faster communication among first responders and emergency services during emergencies. Broadband also allows for the deployment of video surveillance and monitoring in public spaces along with enabling emergency alerts through various digital channels.

- **Entertainment**

  Broadband has enhanced entertainment by offering high-quality streaming, on-demand content, social media engagement, online gaming, and much more.

TYPES OF INTERNET CONNECTIONS

Digital Subscriber Line (DSL): Transmits data over already available traditional copper telephone lines. DSL is good for light internet use but is not recommended for activities that require significant speed like video streaming.

Cable Modem: provides broadband through the same cables that generate sounds and pictures to a cable TV set. Cable internet usually provides reliable speeds but is not available in all areas.

Fiber-Optic: converts electrical signals carrying data to light and sends the light through transparent glass fibers. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps. Currently, availability is limited, and it is costly to install.

Fixed Wireless: connects a home or business to the internet through a radio link between the customer's location and the internet service provider. Often used in rural areas and speeds are comparable to DSL or cable modems.

Mobile Wireless: relies on a cellular network to provide internet access to devices like smartphones and tablets.

Satellite: Another form of wireless internet from satellites orbiting the earth that can be useful in serving sparsely populated areas. It must have a good line-of-sight, but speeds are slower and there can be high installation costs.

Source: Federal Communications Commission

HOW FAST SHOULD BROADBAND BE?

The Federal Communications Commission (FCC) broadband capability requires consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps to be considered unserved locations. For grant funding, The Public Service Commission of Wisconsin will target businesses lacking 25 Mbps download and 3 Mbps upload. Underserved locations are those that do not have access to at least 100/20 Mbps.

Typical Internet Speeds

Speed	Number of users/devices	Tasks
5 Mbps	*1-2*	Online browsing, email, and research
25 Mbps	*3-5*	Downloading large files, business communications, and basic business Wi-Fi use
75 Mbps	*5-10*	Video streaming, numerous point-of-sale transactions, and frequent file-sharing
150 Mbps	*10-15*	Video conferencing, frequent cloud computing, and data backups
250 Mbps	*15-20*	Seamless streaming, conferencing, and server hosting
500 Mbps	*20-30*	Multiple servers hosted, heavy online backups, and constant cloud-based computing
1 GB	*30 +*	Extreme speed operations with zero interruptions

Source: Business.com

Wood County Broadband Committee recommends broadband speeds initially should be at least 100 megabits per second download and 100 megabits per second upload.

WISCONSIN SPEED TEST COLLECTION

In a partnership with the North Central Wisconsin Regional Planning Commission (NCWRPC) Wisconsin Economic Development Corporation (WEDC) and the Wisconsin Public Service Commission (PSC), a statewide internet speed testing application was secured to help collect locations, estimate cost, and upload/download speeds. The public can also note if they have no service or cannot afford service at their location. This application is a crowdsource data collection application. Counties and municipalities need to promote the speed test application to get enough tests to analyze the results. Wood County currently has 976 total tests at 726 test locations and a participation rate of 2.13 percent. Tests can be taken, and results reviewed at www.wisconsinspeedtest.net.

Wood County Speed Test Map

Print this page

Wood County

Households	34,039
Population	74,743
Test locations	726
Total Tests	976
Percent participation	2.13%
Participation goal (10%)	3,404

Download

No Service	5	0.7%
0-25 Mbps	307	42.3%
25-11 Mbps	204	28.1%
100+ Mbps	210	28.9%

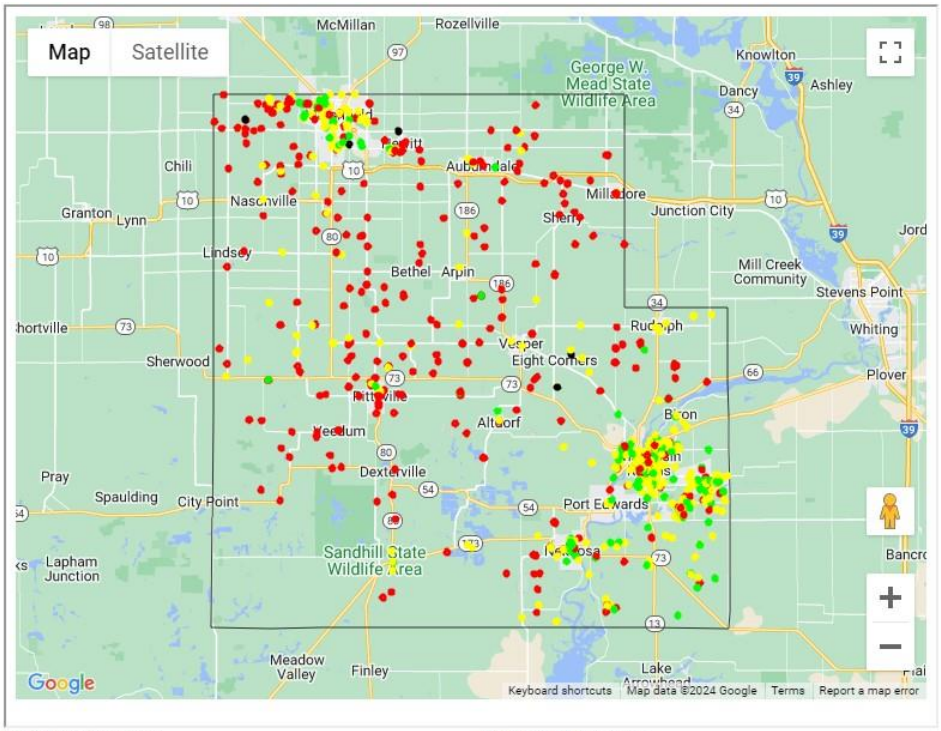
Upload

No Service	5	0.7%
<3 Mbps	216	29.8%
3-25 Mbps	336	46.3%
25-100 Mbps	88	12.1%
100+ Mbps	81	11.2%

	Min Max	Med Mbps
Download	0.21 880.88	34.70
Upload	0.01 906.53	9.88

No service reasons: may total>100%

Not Available	80.00%
Too Expensive	20.00%



Fixed 685 locations

Download			Upload	
No Service	5	0.7%	No Service	5 0.7%
0-25 Mbps	276	40.3%	<3 Mbps	194 28.3%
25-100 Mbps	195	28.5%	3-25 Mbps	317 46.3%
100+ Mbps	209	30.5%	25-100 Mbps	88 12.8%
			100+ Mbps	81 11.8%

Cellular 41 locations

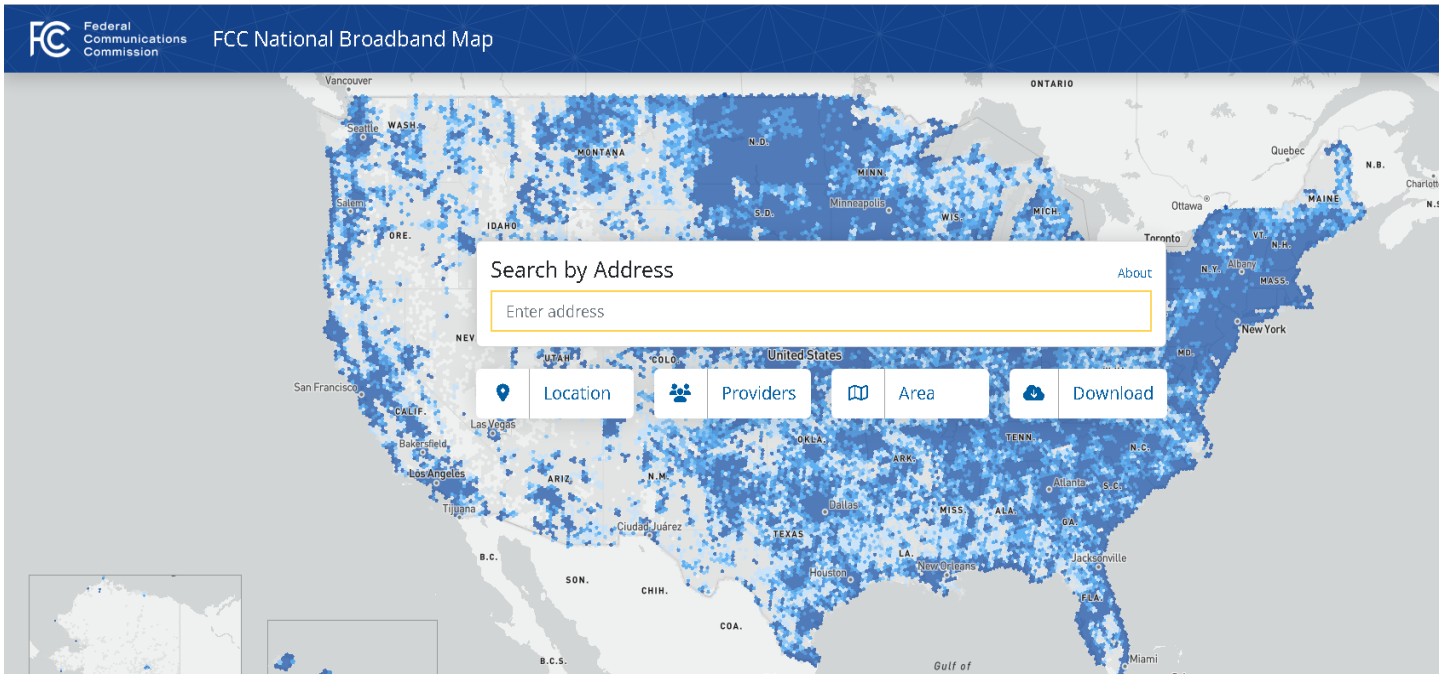
Download			Upload	
0-25 Mbps	31	75.6%	<3 Mbps	22 53.7%
25-100 Mbps	9	22.0%	3-25 Mbps	11 26.8%
100+ Mbps	1	2.4%	25-100 Mbps	8 19.5%
			100+ Mbps	0 0.0%

NATIONAL BROADBAND MAP

In November of 2022, the FCC released a pre-production draft of its new National Broadband Map. This map was the first of its kind, showing address-level broadband coverage data for homes and businesses in the nation. Previously, the FCC had mapped broadband coverage data as reported by the census block. This led to the overstatement of broadband coverage and inaccuracies in the map. The new map displays fixed and mobile broadband availability in the United States and allows users to search by address, view provider coverage areas, display location and area summaries, download the data, and more. The map also allows users to filter by data vintage, residential vs. business service, technology type, and speed.

A recent update to the map was released in May of 2023 and incorporated millions of availability and location challenges from the public, state, local, and Tribal governments nationwide. Challenges to the map are a critical mechanism to create the most accurate and up-to-date map possible. Location challenges allowed users, where appropriate, to challenge that an address was either incorrectly located, missing, an incorrect unit count, not contained within the correct

building footprint, not broadband serviceable, or the wrong building type. Availability challenges allowed users to challenge that a provider was incorrectly reported at an address for reasons such as the provider requested more than the standard installation fee to connect service, failed to schedule a service installation within 10 business days of request, denied a request for service, or did not offer the technology reported to be available. As a result of other advancements and the challenge process, the National Broadband Map will continue to improve and be updated twice a year.



CHAPTER 3

Wood County Community Profile

3. WOOD COUNTY COMMUNITY PROFILE

PURPOSE

Demographics play a critical role in broadband planning by offering insights that guide strategic decisions. They enable targeted investment by identifying areas with high demand for broadband services, ensuring efficient allocation of resources. Additionally, demographic data helps address inequalities in access, promoting equitable connectivity across various segments of the population. By estimating demand and usage patterns, planners can design networks that cater to specific needs. This customization extends to business development, education, and digital inclusion efforts, fostering economic growth and bridging societal gaps. Demographics essentially serve as a foundation for inclusive and well-informed broadband planning, enabling better connectivity and opportunities for all.

GENERAL POPULATION

Population growth has slowed at the state level and continued to slowly decline at the county level over the past two decades. In the 1990s, the County grew 2.5 percent while the state grew 4.0 percent. In 2010, Wood County had a total population of 74,812 residents. By 2020, 74,197 persons resided in the County, which is a 0.8 percent decrease from the 2010 census total. Overall, Wood County's population decreased by 1.7 percent between 2000 and 2020. In comparison, the state's population grew by 9.9 percent between 2000 and 2020, with a 3.6 percent increase between 2010 and 2020.

Understanding the population of an area provides insights into the potential user base for broadband services. Higher population density often correlates with greater demand for internet access, making it important to allocate resources to meet this demand effectively. Moreover, population distribution across urban and rural areas influences the deployment strategy, as densely populated urban centers may require different infrastructure solutions compared to sparsely populated rural regions. Additionally, the size of the population affects the economic viability of broadband projects.

Table 3-1 displays the total population for each local unit (minor civil division), the county, and the state. 25 out of the 34 municipalities in Wood County lost population from 2000 to 2020. During this time, the Town of Saratoga saw the largest net decrease, losing 331 people. At the same time, the Town of Remington experienced the largest percentage decrease, at 21.8 percent. The City of Wisconsin Rapids had the largest net increase, adding 529 people, with the Town of Arpin's population growing over 20 percent.

Table 3-1: Population				
Minor Civil Division	**2000**	**2010**	**2020**	**2000-20 % Change**
Arpin village	354	333	305	-13.8%
Arpin town	784	929	942	20.1%
Auburndale village	725	703	702	-3.2%
Auburndale town	812	860	790	-2.7%
Biron village	901	839	839	-6.9%
Cameron town	559	511	539	-3.6%
Cary town	398	424	406	2.0%
Cranmoor town	185	168	181	-2.2%
Dexter town	405	359	350	-13.6%
Grand Rapids town	7,893	7,646	7,576	-4.0%
Hansen town,	752	690	747	-0.6%
Hewitt village	727	828	796	9.5%
Hiles town	185	167	152	-17.8
Lincoln town	1,506	1,564	1,593	5.8%
Marshfield city	18,384	18,218	18,119	-1.4%
Marshfield town	761	764	763	0.3%
Milladore village	251	276	268	6.8%
Milladore town	721	690	668	-7.4%
Nekoosa city	2,558	2,580	2,449	-4.3%
Pittsville city	851	874	813	-4.5%
Port Edwards village	1,941	1,818	1,762	-9.2%
Port Edwards town	1,465	1,427	1,356	-7.4%
Remington town	294	268	230	-21.8%
Richfield town	1,520	1,628	1,596	5.0%
Rock town	846	855	787	-7.0%
Rudolph village	396	439	433	9.3%
Rudolph town	1,214	1,028	1,027	-15.4%
Saratoga town	5,391	5,142	5,060	-6.1%
Seneca town	1,168	1,120	1,039	-11.0%

Sherry town	825	803	755	-8.9%
Sigel town	1,119	1,051	1,017	-9.1%
Vesper village	525	584	513	-2.3%
Wisconsin Rapids, city	18,348	18,367	18,877	2.9%
Wood town	791	796	757	-4.3%
Wood County	75,471	74,812	74,197	-1.7%
State	5,363,675	5,686,986	5,893,718	9.9%
Source: U.S. Census				

HOUSEHOLDS

Understanding the number of households holds significant importance in broadband planning, as it influences the scope of infrastructure deployment, service coverage, resource allocation, financial viability, and equitable access.

In 2020, there were 32,322 households in Wood County following at least three decades of household growth. The early 2000s saw a 6.1 percent increase in the number of households. Between 2010 and 2020, the number of households grew by 2 percent. Generally, the number of households across the country has been increasing as more people decide to live alone and more couples have fewer children or no children at all for several decades.

YEAR-ROUND AND SEASONAL HOUSING

Table 3-2 displays the percentage of seasonal and year-round housing in the County. Not reflected in the population numbers is the seasonal population, particularly the summer visitor season. In 2020, 1.5 percent of housing units were seasonal housing.

The county has some tourist destinations and popular vacation home areas. There are campgrounds, resorts, hotels, short-term rentals, and seasonal housing units in the county. While an insignificant number, the summertime population places an increased demand on county and local government resources and should be considered in the broadband planning process.

Table 3-2 Seasonal and Year-Round Housing		
Minor Civil Division	**Seasonal**	**Year Round***
Arpin village	0.0%	86.7%
Arpin town	5.4%	94.6%
Auburndale village	0.0%	94.2%
Auburndale town	0.0%	93.2%
Biron village	0.0%	91.9%
Cameron town	0.0%	96.9%
Cary town	12.2%	74.8%
Cranmoor town	2.6%	85.5%
Dexter town	20.9%	79.1%
Grand Rapids town	0.0%	96.7%
Hansen town,	2.4%	95.3%
Hewitt village	0.0%	98.4%
Hiles town	10.3%	67.8%
Lincoln town	0.0%	97.5%
Marshfield city	0.0%	93.1%
Marshfield town	0.0%	95.6%
Milladore village	0.0%	90.1%
Milladore town	2.5%	96.1%
Nekoosa city	1.6%	92.4%
Pittsville city	0.0%	93.6%
Port Edwards village	2.6%	94.0%
Port Edwards town	4.6%	93.4%
Remington town	45.2%	54.8%
Richfield town	1.5%	91.8%
Rock town	10.1%	84.4%
Rudolph village	0.0%	97.5%
Rudolph town	2.4%	92.5%
Saratoga town	7.1%	92.6%
Seneca town	0.0%	91.9%
Sherry town	1.9%	97.1%

Sigel town	0.0%	89.5%
Vesper village	0.8%	92.2%
Wisconsin Rapids, city	0.4%	93.4%
Wood town	4.2%	90.1%
Wood County	1.5%	93.3%
State	7.0%	89.0%

Source: US Census

* Year-round population percentages do not include vacant housing. Due to this, the sum of seasonal and year-round population does not equal 100 percent.

BROADBAND SERVICEABLE LOCATIONS (BSL)

Broadband Serviceable Locations (BSL) were estimated using Wood County tax parcels. Centroids were created for each parcel with an improvement value that was counted as a BSL. Table 3-3 summarizes the BSL by minor civil division.

Table 3-3 Wood County Broadband Serviceable Locations (BSL)

MCD	BSL	BSL per SQMI	SQMI
City of Marshfield	6124	600.9	10.2
City of Nekoosa	876	257.6	3.4
City of Pittsville	365	181.7	2.0
City of Wisconsin Rapids	6385	509.7	12.5
Village of Arpin	148	174.6	0.8
Village of Auburndale	221	107.7	2.1
Village of Biron	266	51.1	5.2
Village of Hewitt	192	240.3	0.8
Village of Milladore	123	123.5	1.0
Village of Port Edwards	914	125.6	7.3
Village of Rudolph	189	195.5	1.0
Village of Vesper	252	224.8	1.1
Town of Arpin	387	11.7	33.0
Town of Auburndale	411	12.7	32.2
Town of Cameron	243	32.1	7.6
Town of Cary	277	7.9	35.1
Town of Cranmoor	170	4.0	42.3
Town of Dexter	259	7.3	35.5
Town of Grand Rapids	3998	175.2	22.8
Town of Hansen	347	10.3	33.8
Town of Hiles	151	4.3	35.3

Town of Lincoln	968	28.2	34.3
Town of Marshfield	602	35.1	17.1
Town of Milladore	308	9.1	34.0
Town of Port Edwards	575	14.7	39.2
Town of Remington	214	3.0	71.5
Town of Richfield	636	18.3	34.8
Town of Rock	399	11.6	34.5
Town of Rudolph	557	18.2	30.5
Town of Saratoga	2441	47.7	51.1
Town of Seneca	515	15.9	32.5
Town of Sherry	356	10.1	35.4
Town of Sigel	518	14.6	35.5
Town of Wood	396	11.9	33.3

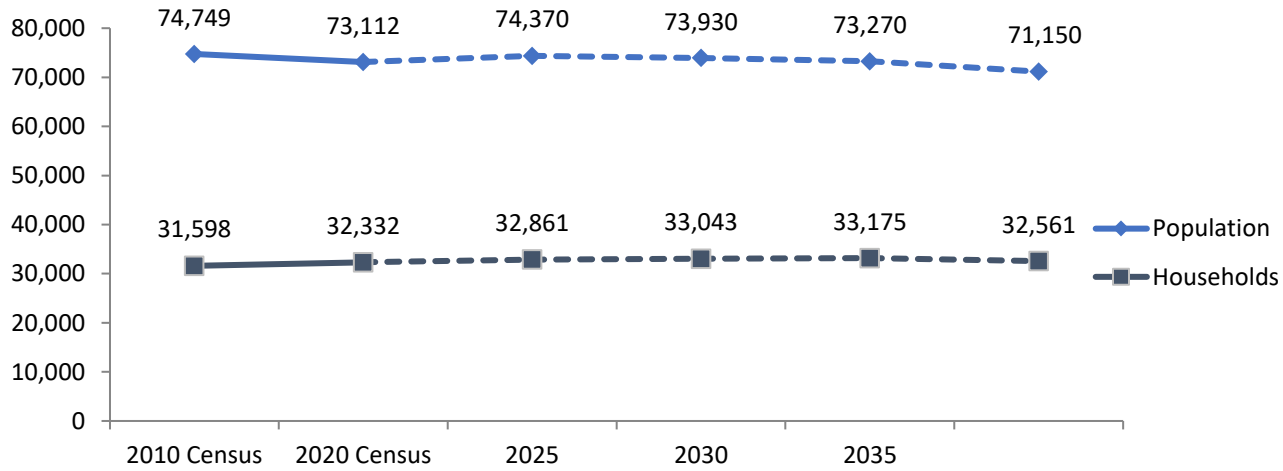
Source: NCWRPC and Wood County GIS

WOOD POPULATION AND HOUSEHOLD PROJECTIONS

Figure 3-1 shows the population and household future projections for Wood County. Despite the past few decades of population declines, the County is expected to grow by 1.2 percent over the next 10 years. After peaking in population in 2030, the population is expected to decline by 3.8 percent through 2040.

The number of households in the County is projected to increase by 2.6 percent between 2020 and 2035. The population is expected to then slightly decline by 1.8 percent between 2035 and 2040.

Figure 3-1: Wood County Population and Household Change



Source: U.S. Census, Wisconsin Department of Administration 2015 Estimate, Wisconsin DOA

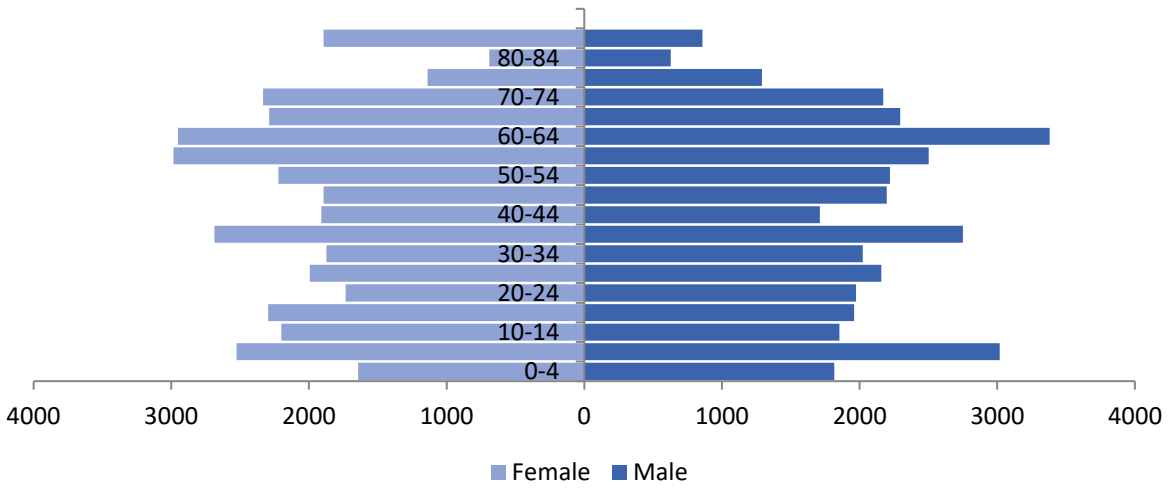
AGE DISTRIBUTION

Population distribution is important to the planning process. In particular, understanding and considering age-related factors will better ensure that broadband services will effectively meet the needs of all community members, regardless of age. Factors like tailoring infrastructure for different age groups based on varying needs and preferences are important. For example, communities with a significant number of elderly residents might need services like telemedicine. Age distribution can also provide insights into broadband adoption and usage patterns. Understanding the adoption of broadband by age group can help determine where resource allocation is most appropriate.

Like many rural counties in Wisconsin, Wood County is aging faster than the state and country. In 2010, the median age in Wood County was 42 years old, compared to 38.1 for the state. By 2020, the median age in the county increased to 43.9 years old, compared to 39.6 for the state. Furthermore, the percentage of the county's population 60 years old or older is increasing. In 2010, 22.3 percent of the county's total population was 60 years old or older. By 2020, 27.3 percent of the county population was 60 years old or older. Comparatively, the state's share of the population 60 years or older increased from 18.4 in 2010 to 23.6 percent of the population in 2020. It is believed that this older age demographic has been slower adopters of broadband and internet usage more generally.

On the other hand, the share of the population that are 17 and younger in the county has increased over the last decade (2010-2020), from 17.1 percent in 2010 to 21.6 percent in 2020. Similarly, in 2010, 17.5 percent of the state's population was under 18 in 2010 and rose to 21.9 percent in 2020. Like the senior citizen population, this younger age cohort has technology needs and many younger people rely heavily on having reliable internet access for school or connecting with their peers online.

Figure 3-2: Wood County 2020 Age Pyramid

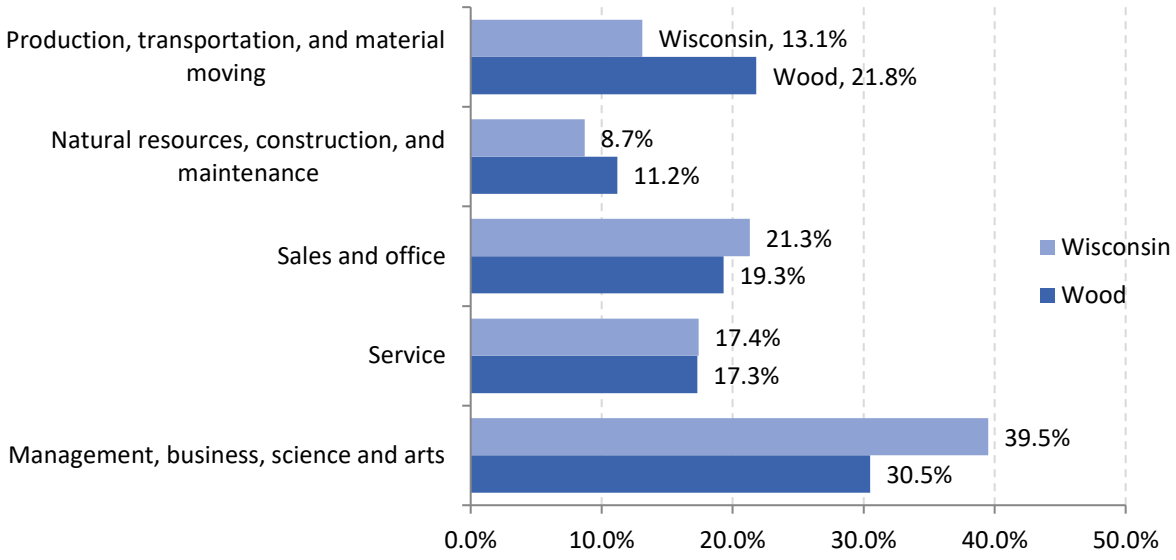


Source: American Community Survey, 2016-2020

EMPLOYMENT

In 2020, there were 35,964 residents employed. (Note that these are persons employed and many of them work outside the county.) This reflected a 2.6 percent decrease in the county's employment since 2010, compared to 3.9 percent growth for the state, as shown in figure 3-3. The decrease in the number of workers in Wood County is likely tied to the aging population. Prominent resident occupations in the county include the production, transportation, and material moving industries as well as management, business, science, and arts industry category. Both the production, transportation, and material moving industry categories and natural resources, construction, and material moving categories have a bigger share of jobs in the county than the state overall.

Figure 3-3: Wood County Resident Occupation



Source: American Community Survey

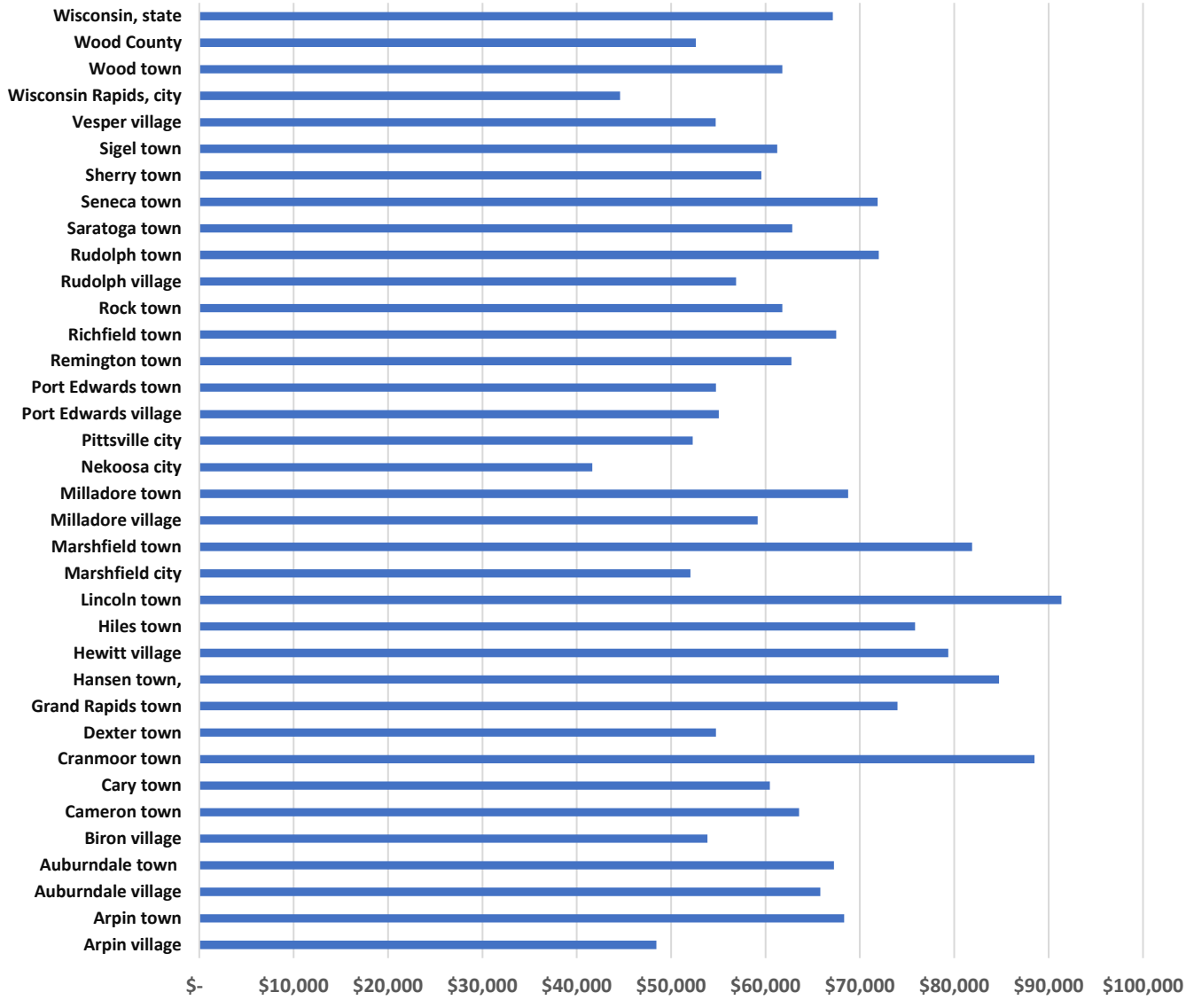
INCOME

Income levels are important in broadband planning due to their impact on affordability, digital inclusion, and the overall effectiveness of broadband initiatives.

Median household income is displayed in Figure 3-4. The county median household income rose about 17.9 percent between 2010 and 2020, compared to a state increase of 22.7 percent. Meanwhile, the county per capita income increased by 28.7 percent, compared to the state increase of 29.4 percent. Overall, the total county median income and per capita income is lower than the state level.

However, when incomes are adjusted for inflation, it is apparent that household incomes have stagnated. Had the median household income risen with the Consumer Price Index, it would have been $56,197 in 2020, higher than the actual $55,684 median household income. The decrease in household size during this time likely plays a role, as per-person capita incomes within the County have almost kept up with inflation over time. Per capita income would have been $29,635 if it rose similarly to inflation. However, the per-person capita income in 2020 was $32,037. The municipalities with the highest median household income include the towns of Cranmoor, Lincoln, and Hansen. The lowest median incomes include Arpin, Nekoosa, and Wisconsin Rapids.

Figure 3-4 Household Income



American Community Survey, 2016-20

CHAPTER 4

Current Broadband Assessment of Wood County

4. CURRENT BROADBAND ASSESSMENT OF WOOD COUNTY

CURRENT BROADBAND ASSESSMENT OF WOOD COUNTY

This section primarily provides an overview of the current state of internet supply (available internet services) in Wood County from readily available sources. This section is supplemented by the Wisconsin Speed Test (M-Lab) data, American Community Survey Data, FCC form 477 data, and Wisconsin Department of Public Instruction data.

Broadband adoption is typically measured in the percentage of households that subscribe to home broadband internet service. Broadband internet includes internet via cable, fiber optic, wireless or DSL service. On the other hand, wireless internet (ex. Mobile cellular service), is typically not considered broadband, yet many households only use mobile cellular service to connect to the internet.

WISCONSIN SPEED TEST COLLECTION

In a partnership with the North Central Wisconsin Regional Planning Commission (NCWRPC) Wisconsin Economic Development Corporation (WEDC) and the Wisconsin Public Service Commission (PSC), a statewide internet speed testing application was secured to help collect locations, estimate cost, and upload/download speeds. The public can also note if they have no service or cannot afford service at their location. This application is a crowdsource data collection application. Counties and municipalities need to promote the speed test application to get enough tests to analyze the results. Wood County currently has 976 total tests at 726 test locations and a participation rate of 2.13 percent. Tests can be taken, and results reviewed at www.wisconsinspeedtest.net.

Speed Test Results for Wood County

- While the 2023 State median download speed is over 100 Mbps, the Wood County median (82.9 Mbps) meets the FCC's minimum standard to qualify as broadband (25 Mbps).
- Both Wood County and Wisconsin's monthly median download speeds have been steadily increasing over the past several years
- Significant speed disparity between rural and urban areas
- Wood County's upload speeds were better than those of the State in 2023 (25 Mbps vs. 15 Mbps). As a reminder, the FCC's current minimum upload standard for broadband is 3 Mbps.

Table 4-1 Wood County Households with Internet		
Minor Civil Division	**Average Download Speeds (Mbps)**	**Average Upload Speeds (Mbps)**
Arpin village	92.0	12.5
Arpin town	39.2	43.3
Auburndale village	164.5	48.7
Auburndale town	13.7	3.2
Biron village	106.6	93.5
Cameron town	97.5	6.1
Cary town	39.8	5.2
Cranmoor town	30.8	5.8
Dexter town	9.3	2.4
Grand Rapids town	129.8	66.7
Hansen town,	43.3	27.3
Hewitt village	65.7	38.8
Hiles town	9.6	0.9
Lincoln town	36.5	5.1
Marshfield city	120.2	36.7
Marshfield town	4.5	2.1
Milladore village	19.2	10.4
Milladore town	15.2	7.1
Nekoosa city	183.8	74.7
Pittsville city	29.4	10.0
Port Edwards village	122.7	43.6
Port Edwards town	21.1	11.7
Remington town	45.1	7.6
Richfield town	24.2	2.6
Rock town	12.6	2.0
Rudolph village	102.1	52.6
Rudolph town	56.8	34.7
Saratoga town	145.3	61.3

Seneca town	38.6	17.5
Sherry town	10.4	1.4
Sigel town	21.8	12.1
Vesper village	129.8	137.6
Wisconsin Rapids, city	123.1	53.9
Wood town	20.6	3.4
Wood County	82.9	35.1
State	68.7	16.8

Wood County Speed Test Map

Print this page

Wood County

Households	34,039
Population	74,743
Test locations	726
Total Tests	976
Percent participation	2.13%
Participation goal (10%)	3,404

Download

• No Service	5	0.7%
•0-25 Mbps	307	42.3%
25-11 Mbps	204	28.1%
•100+ Mbps	210	28.9%

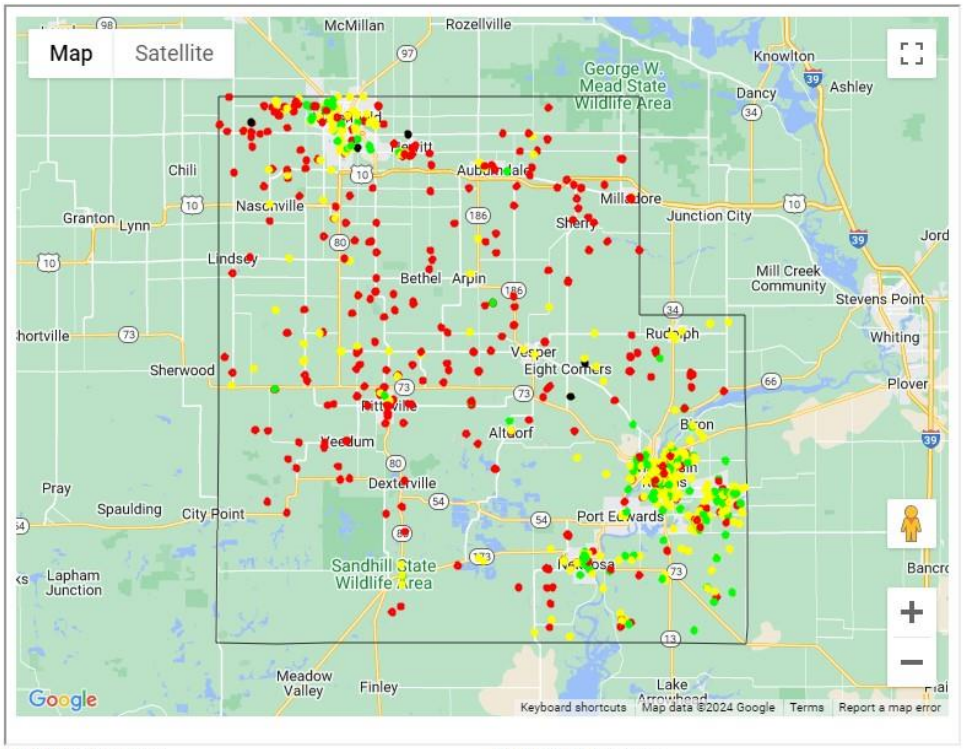
Upload

No Service	5	0.7%
<3 Mbps	216	29.8%
3-25 Mbps	336	46.3%
25-100 Mbps	88	12.1%
100+ Mbps	81	11.2%

	Min	Max	Med Mbps
Download	0.21	880.88	34.70
Upload	0.01	906.53	9.88

No service reasons: may total>100%

Not Available	80.00%
Too Expensive	20.00%



Fixed 685 locations

Download			Upload		
No Service	5	0.7%	No Service	5	0.7%
0-25 Mbps	276	40.3%	<3 Mbps	194	28.3%
25-100 Mbps	195	28.5%	3-25 Mbps	317	46.3%
100+ Mbps	209	30.5%	25-100 Mbps	88	12.8%
			100+ Mbps	81	11.8%

Cellular 41 locations

Download			Upload		
0-25 Mbps	31	75.6%	<3 Mbps	22	53.7%
25-100 Mbps	9	22.0%	3-25 Mbps	11	26.8%
100+ Mbps	1	2.4%	25-100 Mbps	8	19.5%
			100+ Mbps	0	0.0%

AMERICAN COMMUNITY SURVEY

The U.S. Census Bureau's American Community Survey gathers information from households to understand broadband adoption. The 2017-2021 5-year American Community Survey revealed that 86 percent of households in Wood County have access to an internet subscription. A few rural municipalities have relatively low rates of broadband or internet subscriptions per household; with the Village of Arpin and Towns of Dexter, Milladore, and Wood with 20 percent of households without access to broadband at their home. On the other hand, the communities of Cranmoor, Cameron, Hewitt, and several other rural towns have relatively high broadband adoption rates.

Approximately 70.2 percent of households within Wood County have a broadband subscription (cable, fiber optic, or DSL), not including cellular data plan service. While typically not as reliable or as fast as broadband, cellular data subscriptions, and more costly satellite internet services help fill the internet gap within the County by providing access to the internet for households without broadband subscriptions. Mobile data services are often required for households that cannot afford a broadband subscription, while both mobile data and satellite services are often required for those who do not live in an area where broadband service is readily available. The percentage of households with a cellular data plan and no other internet subscription in the county is 11.7 percent. The communities of Milladore and Remington have households with at least 20 percent only having access to the internet through a cellular data plan (i.e., cell phone service).

Comparatively, Wood County has a smaller proportion of households than the state with access to broadband by about 5 percent. Additionally, the percentage of households with cellular data but no other internet plan is greater than the state by approximately 6 percent. Also, the percentage of Wood County households with broadband access can also be compared to neighboring counties. Generally, Wood County households have greater access to broadband than some of the more surrounding rural counties. As mentioned, 86.1 percent of Wood County households have an internet subscription. This is higher than Adams County (76.6 percent) and Clark County households (76.6 percent), but lower than Portage County (89.4 percent) and Marathon County (87.4 percent) households with broadband access.

In general, broadband adoption rates within the county are typically highest in and around population centers, and lowest in the more scarcely populated areas. This disparity in broadband adoption rates is partly due to differences in the availability of broadband in these areas, as broadband availability is much higher in more densely populated areas than in areas with low-density populations.

Table 4-2 Wood County Households with an Internet Connection		
Minor Civil Division	**% of Households with an Internet Subscription**	**% of Households with Cellular Data Plan, no other Internet Subscription**
Arpin village	66.1%	10.5%
Arpin town	83.2%	16.5%
Auburndale village	85.6%	6.9%
Auburndale town	84.9%	9.8%
Biron village	85.4%	11.2%
Cameron town	93.4%	14.2%
Cary town	85.4%	13.5%
Cranmoor town	93.0%	15.8%
Dexter town	78.1%	16.8%
Grand Rapids town	92.3%	4.8%
Hansen town,	89.1%	17.0%
Hewitt village	92.6%	4.8%
Hiles town	82.8%	8.6%
Lincoln town	90.7%	14.9%
Marshfield city	88.1%	14.1%
Marshfield town	88.5%	9.8%
Milladore village	87.0%	22.1%
Milladore town	79.2%	11.6%
Nekoosa city	81.1%	16.5%
Pittsville city	81.9%	8.9%
Port Edwards village	89.8%	5.5%
Port Edwards town	88.5%	14.7%
Remington town	82.8%	30.2%
Richfield town	84.4%	11.9%
Rock town	92.4%	5.9%
Rudolph village	84.2%	7.1%
Rudolph town	86.3%	9.8%
Saratoga town	83.2%	10.3%
Seneca town	90.5%	12.7%
Sherry town	91.0%	11.0%
Sigel town	84.2%	15.2%

Vesper village	87.9%	15.7%
Wisconsin Rapids, city	82.6%	11.3%
Wood town	79.3%	18.0%
Wood County	86.1%	11.7%
State	86.9%	11.0%
Source: American Community Survey, 2017-2021		

FEDERAL COMMUNICATIONS COMMISSION FIXED BROADBAND DEPLOYMENT

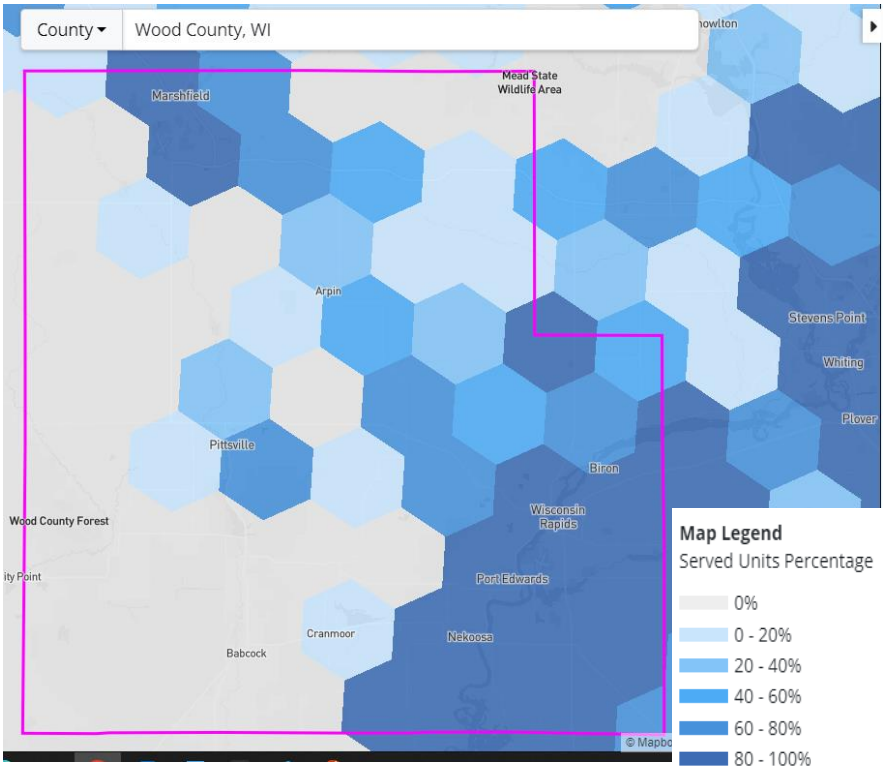
The data and National Broadband Map in this sub-section are primarily drawn from internet service provider (ISP) reporting to the Federal Communications Commission (FCC) via Form 477. All facilities-based ISPs are required to file data with the FCC twice a year (Form 477) where they offer Internet access service at speeds exceeding 200 kbps in at least one direction.

There are two important factors to remember about FCC Form 477 Reporting and "Advertised Speeds."

(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 Wood 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 of subscription plans by the end user.

ISP Advertised Speeds over 100 Mbps to FCC



WISCONSIN DEPARTMENT OF PUBLIC INSTRUCTION (DPI) 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 connection speeds across Wisconsin.

The latest 2021-2022 Digital Equity Survey showed that 5 of the 6 school districts primarily located in the county participated in the DPI survey on broadband. Specifically, DPI received data from the School Districts of Auburndale, Marshfield, Pittsville, and Port Edwards, but not Nekoosa. This survey revealed that the vast majority of students in the county have access to the internet at home (>95%). The primary reason why some homes lack internet access is the absence of internet availability in their area. At the same time, respondents indicated that the internet was less reliable to them at home, even if they had access to it (>25%). Further, the vast majority of respondents mentioned that they have issues with streaming on their primary device.

Table 4-3 DPI Wood County Digital Equity Findings-Access			
School District	**% of respondents without home internet**	**% of respondents without home internet due to affordability**	**% of respondents without home internet due to availability**
Auburndale School District	**1.6%**	**100%**	**0%**
Marshfield United School District	**7.5%**	**23.2%**	**44.9%**
Pittsville School District	**5.9%**	**28.1%**	**68.8%**
Port Edwards School District	**1.4%**	**50%**	**50%**
Wisconsin Rapids School District	**2.4%**	**31.1%**	**52.8%**
Source: Department of Public Instruction Digital Equity Survey, 2021-2022			

*No Data for Nekoosa School District

*Stevens Point Area School District only marginally in Wood County

Table 4-4 DPI Wood County Digital Equity Findings-Performance			
School District	**% of respondents with partially or completely unreliable internet**	**% of respondents who cannot reliably stream video on primary device**	**% of respondents who have issues with quality or interruptions of the stream on primary device**
Auburndale School District	**62.4%**	**4.5%**	**95.5%**
Marshfield United School District	**16.7%**	**20%**	**80%**
Pittsville School District	**32.2%**	**7.9%**	**92.1%**
Port Edwards School District	**14%**	**10.3%**	**89.7%**
Wisconsin Rapids School District	**16.6%**	**12.8%**	**87.2%**
Source: Department of Public Instruction Digital Equity Survey, 2021-2022			

*No Data for Nekoosa School District

*Stevens Point Area School District only marginally in Wood County

OVERVIEW

Wood County's current broadband assessment reveals a mixed landscape of internet access and quality. The median download speed in Wood County is 82.9 Mbps, meeting the FCC's broadband minimum standard of 25 Mbps, with upload speeds (35.1 Mbps) surpassing the FCC's requirement of 3 Mbps. However, there remains a significant speed disparity between rural and urban areas. The American Community Survey indicates that around 86 percent of households in Wood County have access to internet subscriptions, but certain rural areas, such as the Village of Arpin and Towns of Dexter, Milladore, and Wood, still have 20 percent of households without broadband access. Additionally, FCC data underscores the challenge of relying on advertised speeds, which can be considerably higher than actual speeds. The DPI's Digital Equity Survey further highlights that while most students in the county have home internet access, reliability, and streaming quality issues persist. Overall, Wood County's broadband situation reflects the ongoing need for efforts to improve access and service quality, particularly in rural areas.

CHAPTER 5

Common Barriers to Broadband Connectivity

5. COMMON BARRIERS TO BROADBAND CONNECTIVITY

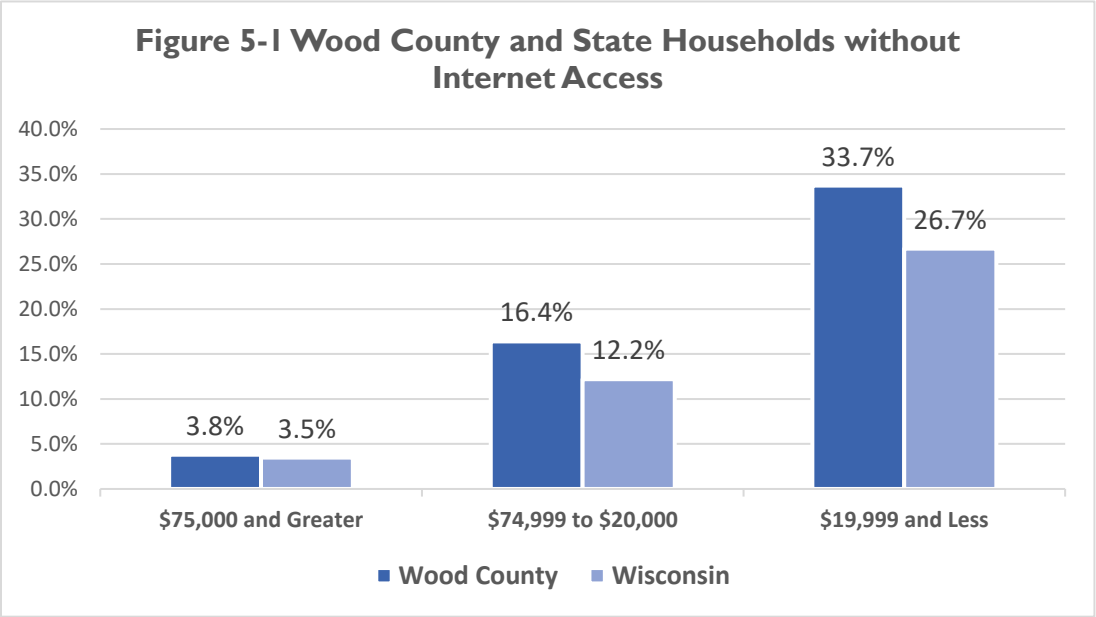
In today's interconnected world, widespread broadband connectivity is essential, yet several barriers hinder its adoption. Common challenges like affordability, a lack of interest in broadband adoption, and connectivity hurdles associated with rural areas continue to persist. These challenges are highlighted in detail below:

AFFORDABILITY BARRIER

The affordability of broadband continues to be a significant challenge for many households. Monthly broadband costs can range from as low as $10 (ex. with a subsidy) to over $100 depending on the speed, the type of internet (ex. fiber, DSL, etc.), and whether the service area is rural. Broadband for commercial use can be up to $1000 per month. In general, American consumers pay higher prices than broadband consumers in other countries, with one study finding that Americans pay two or three times more per month than European consumers.

Research has found that cost is the primary barrier to low-income households having an internet connection at home. According to the Pew Research Center, 45 percent of people mention cost as the reason they do not have broadband at home.

Figure 5-1 shows household incomes and internet subscription rates for Wood County and Wisconsin. Among County households with incomes of $75,000 and above, a substantial 96.2 percent have access to broadband in their homes. Households with incomes of $74,999 to $20,000, 83.6 percent have access to broadband in their homes. For households with incomes below $20,000, only 66.3 percent of households have broadband access. Comparing the share of households at the state level with broadband access shows a similar pattern, with the highest earners having the most access to broadband. However, as a whole, the state has a higher proportion of households with broadband access across each income group than Wood County.



Source: American Community Survey, 2017-2021

Overall, an examination of the Wood County households without an internet subscription shows a clear correlation between internet access and household income. This is substantiated by the fact that a 2015 U.S. Department of Commerce study revealed that 24 percent of households do not use the internet at home because of cost concerns. Further, 23 percent of all households that did not use the internet at home in 2015 would purchase internet if it was less expensive. In general, broadband affordability is a major barrier to broadband connectivity, and programs and policies to mitigate this should be promoted.

NO INTEREST BARRIER

Lack of interest is another significant barrier to more broadband connectivity in certain places. According to a 2015 study by the U.S. Department of Commerce, 55 percent of households that were not using the internet cited a lack of need or interest as the primary reason for their non-adoption. This trend was consistent regardless of demographics, rural or urban residence, or the presence of school-aged children at home.

There are several factors that might be contributing to this lack of interest. In some regions, people might not be fully aware of the benefits of broadband connectivity or may not understand how to use it to its full potential. Benefits like telehealth, online banking, and online booking/shopping are just a few examples of basic online services that greatly benefit people and have been fully embraced by most people. Along these lines, the lack of digital literacy can also play a role. If people are not familiar with the internet or lack the skills to use the internet effectively, they may not perceive the need for the Internet. Lastly, cultural, and societal factors might also contribute to the level of interest in using the internet.

ACCESSIBILITY BROADBAND BARRIER

Rural broadband faces several challenges that make it a significant barrier to achieving widespread internet connectivity in rural areas. Currently, around 22 percent of Americans in rural areas and 27 percent of Americans in Tribal lands lack coverage from fixed terrestrial 25/3 Mbps broadband, as compared to only 1.5 percent of Americans in urban areas.

Most of the challenges of bringing fast broadband to rural areas are a direct result of the low density of housing in most rural areas. This low density leads to high costs for land-based broadband technology, which results in costs customers will not always pay. The second challenge is that companies that have never sold in a competitive market struggle with marketing and selling broadband. Also, internet service providers might face operational risks associated with failing to execute the business plan as well as increased costs, supply chain issues, etc. Lastly, there are competitive risks to deploying broadband in new markets. Competition can cut costs, try to get customers to sign long-term contracts, or react by upgrading their broadband.

CHAPTER 6

Broadband Strategies and Programs

6. BROADBAND STRATEGIES AND PROGRAMS

ADOPTION STRATEGIES

Increasing broadband adoption is essential for bridging the digital divide. Some of the strategies that public and private entities have done to promote broadband adoption include the following:

1. Digital literacy programs: Increasing people's knowledge about the advantages of broadband and teaching them how to use the internet proficiently can enhance their overall internet experience and encourage broader adoption. For instance, local libraries are ideal places to teach residents how to effectively use and access digital resources.

2. Community Outreach: Engaging the community through outreach programs can raise awareness of the importance of broadband access and the opportunities it brings.

3. Infrastructure development: Investing in building and expanding broadband infrastructure will enable more people to connect to the internet. This includes building more fiber optic networks, fixed wireless, and satellite-based connections. Sometimes, this means providing incentives to service providers to expand their coverage. This includes tax breaks, grants, or streamlined permitting processes.

4. Public Wi-Fi initiatives: Setting up public WI-FI hotspots in areas with limited connectivity can provide access to people without broadband at home.

5. Broadband Affordability: Promote broadband affordability programs such as the Federal Communication Commission's Affordable Connectivity Program

GRANTS AND BROADBAND ADOPTION PROGRAMS

There are several programs and initiatives aimed at promoting broadband access and adoption. Both the state of Wisconsin and the federal government have implemented programs that are available to either residents or internet service providers.

At the **state level**, the Public Service Commission (PSC) of Wisconsin's Broadband Office has awarded grants to organizations, (ex. telecommunications utilities, municipalities, or counties) or telecommunications utilities to encourage the deployment of broadband and improve broadband access for Wisconsin residents.

BROADBAND EXPANSION GRANT PROGRAM

Over the past 9 years, the State has run the *Broadband Expansion Grant Program* to encourage the deployment of broadband capability in underserved areas of the state. Since the program's inception, over $200 million in grants have been given to ISPs for broadband expansion.

CAPITAL PROJECTS BROADBAND INFRASTRUCTURE

Under the program name Capital Projects Broadband Infrastructure, the PSC, at the discretion of the Governor, administers limited federal funds to expand broadband access, adoption, and affordability. For-profit internet service providers, telecommunications utilities, co-operatives, local governments, and non-profit organizations are eligible to apply for grants. In fiscal year 2023, the Commission awarded funds from the federal American Rescue Plan Act (ARPA) of 2021 under the Capital Projects Fund (CPF) Broadband Infrastructure Grant Program. CPF Broadband Infrastructure Grants will provide up to $42 million in grant funding during **Fiscal Year 2024** to eligible applicants. As part of the merit criteria, projects that have the highest share and highest index score of vulnerable locations, as defined by the Center for Disease Control's **Social Vulnerability Index (SVI)**, will receive the most points.

ARPA BROADBAND ACCESS

More broadly, the American Rescue Plan Act (*ARPA) Broadband Access Grants* Program administered federal funds for the purpose of expanding broadband, access, adoption, and affordability. ISPs, telecommunications utilities, co-operatives, local governments, and profit and non-profit organizations are eligible to apply for grants. Under the 2020 CARES Act, approximately $5.3 million of total funds were awarded to 12 applicants/projects to expand broadband access. In 2022, using ARPA funds, just under $100 million was allocated for 83 broadband expansion projects.

RURAL DIGITAL OPPORTUNITY FUND (RDOF)

The Rural Digital Opportunity Fund (RDOF) will disburse up to $20.4 billion over 10 years to bring fixed broadband and voice service to millions of unserved homes and small businesses in rural America. Building on the success of the Connect America Fund Phase II Auction (CAF II Auction), RDOF uses a two-phase, competitive reverse auction (Auction 904) that prioritizes higher network speeds and lower latency to ensure the deployment of robust, sustainable high-speed networks that meet the needs of consumers now and in the future.

The RDOF Phase I Auction ended on Nov. 25, 2020, and awarded $9.2 billion in support to 180 winning bidders, including incumbent telephone companies, cable operators, electric cooperatives, satellite operators, and fixed wireless providers. Winning bidders have committed to deploy broadband to more than 5.2 million homes and small businesses in census blocks that previously lacked broadband service with minimum speeds of 25 megabits per second downstream and 3 megabits per second upstream (25/3 Mbps) as determined by FCC Form 477 data. Phase II will cover locations in census blocks that are partially served, as well as locations not funded in Phase I. The Rural Digital Opportunity Fund will ensure that networks stand the test of time by prioritizing higher network speeds and lower latency so that those benefitting from these networks will be able to use tomorrow's Internet applications as well as today's.

ALTERNATIVE CONNECT AMERICA COST MODEL (ACAM)

The **Alternative Connect America Cost Model (ACAM)** provides funding to rate-of-return carriers that voluntarily elected to transition to a new cost model for calculating High-Cost support in exchange for meeting defined broadband build-out obligations. ACAM models the forward-looking economic costs of deploying a high-speed network and delivering broadband service. Carriers that elected this option receive predictable monthly payments to provide voice and broadband service to all funded locations over the program's 10-year support term (2017-2026). Carriers that elected ACAM funding must meet the deployment obligations published in the Public Notice authorizing them to receive A-CAM support. Some of these requirements include maintaining existing voice and broadband service and offering broadband speeds of at least 10 Mbps downstream/1 Mbps upstream (10/1 Mbps) to a number of eligible locations equal to the number of fully funded locations. (locations for which the carrier receives support for the full cost of build-out). Or offer broadband speeds of at least 25/3 Mbps to a number of eligible locations equal to a certain percentage of fully funded locations depending on the population density of the carrier's service area.

ACAM II, established by the 2018 Rate-of-Return Reform Order provides funding to rate-of-return carriers that voluntarily elected to transition to a new cost model for calculating high cost support in exchange for meeting defined broadband build-out obligations. Carriers that elected this option receive predictable monthly payments based on support of up to $200 for each funded location over the program's 10-year support term (2017-2026). (Carriers electing ACAM II

support receive transition payments if their ACAM II support is less than their 2018 legacy support.) Participating carriers must meet annual deployment milestones starting in year four, 2022. Carriers that elected ACAM II funding must meet the deployment obligations such as maintaining existing voice and broadband service as of December 31, 2018 and offering broadband speeds of at least 25 mbps downstream.

The **Enhanced Alternative Connect America Model** (Enhanced A-CAM) is a progressive iteration of its precursor, the A-CAM (Alternative Connect America Model), a funding program designed to address rural connectivity challenges within the broadband telecommunications sector. The new Enhanced A-CAM program sets forth a more ambitious and forward-looking framework for participating carriers to offer broadband and voice service at speeds of 100/20 Mbps (download/upload) or faster to all Enhanced A-CAM required locations within its study area (as determined by the National Broadband Map), compared to the previous A-CAM Program speed requirements of 25/3 Mbps, (FCC Report & Order). The primary purpose of Enhanced A-CAM is to synchronize study areas with the Broadband, Equity, Access, and Deployment (BEAD) program funding initiatives. This alignment is aimed at preventing redundant funding efforts and potential strategic manipulation within the same geographical zones.

BIPARTISAN INFRASTRUCTURE LAW (BEAD & DIGITAL EQUITY ACT)

The recent Bipartisan Infrastructure Bill (BIL) provides $65 billion to connect more Americans to high-speed broadband internet that is affordable and reliable. Within BIL there are several programs that support broadband planning, infrastructure, and adoption. Wisconsin will administer funding under the *Broadband Equity, Access & Deployment Program (BEAD)* program and *Digital Equity Act (DEA)* programs. BIL grant programs are not intended for household or individual applicants. Instead, states will lead planning and grantmaking efforts to provide funding to internet service providers which will build and provide service to households and businesses.

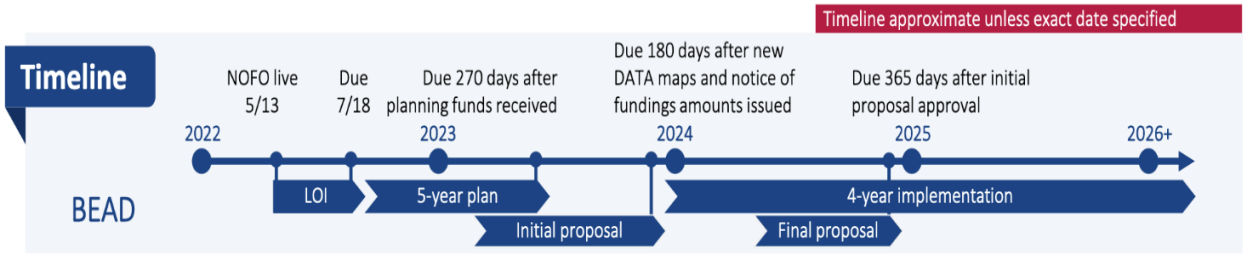
BEAD PROGRAM

Wisconsin's allocation of the BEAD program is approximately $1.06 billion, which was determined through a formula based on the state's proportion of locations lacking access to broadband service. Ultimately, BEAD will support the deployment of primarily fiber internet technology that provides service of 100/20 Mbps to all households and residences in Wisconsin that lack access to 25/3 Mbps service.

The following are eligible uses of funds:

1. Planning for the deployment of high-speed Internet, including conducting research, collecting data, outreach, and training.
2. Deploying or upgrading Internet in unserved or underserved areas or improving service to community anchor organizations
3. Installing Internet and Wi-Fi in multi-unit residential buildings
4. Adoption and digital equity programs
5. Workforce development programs and vocational training

Timeline for Bead Planning



HOUSEHOLD ADOPTION PROGRAMS

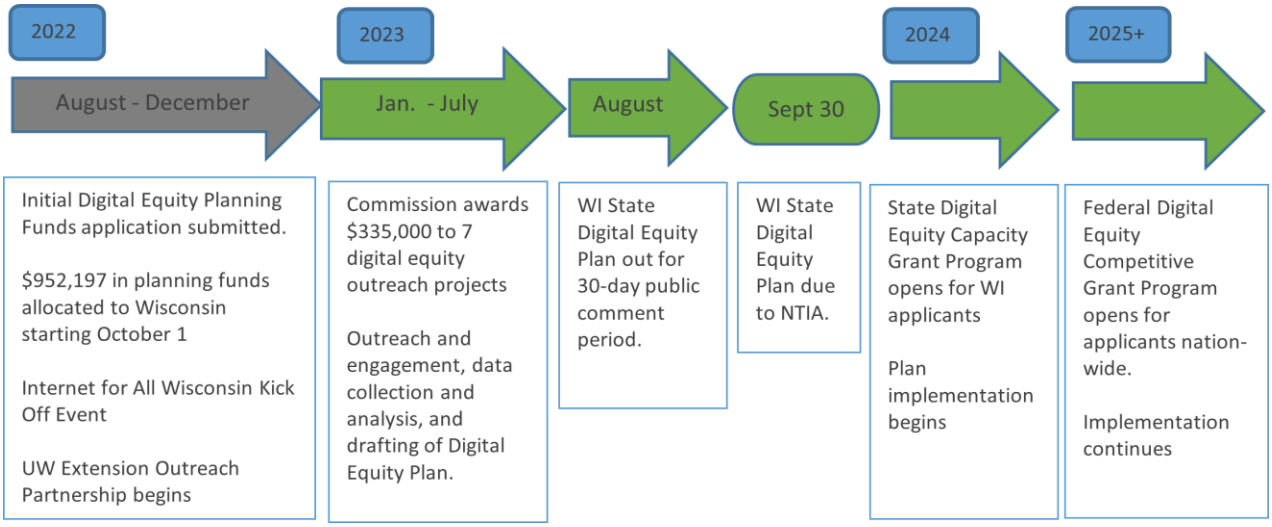
Broadband costs continue to be a significant barrier for many low-income households. Local, state, and federal partners have aimed to make broadband affordable by subsidizing the cost of internet for many households.

DIGITAL EQUITY ACT

The Digital Equity Act (DEA) consists of three separate planning and implementation grant programs that promote digital equity. Digital equity is the condition where all citizens have the skills, devices, and broadband service necessary to fully participate in the economy and society of Wisconsin. Specific populations will be targeted with digital equity funding include: residents of rural areas, individuals of color, aging individuals, and more. Funding will be distributed through three programs, two of which are administered by the PSC. The first program is the State Planning Program, which provides funding to states based on a formula for the development of a state digital equity plan. Wisconsin's share of planning funds is $952,197. Secondly, the State Capacity Grant Program provides funding to states through a formula to support digital equity projects and implement each state's digital equity plan. Wisconsin's estimated share of capacity grant funding is approximately $24 million to $30 million over five years. The final program is the

Competitive Grant Program, administered by NTIA, which will support digital equity projects nationally over a five-year period.

Estimated Digital Equity Act Programs Timeline



AFFORDABLE CONNECTIVITY PROGRAM

The Federal Communications Commission's (FCC) Affordable Connectivity Program (ACP) is a benefit program that helps to ensure households can afford broadband at their home. The ACP provides a discount of up to $30 per month toward internet service for eligible households and up to $75 per month for households on qualifying Tribal lands. Additionally, households can receive one-time discounts of up to $100 to purchase a laptop, desktop computer, or tablet from participating providers if they contribute up to $50 toward the purchase price. One of the guidelines to be eligible for the ACP is that a household must have an income that is at or below 200 percent of the federal poverty guidelines. Other potential eligibility criteria include participation in certain assistance programs (Ex. SNAP, Medicaid, WIC, etc.), participation in Tribal specific programs (Ex. Bureau of Indian Affairs General Assistance), or approval to receive free and reduced-price school lunch programs.

Participation by internet service providers is voluntary by the company, but most providers in Wisconsin are participating in the ACP program. Several providers offer one or more plans that are covered in full by the ACP discount, resulting in those plans costing nothing for those households.

In the beginning of 2024, the ACP stopped accepting new applications with the program on track to run out of funding by April 2024, unless more funding is allocated by Congress. At the time of the enrollment freeze, approximately 6,028 households, or 17 percent of all households in Wood County had enrolled in the ACP. It is estimated that over 20 percent of households in Wood County qualified for the ACP benefit based on the income requirement.

It is recommended that residents struggling to afford internet utilize the Wisconsin Public Service Commission's Internet Discount Finder to see a list of discounted internet service options available.

LIFELINE

Lifeline is another FCC program that helps make communications services more affordable for low-income consumers. Lifeline provides subscribers with a discount on qualifying monthly telephone service, broadband Internet service, or bundled voice-broadband packages purchased from participating wireline or wireless providers. Lifeline provides up to a $9.25 monthly discount on service for eligible low-income subscribers and up to $34.25 per month for those on Tribal lands. Subscribers may receive a Lifeline discount on either a wireline or a wireless service, but they may not receive a discount on both services at the same time. Lifeline also supports broadband Internet service and broadband-voice bundles. FCC rules prohibit more than one Lifeline service per household.

To participate in the Lifeline program, consumers must either have an income that is at or below 135 percent of the Federal Poverty Guidelines or participate in certain federal assistance programs, such as the Supplemental Nutrition Assistance Program (SNAP), Medicaid, Federal Public Housing Assistance, Supplemental Security Income, the Veterans and Survivors Pension Benefit, or certain Tribal Programs.

FUNDING

Funding and financing broadband projects is essential for expanding access to high-speed internet and bridging the digital divide. Various sources of funding are available, including private sector investments, government programs at federal and state levels, tax incentives and credits to encourage private sector participation, bond financing by local governments, and grants from foundations and nonprofits, particularly for projects emphasizing digital inclusion. Public-private partnerships can also play a crucial role in leveraging resources for broadband expansion. These funding options collectively provide the necessary financial support to develop and deploy broadband infrastructure, ultimately improving internet connectivity and accessibility for underserved and rural communities.

PRIVATE SECTOR INVESTMENTS:

Telecommunications companies and Internet Service Providers (ISPs) frequently allocate resources to expand broadband infrastructure, particularly in areas with a potentially lucrative customer base. Collaboration through public-private partnerships can also incentivize and facilitate such investments.

FEDERAL AND STATE PROGRAMS:

Governments at both the federal and state levels administer programs and initiatives to support broadband expansion. These may include subsidies, grants, and other financial incentives aimed at bolstering infrastructure development.

TAX INCENTIVES AND CREDITS:

In certain scenarios, government authorities may provide tax incentives or credits as a means to stimulate private sector participation in broadband infrastructure investment. These incentives serve to encourage companies to engage in these critical projects.

BOND FINANCING:

Local governments have the option to issue bonds as a financial mechanism to fund broadband projects. The expectation is that the revenue generated from broadband services will eventually cover the debt incurred through bond issuance.

GRANTS AND FOUNDATIONS:

A variety of foundations, nonprofit organizations, and philanthropic entities may extend grants and financial support to broadband initiatives. These sources of funding often prioritize projects focused on digital inclusion and promoting equitable access to broadband services.

COST ESTIMATES

Cost estimation for broadband infrastructure and deployment and programs are important to help seek funding options and partners for each of the proposed broadband expansion projects. See the appendix for cost estimates for each of the proposed project areas based on the OptiDesign Rapid Design Study. Other cost estimates for programs could be developed to help increase the adoption of broadband in Wood County

CHAPTER 7

Broadband Goals

7. BROADBAND GOALS

The following are goals identified by several entities to bolster broadband access, affordability, and adoption. The State of Wisconsin's Governor's Task Force worked with the Public Service Commission of Wisconsin (PSC), Federal Communications Commission (FCC), National Telecommunications and Information Commission (NTIA), and other state and federal agencies, and the public to create a series of goals and initiatives.

STATE OF WISCONSIN GOALS

2023 Governor's Task Force on Broadband Access produced recommendations in five areas for the State of Wisconsin:

PREPARING TO CAPITALIZE ON FEDERAL FUNDS

- Wisconsin needs to plan, coordinate, distribute, and capitalize on the increasing federal funding dollars available, including those through the Bipartisan Infrastructure Law (BIL) such as the Broadband, Equity, Access, and Deployment (BEAD) Program and Digital Equity Programs.
- Support the Wisconsin Broadband Office and Public Service Commission of Wisconsin in their drafting and submission of Wisconsin's 5-Year BEAD Action Plan and Digital Equity Plan.
- Find ways to reduce or combat the impacts of inflation and supply chain pressures to create a more hospitable environment for broadband expansion.
- Continue to find ways to braid BIL funds with other funding sources such as local, state, private, philanthropic, and other federal.
- Recognize and emphasize the importance of other sources of funding beyond the BIL. Advocate for increasing those funding sources to complement the BIL.
- Ensure that all Wisconsinites and broadband stakeholders are aware of federal and state funding opportunities by way of technical support, sharing best practices, webinars, workshops, newsletters, local, regional, and statewide in-person meetings, providing general assistance, and supporting applications.
- Help to secure Wisconsin's future by encouraging the use of federal dollars on forward thinking and future proof solutions.
- Support, engage with, and consider the needs of Internet Service Providers and Telecommunications Associations in their preparations for the BEAD program.
- Explore and promote available low-interest loan programs that help to support internet service providers in their pursuit of broadband infrastructure expansion.
- The Wisconsin State Legislature should consider flexibilities and/or waivers to existing State statutes that may be burdensome to federal funding investment.

- Fiber technology should be prioritized, but not exclusively required in publicly funded broadband deployment. Terrestrial fixed wireless solutions are viable in particularly hard-to-reach areas and/or as a short-term solution.

SUPPORTING LOCAL COMMUNITIES

- Support organizations such as the Public Service Commission of Wisconsin, University of Wisconsin – Madison, Division of Extension, and Wisconsin Economic Development Corporation in their technical assistance efforts.
- Maintain a continued focus on how best to assist local communities in broadband planning to ensure their involvement and participation in the rollout of federal funds.
- Support local broadband champions, including digital navigators embedded within the community.
- Help these champions and navigators carry out and see through their community connectivity vision.
- Continue to improve and promote broadband planning playbooks and toolkits available to local communities.
- Find more ways for the public to better understand and utilize broadband maps and data.
- Encourage public participation and input in the planning process where appropriate.
- Engage local communities through statewide listening sessions and take information and stories to the Task Force for continued advancement and strengthening of the Task Force annual report.

WORKFORCE DEVELOPMENT

- Support and include organizations such as workforce development boards, economic development, labor groups and unions, contractors, high schools, higher education and technical colleges, and State agencies (DPI, DWD, PSC). Ensure that these organizations are connected with internet service providers and telecommunications associations to increase awareness and create a sustainable and viable pipeline of talent.
- Ensure a sufficient and trained telecom workforce for internet service providers, contractors, and subcontractors to construct, operate and maintain current and new broadband infrastructure.
- Where practicable and with input from higher education and employers, Wisconsin should encourage hiring from within local communities to help retain local talent and grow good jobs within Wisconsin.

MAPPING AND DATA

- Promote the Federal Communications Commission's (FCC) National Broadband Map and the opportunities for the public and stakeholders to challenge availability and location data within the map.

- Continue to support statewide speed testing and surveying such as funding and promotion of the OptiMap (formerly known as Geo Partners) software and the Wisconsin Internet Self-Report (WISER) survey.
- Support local communities in their efforts to pursue, intake, and make meaning of local data.
- Align state mapping efforts and products with the federal government.
- Find ways to quantify and capture the quality of broadband service beyond basic metrics like download and upload speed.

AFFORDABILITY AND ADOPTION

- Continue outreach and promotion of the Affordable Connectivity Program (ACP) to reach the highest possible levels of participation in Wisconsin.
- Maintain federal funding for the ACP program to ensure access to this vital program for eligible households in Wisconsin. Consider establishing a state internet assistance affordability program.
- Increase outreach and engagement with underserved populations such as aging individuals, incarcerated individuals, veterans, individuals with disabilities, individuals with a language barrier, individuals who are members of racial or ethnic minority groups, and individuals who primarily reside in rural areas to ensure all Wisconsin residents can make full use of the internet.
- Wisconsin should develop and define standard metrics for affordability of broadband services for all Wisconsinites.

NORTH CENTRAL WISCONSIN REGIONAL RECOVERY PLAN BROADBAND GOALS

The following goals were identified in the North Central Wisconsin Regional Recovery Plan. The Advisory Committee, who were represented by economic development professionals from throughout the region, identified these goals as the most important to the vision of the future of broadband in the region.

- Create universal broadband infrastructure throughout the region.
- Bring high-performance broadband service throughout the region.
- Make broadband affordable and competitive.
- Advance digital literacy and inclusion.

CENTERGY-CENTRAL WI ALLIANCE FOR ECONOMIC DEVELOPMENT, BROADBAND GOALS

The following goals were identified in the Centergy Region to assist with planning at a regional level.

- Inventory existing efforts across region, such as past Broadband Expansion Grant recipients, past broadband plans and studies, past surveys, existing maps, etc. Outcomes: This inventory and research will allow staff to create a baseline of existing and current efforts which will help inform us of the next steps in our planning process.
- Form a regional broadband committee with appointments from each of the counties and tribes. Outcomes: This committee will be the working group for the duration of the project. They will assist staff in outreach and communication to their respective counties/tribe and communities.
- Coordinate and implement sub-regional meetings for communities (these may be in-person or virtual depending on the input received from the regional broadband groups. Outcomes: These meetings/sessions will help inform the regional broadband vision and goals by providing stakeholders with an opportunity to be engaged.

WOOD COUNTY GOALS

- Continue to collect and analyze speed test data, and work to improve the FCC Broadband Maps.
- Establishing a strategy to promote affordable access to broadband as well as computer hardware and training to use the internet. (CAM areas)
- Building and maintaining rapport and relationships with area internet service providers and town, village, and city units of government.

CHAPTER 8

Recommendations and Conclusion

8. RECOMMENDATIONS AND CONCLUSIONS

RECOMMENDATIONS

Comprehensive strategies are needed to address gaps in broadband infrastructure, affordability, and adoption. Here are recommendations for bridging these gaps:

INFRASTRUCTURE INVESTMENT

Investing in infrastructure is crucial for improving broadband access and connectivity. Broadband funding, including BEAD and other available sources, presents significant opportunities for the expansion of high-speed internet access in Wood County. Here are recommendations for governments and organizations looking to invest in broadband infrastructure:

1. Assessment and Planning
    - Utilize current assessment of broadband infrastructure and coverage to fully understand broadband gaps.
    - Collaborate with Internet Service Providers (ISPs) to expand broadband services to high priority areas, residents, and businesses within Wood County. Consider submitting a "Request for Information (RFI)" to learn more about ISPs services and their plans.
    - Understand the physical broadband technologies that can best meet the needs of the community (Ex. Fiber, DSL, Fixed Wireless, etc.). Each 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. 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 a good line of sight.
    - Consider the allocation of funding for broadband infrastructure development in areas that first prioritize "unserved" areas and then "underserved" rural areas.
    - Utilize relevant data and maps to position the community for potential grant projects.

- Keep informed about current funding opportunities, including the Bead program, along with details and deadlines for applying for grants.

2. Public Awareness and Engagement
    - Continue to engage the Wood Broadband Committee and ensure that they are actively involved in decision making.
    - Involve the community in the decision-making process by conducting public forums and awareness campaigns. Engaged citizens are more likely to support and participate in broadband infrastructure development.
3. Remove Barriers
    - 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 notification.
    - Adopt public rights-of-way policies that waive fees or expedite use for broadband installation.
    - Adopt tower ordinances that allow agreements for the installation/cp-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.
4. Regular Assessment and Adjustment
    - Once broadband infrastructure is deployed, periodically review the effectiveness of infrastructure investments, and adjust as needed. Encourage residents to continue taking speed tests.

PROMOTE AFFORDABLE BROADBAND

1. Public Awareness and Engagement
    - Promote Affordable Connectivity (ACP) and Lifeline programs which provide affordable access to broadband.
    - Utilize the (ACP) government outreach toolkit.
    - Raise awareness about these programs through advertising, both online and offline. Use social media, local newspapers, radio, and TV to reach a wide audience.
    - Partner with community centers, schools, libraries, and local nonprofits to spread the word. They can assist in reaching specific demographics.
    - Engage local government officials to endorse and support these programs. They can help with funding, resources, and promotion.

2. Tracking and Reporting
    - Monitor the impact of your promotion efforts through analytics and data collection, adjusting strategies as needed.

BROADBAND EDUCATION

1. Increase Digital Literacy
    - Provide digital literacy training to help individuals and families navigate the internet safely and effectively.
    - Organize workshops and classes at local schools, libraries, and community centers.
    - Partner with local organizations to deliver training programs.
2. Raise Awareness
    - Create public awareness campaigns about the advantages of broadband access, such as education, job opportunities, healthcare, and entertainment.
    - Highlight success stories of individuals and communities that have benefited from broadband.

IMPLEMENTATION

1. Designate a point of contact who can help facilitate the next steps and communicate directly with ISPs.
2. Work with and support ISP efforts to expand broadband infrastructure.
3. Pursue additional broadband funding opportunities and watch for updates to the Affordable Connectivity Program.
4. Utilize this report to inform future broadband efforts.

CONCLUSION

This broadband plan outlines a strategy for the deployment and expansion of high-speed internet access within a specific region or community. Typically, such a plan includes key components like an assessment of current broadband infrastructure and demand, identification of funding sources and financial strategies, mapping of coverage gaps, and goals for improving connectivity. It often involves collaboration between public and private sectors, aiming to enhance digital inclusion and equitable access to the internet. Broadband plans play a crucial role in addressing the digital divide and promoting economic growth and innovation by ensuring that robust internet connectivity reaches all residents and businesses within the target area.

The county should explore the feasibility of implementing a Community Area Network (CAN). Such a network could facilitate seamless connectivity between the county government, local municipalities, and key institutions such as schools, colleges, and medical facilities, thereby establishing a strong and secure network infrastructure.

The digital age has ushered in a world of opportunities, but millions are still left on the wrong side of the digital divide, unable to access the benefits of high-speed internet. Now, it's time to act and change that. The information in this plan is intended to help the county engage internet service providers and leverage BEAD funding to help make good decisions to benefit the citizens of Wood County with expanded high-speed broadband expansion.

APPENDIX

A. Broadband Maps

B. PSC Broadband Summary

C. Internet Service Providers

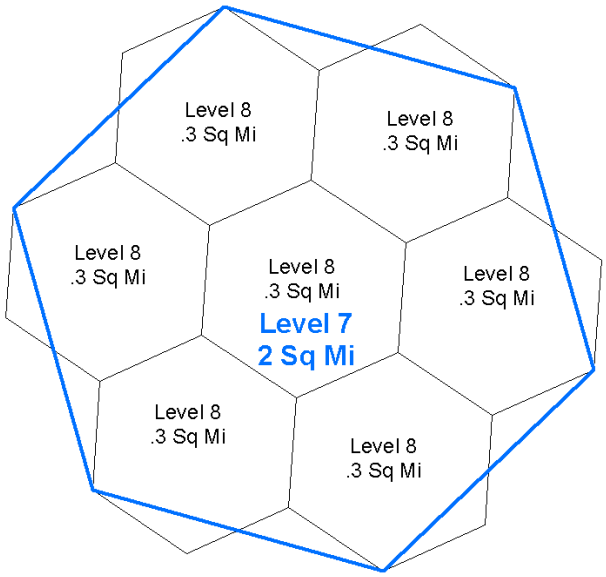
D. Additional Resources

E. Glossary

A. BROADBAND MAPS

Mapping Process

Much of the data on the maps are displayed using hexbin geometry used on the FCC broadband maps. The FCC collected data from providers on coverage and broadband type by this geometry. Level 7 is 2 square miles in size and Level 8 is .3 square miles in size. See the graphic below.



Map 1- Broadband Serviceable Locations (BSL)

Summary of development patterns and density. Centroids of tax parcels with improvement values greater than zero were summarized within level 8 hexbins. Summary of the total number of centroids counted by hexbins displayed on the map.

Map 2a - Managed Forest Lands (MFL)

Summary of large areas of managed forest lands. Tax parcels coded in a MFL programs were union with hexbins level 8. If greater than 75% of the area of hexbins level 8 was in MFL they are displayed on the map

Map 2b – Assessed Agricultural Lands

Summary of large areas of assessed agricultural lands. Tax parcels coded with an assessment code of agriculture were in union with hexbins level 8. If greater than 25% of the area of hexbins level 8 was assessed agriculture, they are displayed on the map.

Map 2c – Assessed Tax Exempt Lands

Summary of large areas of tax-exempt lands. Tax parcels coded with an assessment code for tax-exempt status were union with hexbins level 8. If greater than 50% to 75% and greater than 75% of the area of hexbins 8 was assessed tax exempt are displayed on the maps

Map 3 – Critical Facilities

Summary of critical facilities. Airports, Ambulance Service, Fire Stations, Hospitals, Health Services, Business and Industrial Parks, Campgrounds, city, village, and town facilities, schools, correctional facilities, DNR Ranger Stations, Emergency Operation Centers, Libraries, Nursing Homes, Post Offices, and Tech Colleges. Summarized within hexbins level 7.

Map 4a- Rural Digital Opportunity Fund (RDOF)

Census blocks of areas covered by the Rural Digital Opportunity Fund program. Provided to areas that lacked 25/3 Mbps fixed broadband service. 40 percent deployment by 2025, 60 percent by 2026, 80 percent by 2027, and 100 percent by 2028.

Map 4b- Existing Grant Areas

Wisconsin Public Service (WPS) existing broadband grant footprint locations 2014 to 2022

Map 5a- Broadband Availability Copper

Summary of FCC reported copper broadband availability. Copper broadband refers to a type of internet connection that utilizes copper-based infrastructure, primarily copper telephone lines, to deliver internet services to users' homes or businesses. The most common technology associated with copper broadband is Digital Subscriber Line (DSL). DSL technology enables the simultaneous transmission of voice and data signals over the same copper line by utilizing different frequency bands. DSL comes in different variants, such as ADSL (Asymmetric DSL) and VDSL (Very-high-bit-rate DSL), offering varying speeds and capabilities Areas reported at level 8 hexbins.

Map 5b- Broadband Availability Cable

Summary of FCC reported cable broadband availability. Cable internet, also known as broadband cable or cable broadband, refers to a high-speed internet connection that utilizes the same coaxial cable infrastructure that delivers cable television signals to homes and businesses. This type of internet connection offers faster speeds compared to traditional dial-up and DSL (Digital Subscriber Line) connections. Areas reported at level 8 hexbins.

Map 5c- Broadband Availability Fiber

Summary of FCC reported fiber broadband availability. Fiber internet, also known as fiber-optic internet, is a high-speed broadband internet connection that utilizes fiber-optic cables to transmit data at incredibly fast speeds. Fiber-optic technology employs thin strands of glass or plastic fibers to carry digital information as pulses of light, enabling faster and more reliable data transmission compared to traditional copper-based cables. Areas reported at level 8 hexbins.

Map 5d- Broadband Availability Fixed Wireless

Summary of FCC reported fixed wireless broadband availability. Fixed wireless broadband is a type of high-speed internet connection that utilizes wireless communication technology to provide internet access to homes, businesses, and other locations. Unlike mobile wireless connections, which are designed for on-the-go access, fixed wireless connections are stationary and provide consistent connectivity to a specific location. Areas reported at level 8 hexbins.

Map 5e- Broadband Availability Mobile

Summary of FCC reported mobile broadband availability. Mobile broadband refers to high-speed internet access provided through wireless networks, enabling users to connect to the internet using mobile devices such as smartphones, tablets, laptops, and other portable devices. Unlike fixed broadband connections, which are typically stationary and serve specific locations, mobile broadband provides on-the-go connectivity, allowing users to access the internet from virtually anywhere within the coverage area of a mobile network. 4G and 5G areas are summarized at hexbins level 7 hexbins.

Map 6- Average Download Speeds (may split 6a and 6b for Fixed and Mobile)

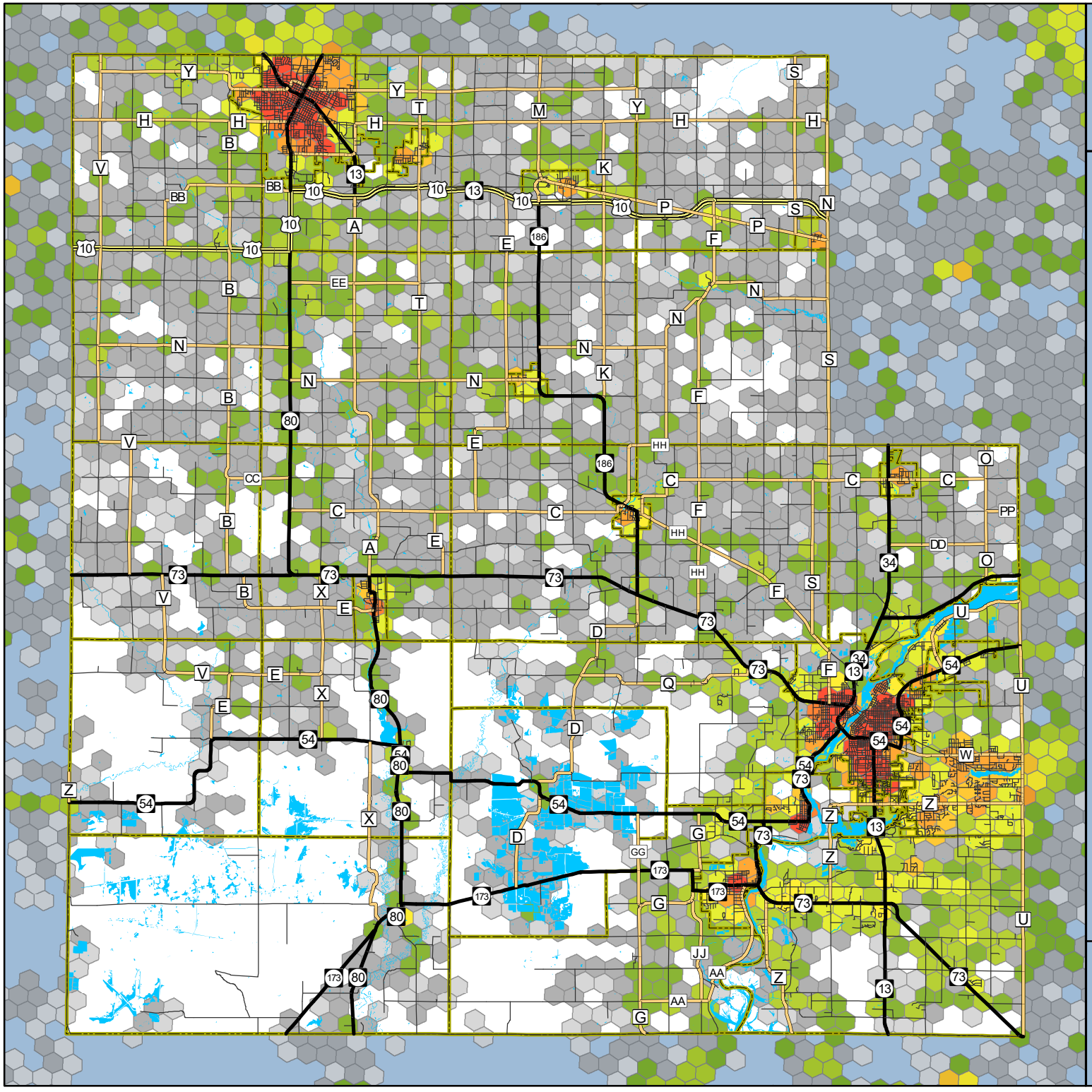
Information was collected from wisconsinspeedtest.net and Ookla Open Data speed tests. These areas are summarized at level 7 hexbins. Areas that reported no service are highlighted.

Map 7- Average Upload Speeds (may split 7a and 7b for Fixed and Mobile)

Information was collected from wisconsinspeedtest.net and Ookla Open Data speed tests. These areas are summarized at level 7 hexbins.

Map 8- Recommended Broadband Expansion Areas

Areas determined by existing data and committee input for potential project locations.



Map 1 **DRAFT**

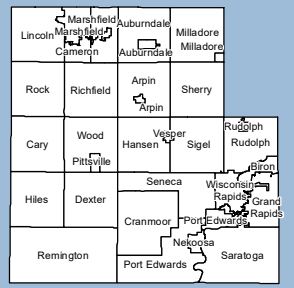
Broadband Serviceable Locations (BSL)

Wood County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Count

- 1
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 150
- 151 - 200
- > 200



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

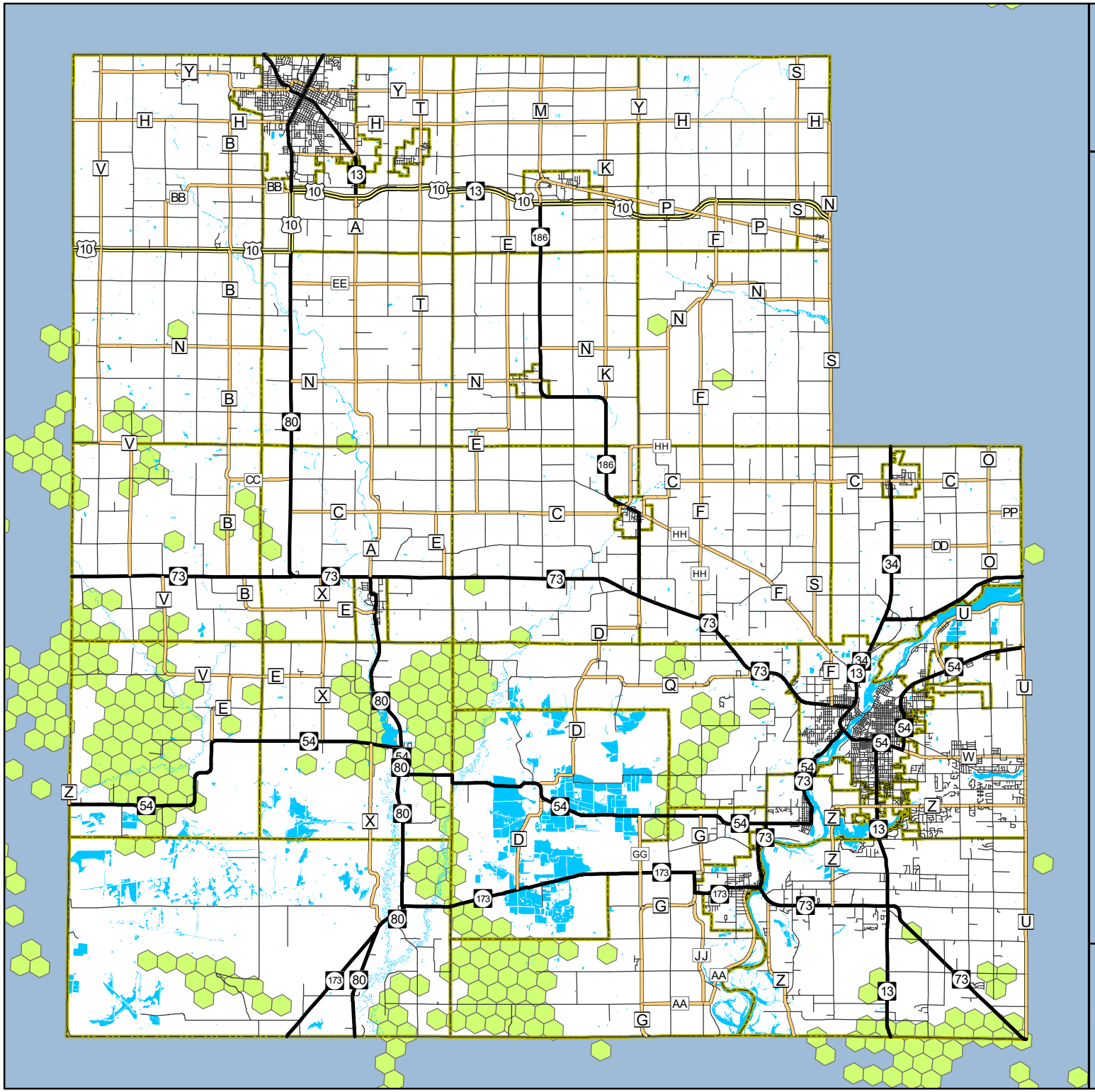
This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 2a **DRAFT**

Managed Forest Lands (MFL)

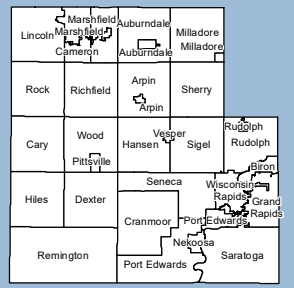
Wood County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- > 75 % MFL

N W E S

0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

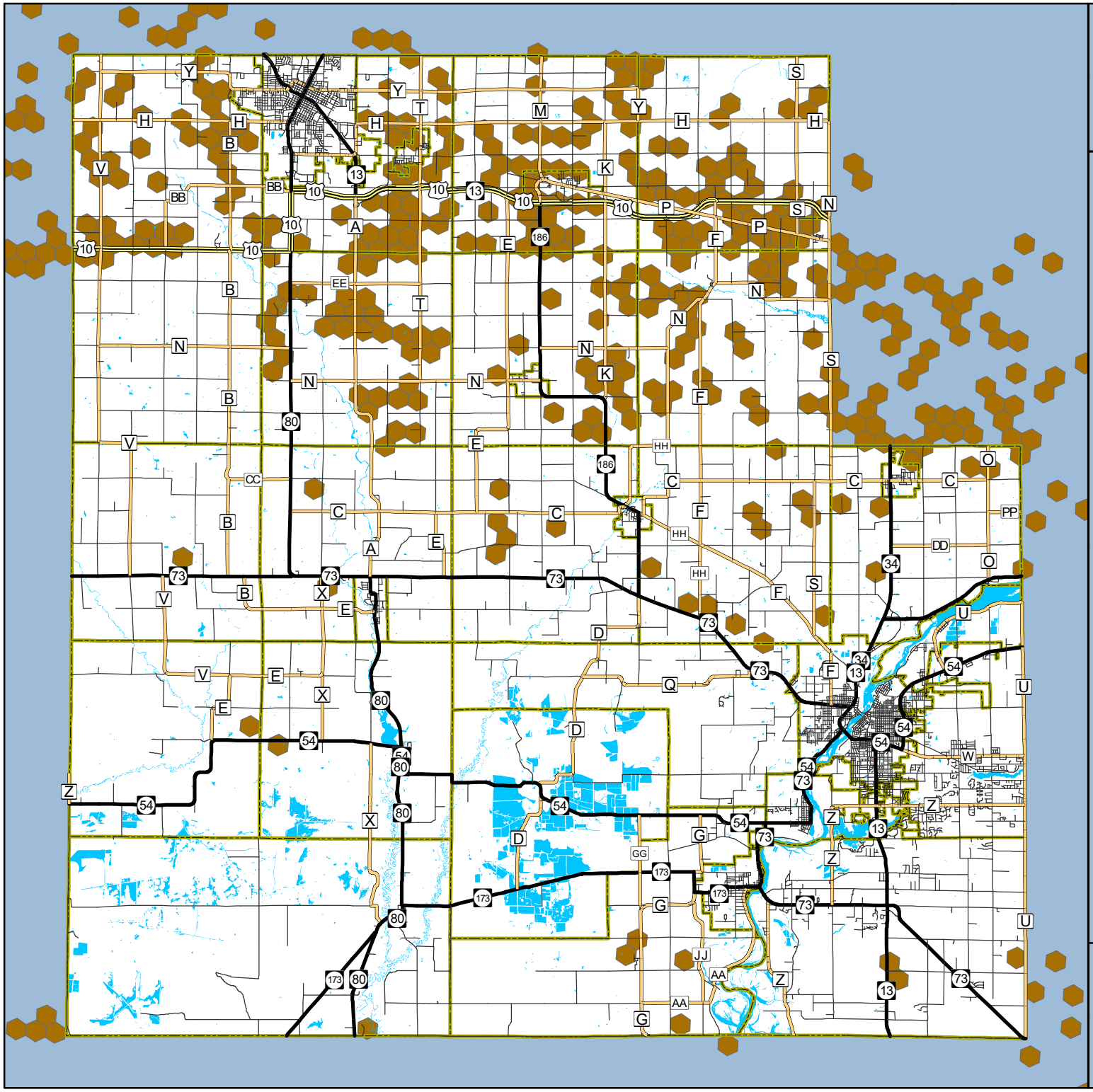
This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
NCWRPC
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 2b **DRAFT**

Assessed Agricultural Lands

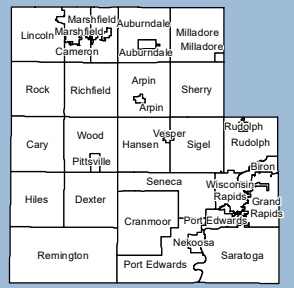
Wood County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- > 25% Agricultural Lands

N W E S

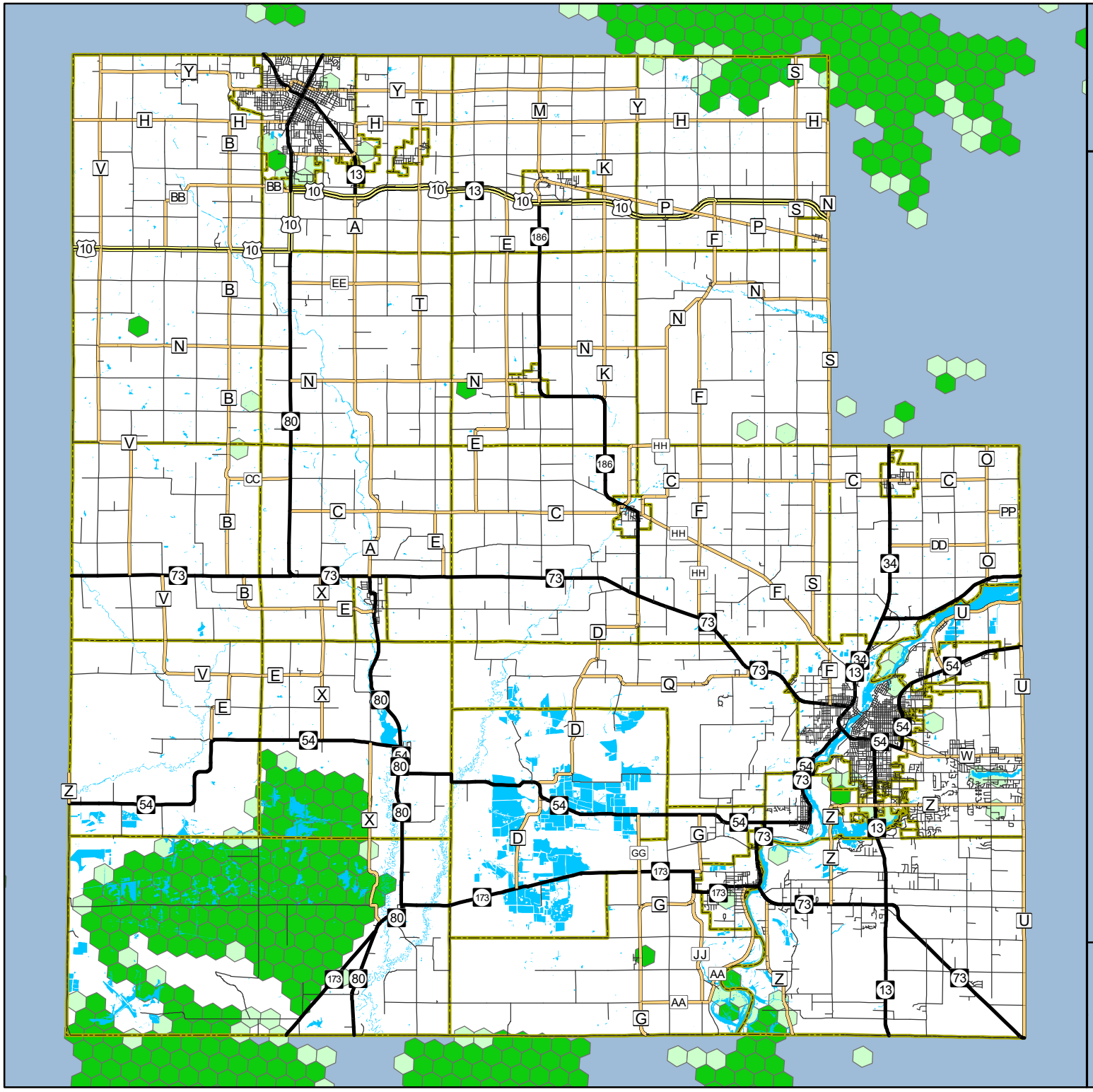
0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org



Map 2c **DRAFT**

Assessed Tax Exempt Lands

Wood County, Wisconsin

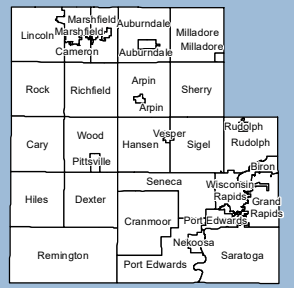
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Tax Exempt

- 50 to 75%
- > 75%

N W E S

0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

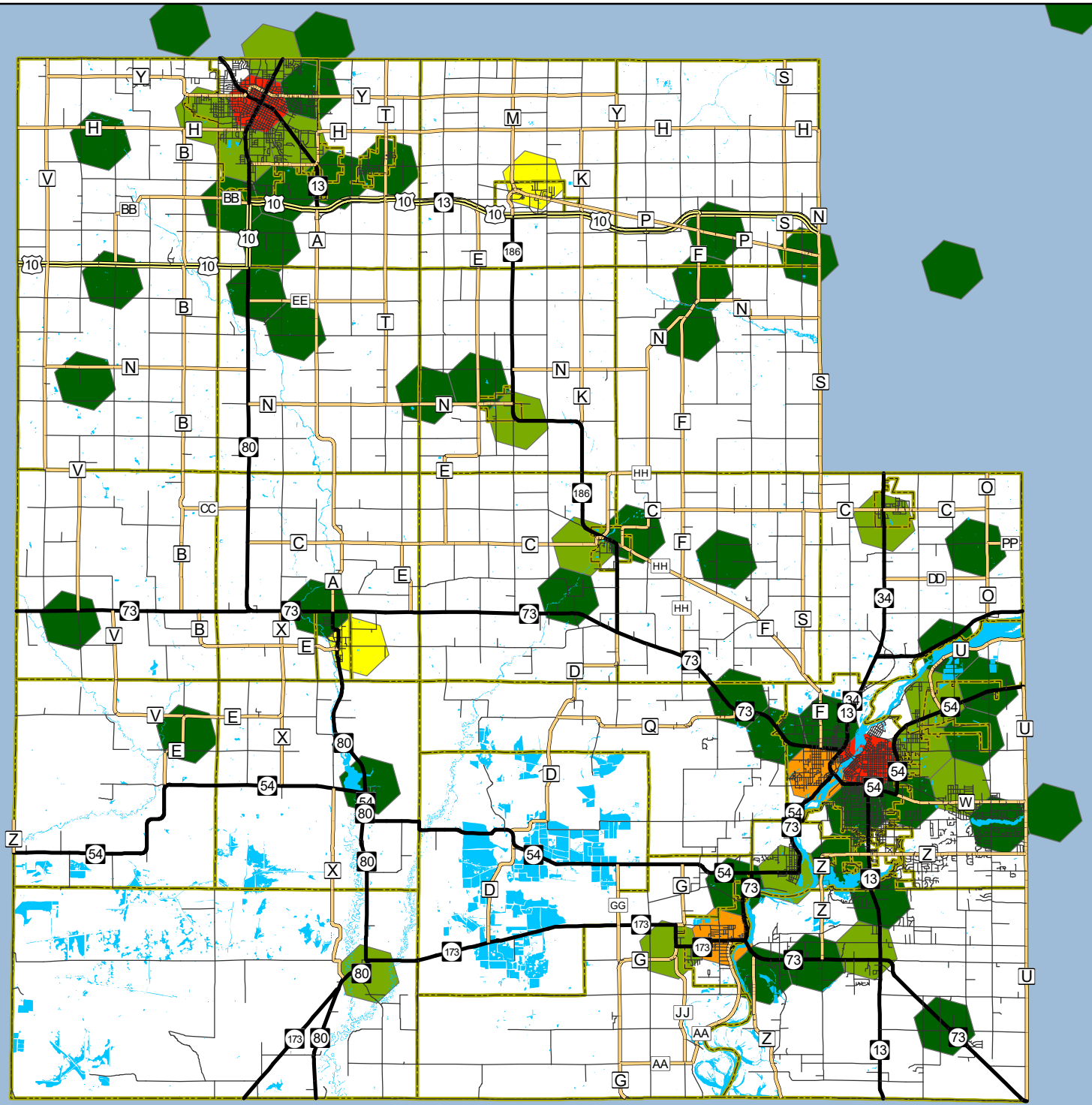
This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
NCWRPC
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 3 **DRAFT**

Critical Facilities

Wood County, Wisconsin



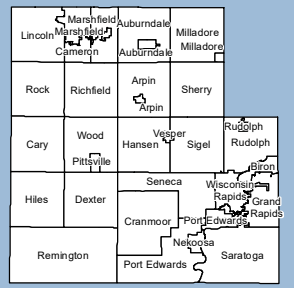
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Count

- 1 - 2
- 3 - 5
- 6 - 8
- 9 - 12
- 13 - 20

N W E S

0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

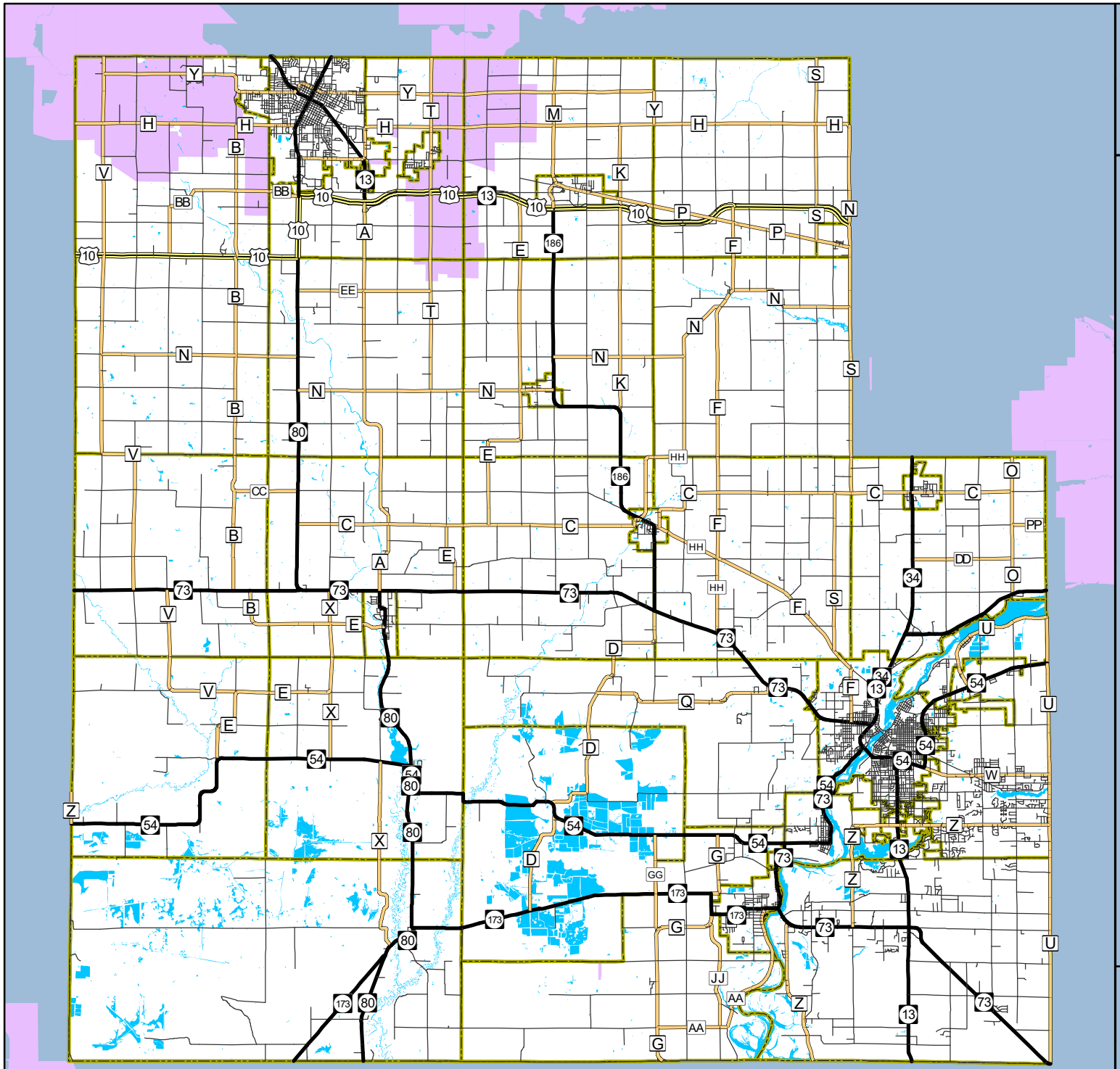
This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 4a **DRAFT**

Rural Digital Opportunity Fund (RDOF)

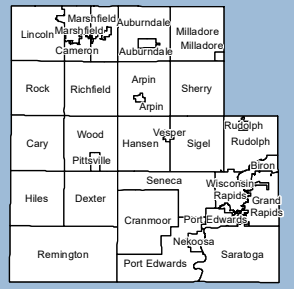
Wood County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- RDOF Areas

N W E S

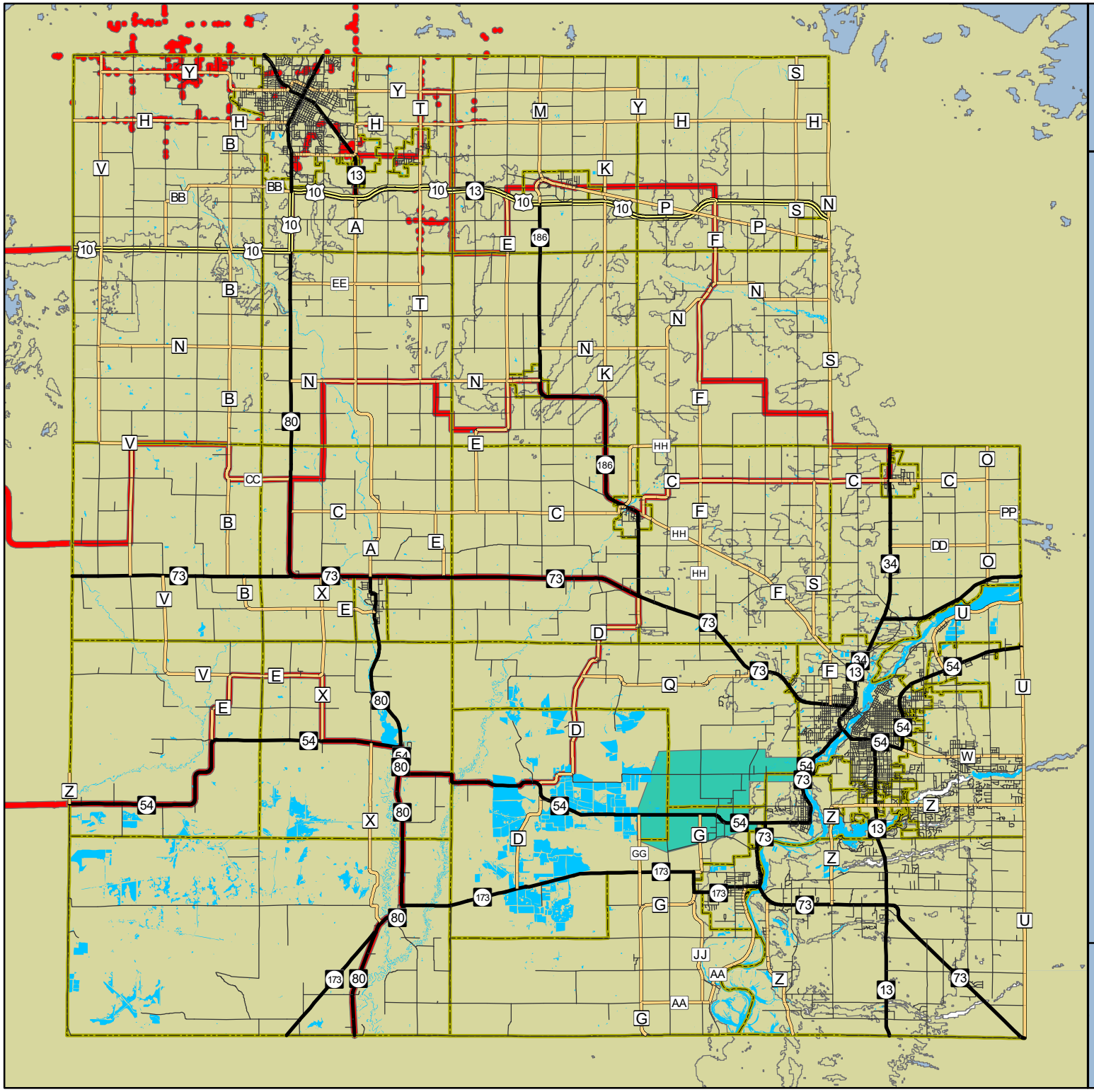
0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
NCWRPC
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org



Map 4b **DRAFT**

Existing Grant Areas

Wood County, Wisconsin

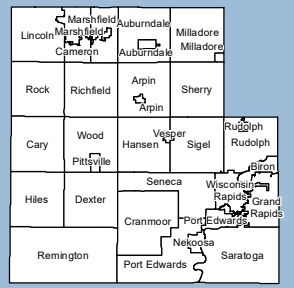
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Grant Round

- No Year Noted
- 2014
- 2021

N W E S

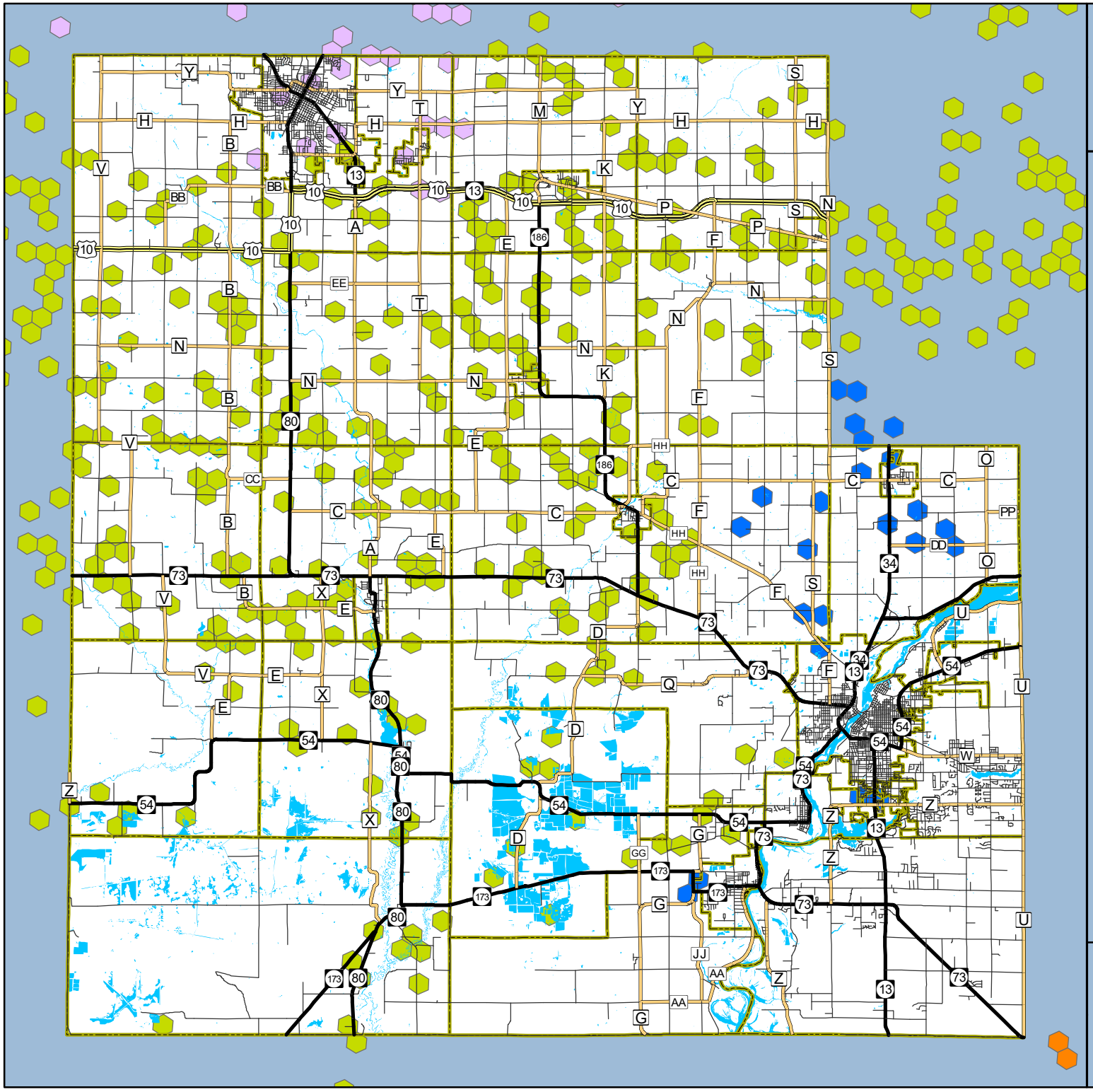
0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
NCWRPC
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org



Map 5a **DRAFT**

Broadband Availability Copper

Wood County, Wisconsin

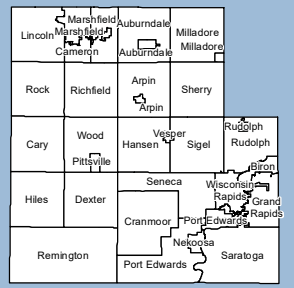
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Provider

- Frontier
- Solarus
- TDS Telecom
- Union Telephone Company

N W E S

0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

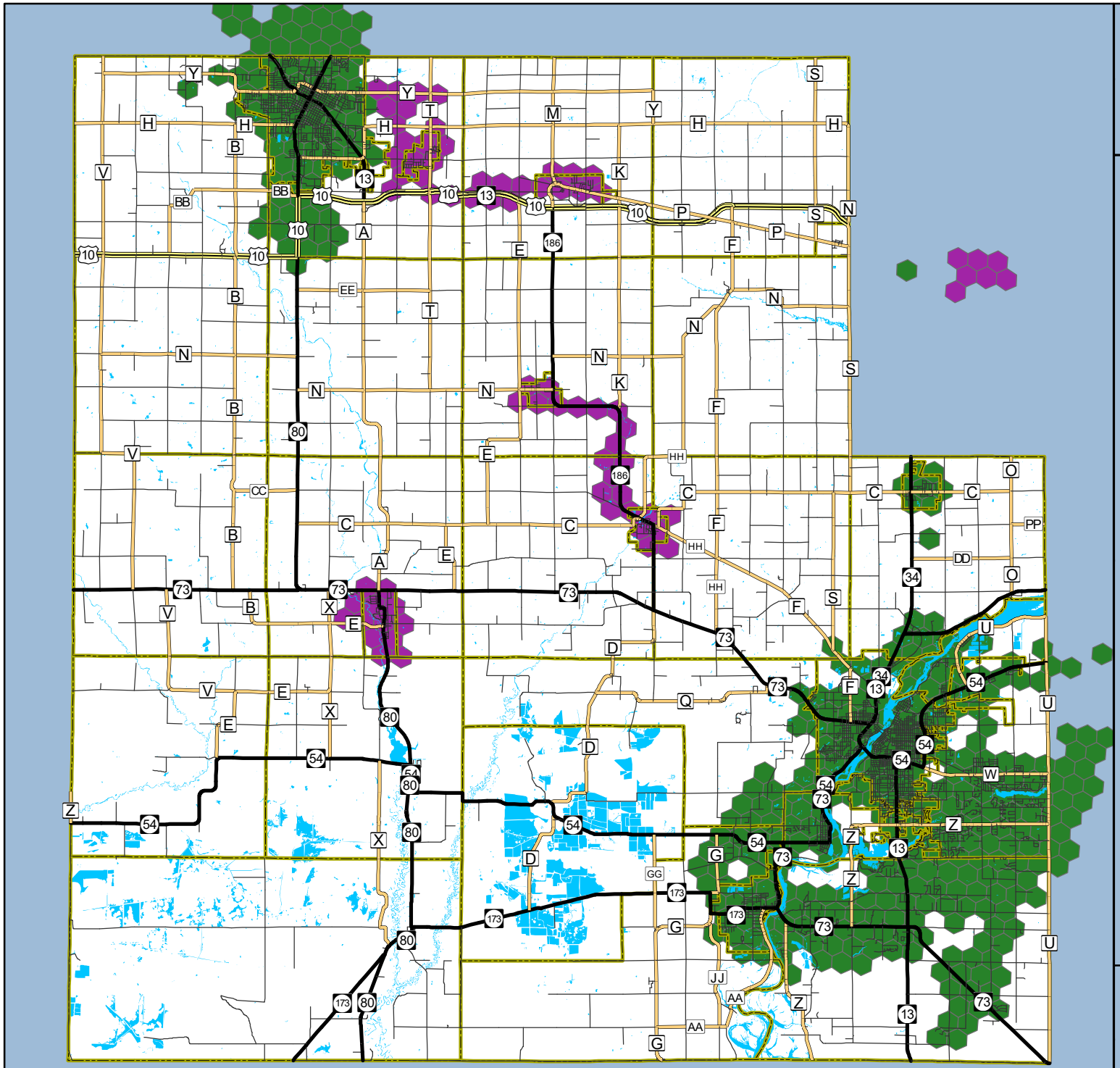
This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 5b **DRAFT**

Broadband Availability Cable

Wood County, Wisconsin



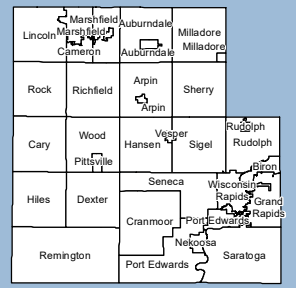
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Provider

- Astrea
- Charter Communications Inc

N W E S

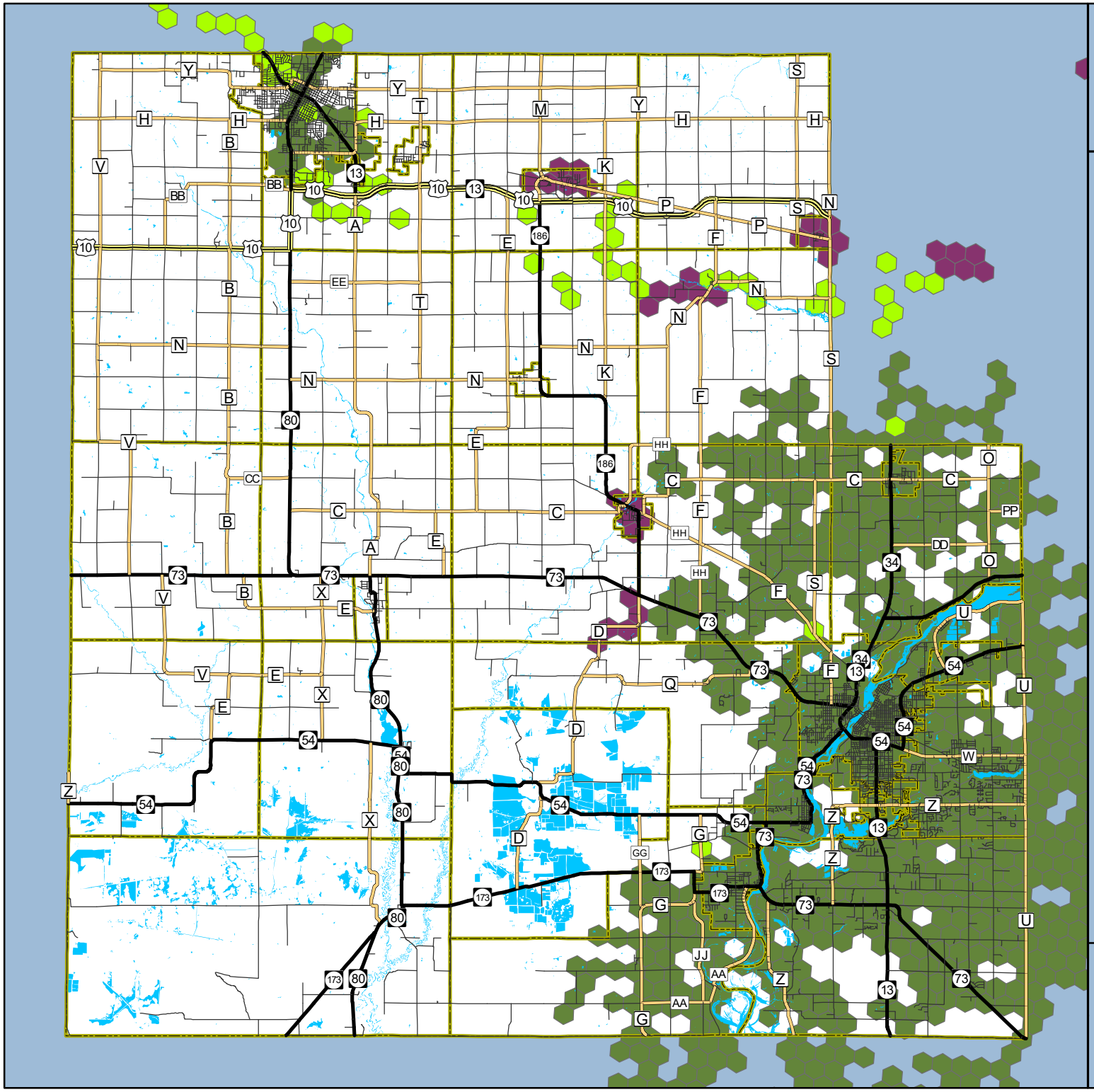
0 2.5 5 Miles



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org



Map 5c **DRAFT**

Broadband Availability Fiber

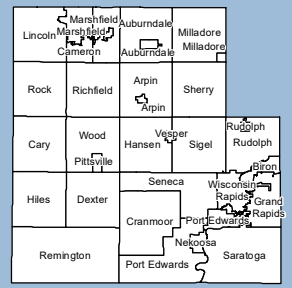
Wood County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Fiber

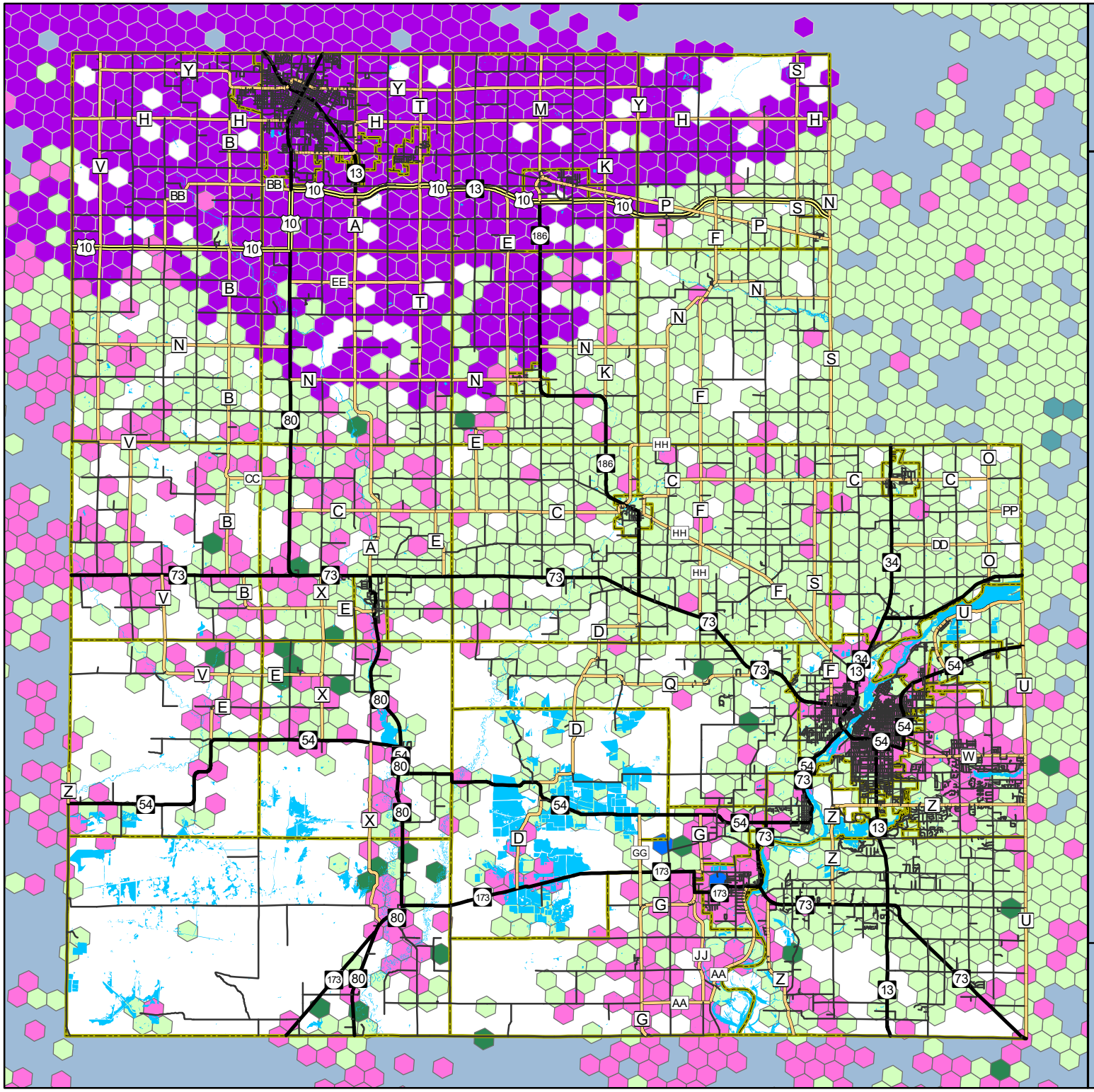
Provider

- Charter Communications Inc
- Solarus
- TDS Telecom



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org



Map 5d **DRAFT**

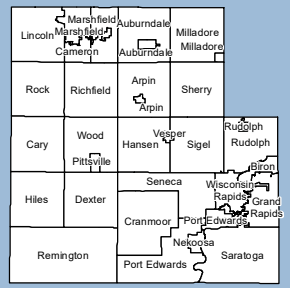
Broadband Availability Fixed Wireless

Wood County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Provider

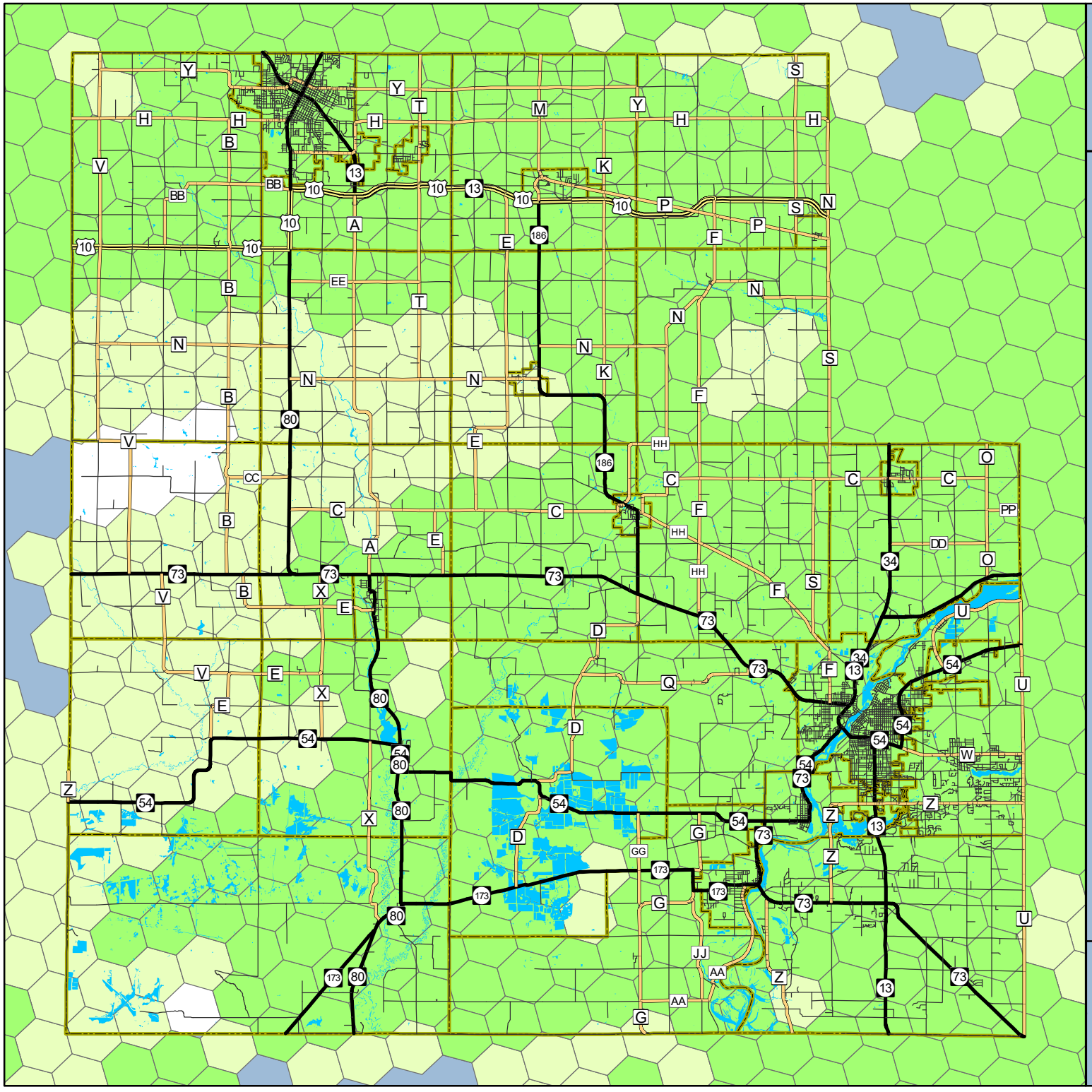
- AT&T Inc
- Bug Tussel Wireless LLC
- Country Wireless
- T-Mobile US
- US Cellular
- Verizon



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

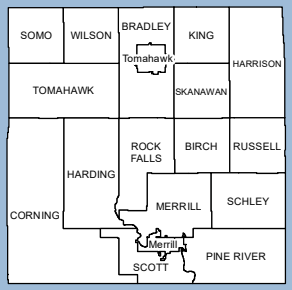


Map 5e **DRAFT**

Broadband Availability Mobile

Wood County, Wisconsin

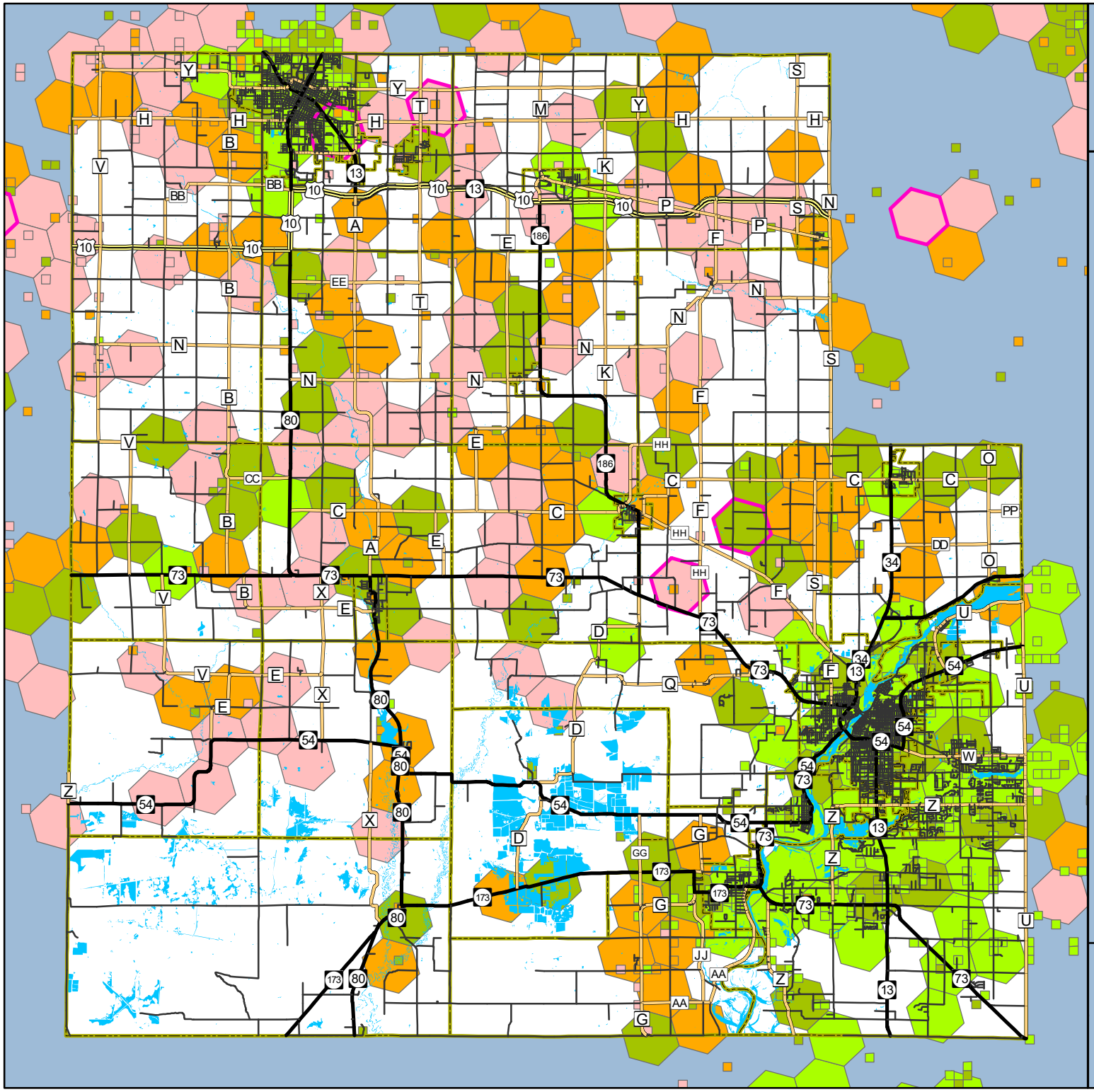
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- 5G Coverage
- 4G Coverage



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org



Map 6 **DRAFT**

Average Download Speeds

Wood County, Wisconsin

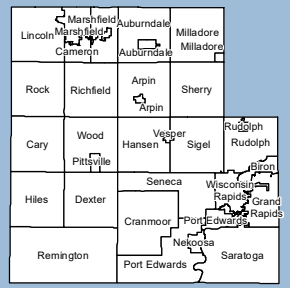
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Download Speed

- < 10 Mbps
- 10 to 25 Mbps
- 25 to 100 Mbps
- > 100 Mbps
- Reported No Service

From wisconsinspeedtest.net - August 8, 2023
No service reported - Cost and or can not find a provider.

Small square test locations from Ookla speed test
Fixed wired only October 2022 - Open Data



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

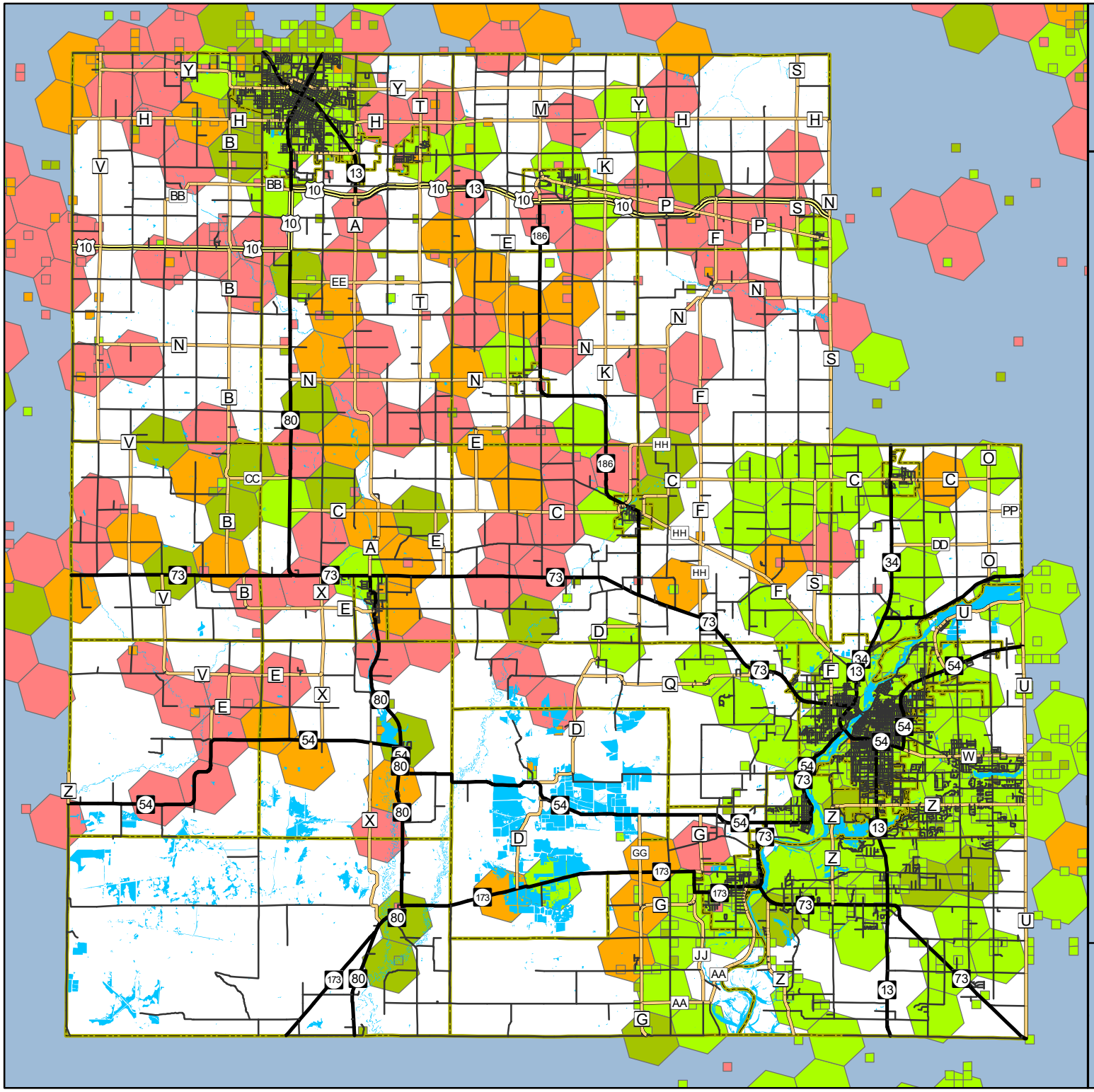
This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 7 **DRAFT**

Average Upload Speeds

Wood County, Wisconsin



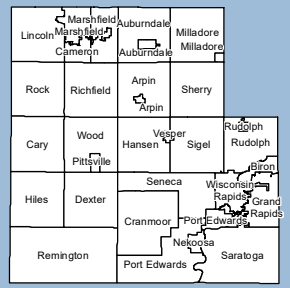
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Upload Speed

- < 2 Mbbs
- 2 to 5 Mbbs
- 5 to 10 Mbps
- > 10 Mbps

From wisconsinspeedtest.net - August 8, 2023

Small square test locations from Ookla speed test
Fixed wired only October 2022 - Open Data



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

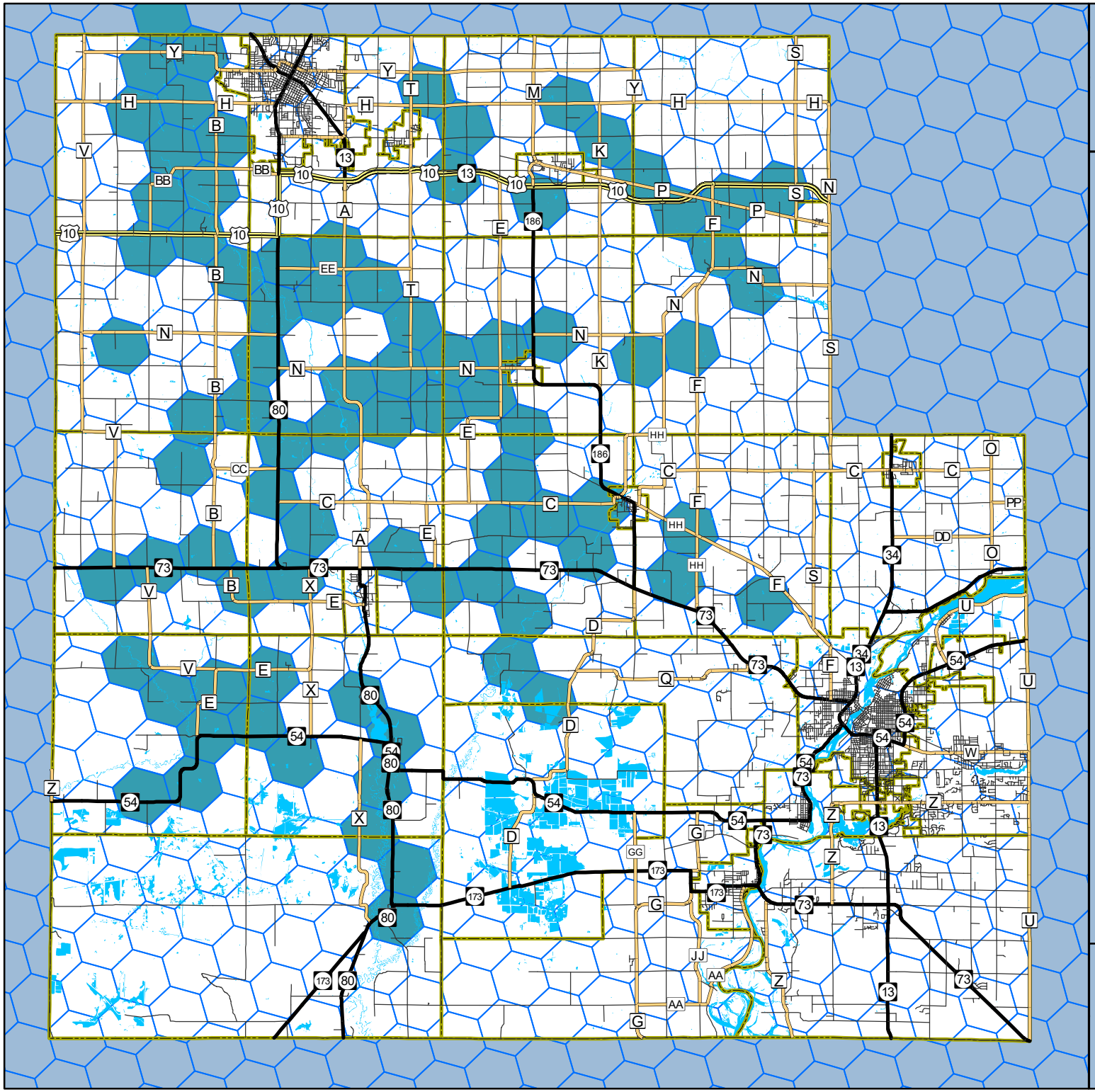
This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

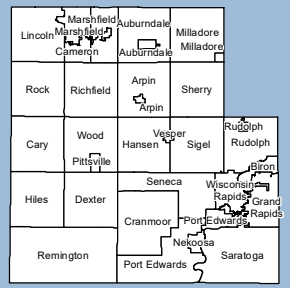
Map 8 **DRAFT**

Possible Project Areas

Wood County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- Possible Project Areas



Source: WI DNR, NCWRPC, Wood Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

B. PSC COUNTY SUMMARY

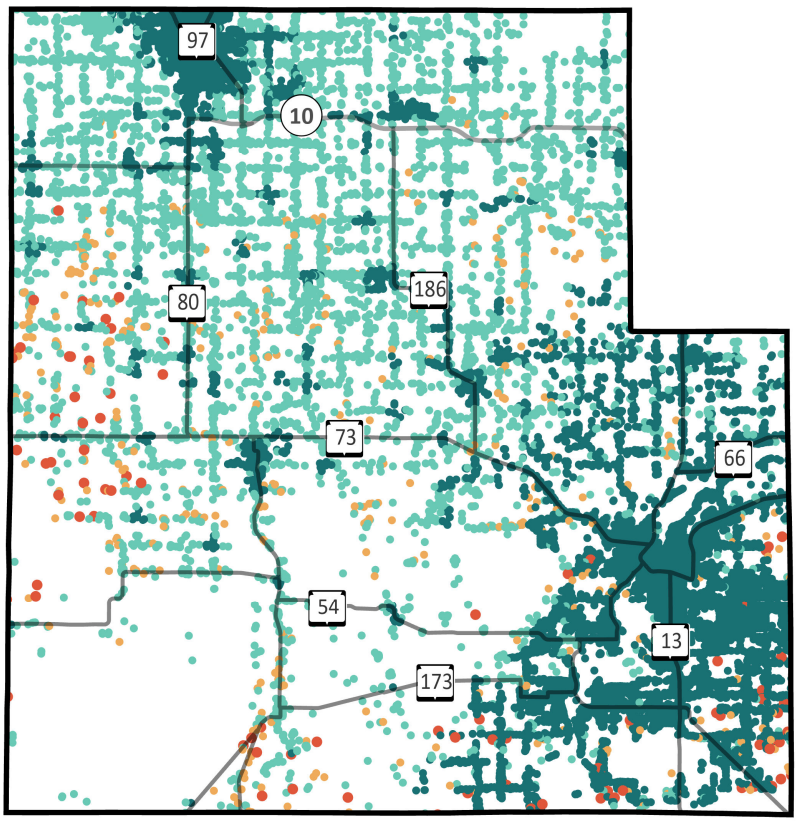
Wisconsin Broadband Access- Serviceable Locations (BSL)

Wood County

Total BSLs **33,292**

Underserved, Unserved and No Service Count **5,917**

Source: FCC Broadband Data Collection BSL Service Status as of June 30, 2023



Explore the Broadband Planning Map at https://maps.psc.wi.gov/apps/WisconsinBroadbandPlanningMap/

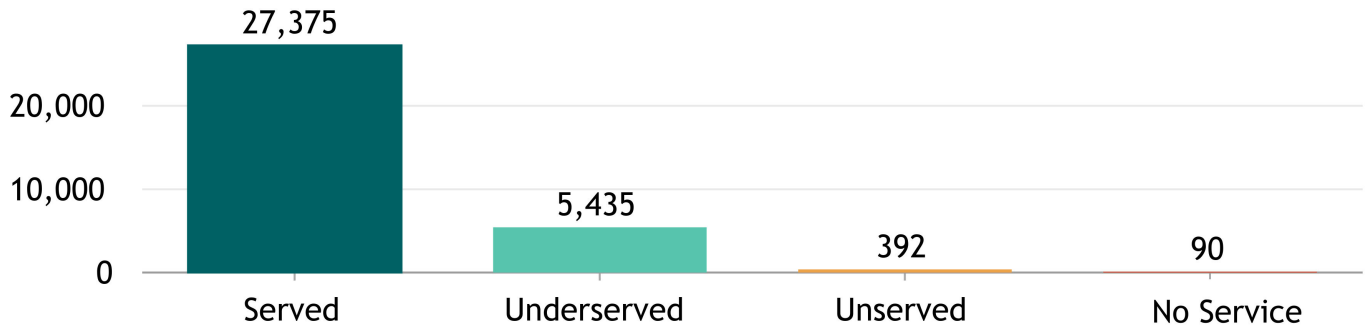
Served >= 100/20 (Mbps)

Underserved >25/3 and <100/20 (Mbps)

Unserved <25/3 (Mbps)

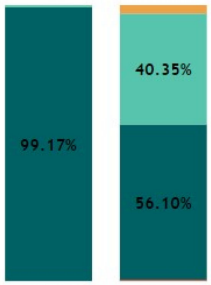
No Service

BSL count, by service status



"Broadband service' = an internet service with a minimum speed 100/20 Mbps

% of BSLs, by urbanicity type, by service status



Note: For counties having 100% BSL in the same urbanicity type only one bar is displayed.

Wisconsin Broadband Office

PSC of WISCONSIN

Wisconsin Broadband- Enforceable Funding Commitment

Wood County

33,292

Count of Total BSLs

5,917

Count of Underserved, Unserved, and No Service BSLs

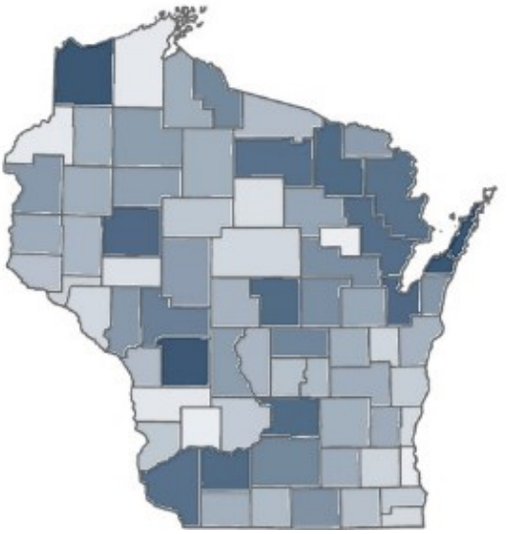
Source: FCC Broadband Data Collection BSL Service Status as of June 30, 2023

"Enforceable Funding Commitment", (EFC) for the purposes of BEAD is any "in progress" award that will build service of at least 100/20 to all locations by either a wireline cable or fiber connection, or a licensed fixed wireless connection. This includes a subset of state awards, all ARPA awards, all USDA Reconnect awards, RDOF, and E-ACAM.

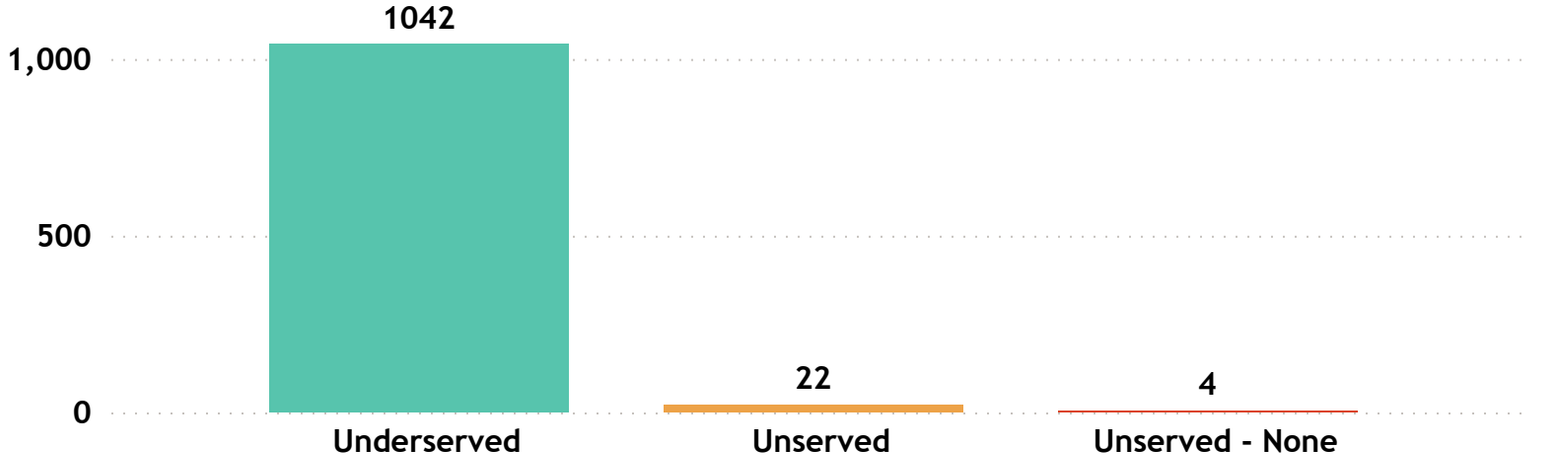
Estimated Underserved, Unserved and No Service Locations without Enforceable Funding Commitment

1,068

Estimated Underserved, Unserved and No Service Locations without EFC (count of locations min to max)



Estimated Underserved, Unserved, and No Service locations without EFC



Wisconsin Broadband Office

PSC of WISCONSIN

Wisconsin Broadband- Internet Service Providers

Wood County

FCC service as of December 31, 2022

14

ISP
Astrea
AT&T Inc
Bug Tussel Wireless LLC
Charter Communications Inc
Consolidated Communications, Fidium
Country Wireless
Frontier
NetFortris
Solarus
Solurus
TDS Telecom
T-Mobile US
United States Cellular Corporation
Verizon

Wisconsin Broadband Affordability- Plan Cost

'Broadband service' = an internet service with a minimum speed 100/20 Mbps

ISPs in Wisconsin: **126**

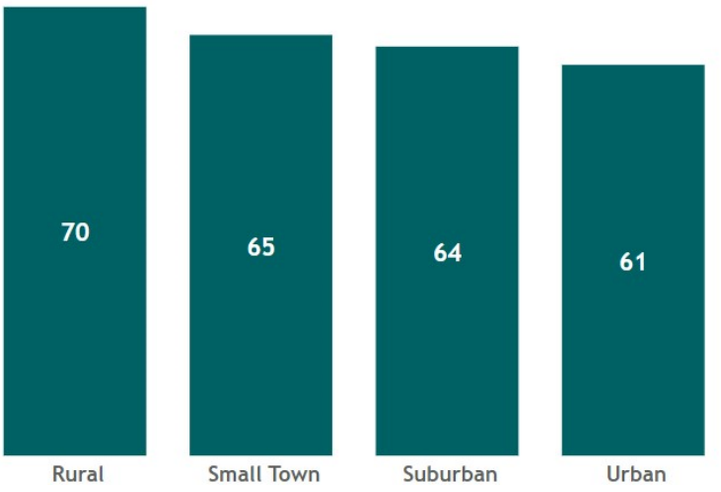
ISPs in Wood County : **14**

State Minimum Broadband Monthly Price Range
$ 49.95 - $ 156.50

State Average of Minimum Broadband Price/ Month
$64.85

WI Household (HH) Median Income
$67,080

WI Average Minimum Broadband Price/ Month (in $) by Urbanicity



Source: Service offerings from ISPs representing 2,200 price offerings across all counties.

AFFORDABILITY CRITERIA:
1.17% of Household Income

HH annual income-range ($)	Broadband Plan* monthly cost
less than $15K	less than $15
$15K - $24K	$15 - $24
$25K - $39K	$25 - $38
$40K - $54K	$39 - $52
$55K - $69K	$53 - $67
$70K - $84K	$68 - $81
$85K - $99K	$82 - $96
$100K - $150K	$97 - $146
$150K+	$147+

* Broadband plan: is a plan providing internet service of a minimum speed of 100/20Mbps
The commonly accepted Broadband cost-burden threshold's income (see worldwide affordability target by 2025)

Wood County

Average of Minimum Broadband Price/ Month

$ 58.16

Wood County

Household (HH) Median Income

$ 55,684

Wisconsin HHs: 2,401,818

Wood County HHs: 32,707

Source: ACS 5y 2017-2021

Wisconsin Broadband Office

PSC of WISCONSIN

C. INTERNET SERVICE PROVIDERS

REGIONAL INTERNET SERVICE PROVIDERS

*** Indicates known Internet Service Provider in Wood County**

Provider	Website	Phone	Mailing Address
Airnet	netpros-inc.net	715-241-0200	117 S. 17th Avenue Suite B Wausau, WI 54401
AirRunner Networks	www.airrun.net	715.443.3700	216 Main St #3, Marathon City, WI 54448
Amherst Telephone Company	amherstcomm.net	715.842.5529	120 Mill St, Amherst, WI 54406
Astrea*	astreaconnect.com	800.236.8434	105 Kent St, Iron Mountain, MI 49801
AT&T*	www.att.com	210.821.4105	208 S. Akard Street, Suite 2954, Dallas, Texas 75202.
Bertram Internet	gobertram.com	920.351.1023	300 Industrial Dr, Random Lake, WI 53075
Brightspeed	www.brightspeed.com	833.692.7773	1120 S Tryon St, Charlotte, NC 28203
Bug Tussel Wireless LLC*	btussel.com	877.227.0924	417 Pine St, Green Bay, WI 54301
Cellcom	www.cellcom.com	920-339-4000	1580 Mid Valley Drive, De Pere, WI 54115
CenturyLink	www.centurylink.com	877.862.9343	100 CenturyLink Dr. Monroe, LA 71203
Charter Communications Inc (Spectrum)*	www.spectrum.com	855.860.9068	5720 Bandel Rd NW, Rochester, MN 55901
Cirrinity (Wittenberg Telephone Company)	cirrinity.net	715.253.2111	104 W Walker St, Wittenberg, WI 54499
Community Antenna System Inc	comantenna.com	888.394.4772	1010 Lake Street Hillsboro, WI 54634
Country Wireless*	countrywireless.com	715.389.8584	205 W Willow Dr, Spencer, WI 54479
Ethoplex	www.ethoplex.com	262-252-9000	N115 W19150 Edison Drive, Germantown, WI 53022
Frontier*	frontier.com	844.817.0206	401 Merritt 7, Norwalk, CT 06851

HughesNet*	www.hughesnet.com	844.7.37.2400	11717 Exploration Lane, Germantown, MD 20876
LTD Broadband	ltdbroadband.com	507.369.6669	PO Box 3064, Blooming Prairie, MN 55917
Lumen	www.lumen.com	877.753.8353	3340 Peachtree Road NE Suite 200 Atlanta, GA 30326
Marquette-Adams Telephone Cooperative	www.marquetteadams.com	608-586-4111	113 N, 113 S Oxford St, Oxford, WI 53952
Mediacom Wisconsin LLC	mediacomcable.com	844.987.3260	100 N Marquette Rd Suite 116, Prairie du Chien, WI 53821
NetFortris*			
Norvado	norvado.com	800.250.8927	105 N Avon Ave, Phillips, WI 54555
Nsight	www.nsighttel.com	920.865.7000	122 S St Augustine St, Pulaski, WI 54162
Reach	reachconnects.com	715.298.4414	1710 Garfield Ave, Wausau, WI 54401
Solarus*	www.solarus.net	715.421.8111	440 E Grand Ave, Wisconsin Rapids, WI 54494
SonicNet Inc.	www.sonicnet.us	715.301.0600	103 N Railroad St, Eagle River, WI 54521
Starlink	www.starlink.com	888.479.9644	500 Center Ridge Dr Austin, TX 78753
TDS Telecom*	tdstelecom.com	855.220.2592	525 Junction Road Madison, WI 53717
T-Mobile US*	www.t-mobile.com	844.249.6310	12920 Se 38th St., Bellevue, WA, 98006
Union Telephone Company	uniontel.net	715.335.6301	W North St, Plainfield, WI 54966
US Cellular Corporation*	www.uscellular.com	800.819.9373	8410 W Bryn Mawr Ave, Chicago, IL 60631
Verizon*	www.verizon.com	800.922.0204	One Verizon Way, Basking Ridge, New Jersey 07920
Viasat*	www.viasat.com	844.702.3199	6155 El Camino Real Carlsbad, CA 92009

D. ADDITIONAL RESOURCES

ADDITIONAL PROGRAM DETAILS AND RESOURCES

Helpful Websites:

Broadband USA Program. The National Telecommunications and Information Administration's (NTIA) programs and policymaking focus largely on expanding broadband Internet access and adoption in America, expanding the use of spectrum by all users, and ensuring that the Internet remains an engine for continued innovation and economic growth. NTIA will implement a number of broadband programs including the BEAD program. The website is very helpful for staying informed about the most recent developments and updates concerning broadband programs.

https://broadbandusa.ntia.doc.gov/

Community Economic Development-UW Extension. The UW-Extension works to support communities by providing resources and training opportunities to increase broadband access.

https://economicdevelopment.extension.wisc.edu/topics/broadband/

Wisconsin Public Service Commission. The Wisconsin Broadband Office, part of the Public Service Commission, leads statewide efforts to expand broadband access, adoption, and affordability. WBO provides support to residents seeking internet access, manages broadband grant programs, compiles broadband service maps, and builds capacity through planning and outreach.

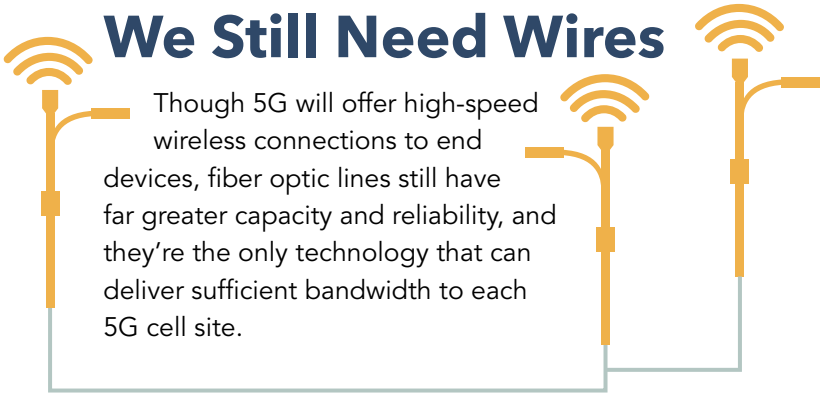
https://psc.wi.gov/Pages/ServiceType/Broadband.aspx

A Pocket Guide To 5G HYPE

5G, or "fifth generation" wireless, is a set of new standards and technological improvements that will enable faster wireless connectivity once implemented.

Compared to current 4G LTE networks, in which users connect to towers thousands of feet away, typical 5G networks require much more densely deployed infrastructure, with small cell base stations less than 1,000 feet from devices. The cell sites will be connected to each other and the broader Internet by fiber optic cables. 5G networks are being marketed both for mobile (e.g., cell phones) and fixed (e.g., home Internet access) uses and as smart city infrastructure.

We Still Need Wires



Though 5G will offer high-speed wireless connections to end devices, fiber optic lines still have far greater capacity and reliability, and they're the only technology that can deliver sufficient bandwidth to each 5G cell site.

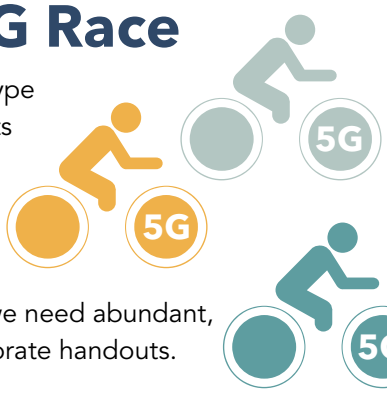
5G Won't Fix the Broadband Market

Competition is limited by economic considerations, not technology. 5G providers are unlikely to rival cable directly because big companies prefer to divide markets rather than engage in robust competition. 5G development won't open the market to new competition because only the biggest telephone companies, like AT&T and Verizon, have access to the volume of spectrum needed.

5G Won't Solve the Digital Divide

Since 5G connectivity relies on fiber optics that aren't available in many rural areas, these communities won't receive 5G access anytime soon. The same market reality discouraging investment in rural broadband will also discourage 5G investment. Even in urban areas, companies like AT&T and Verizon are unlikely to start investing in the low-income neighborhoods they have neglected for years.

There's No 5G Race



The "5G Race" is marketing hype designed to scare governments into giving companies large subsidies and consumers into paying a premium for prototype devices. To achieve widespread 5G deployment, we need abundant, open fiber networks, not corporate handouts.

This fact sheet is a response to the hype around 5G in the United States, primarily from the big wireless companies.

Community Networks

ILSR Institute for Local Self-Reliance

MuniNetworks.org | ILSR.org
Published August 2019

5G and Fiber-to-the-Home (FTTH) are complementary technologies that are each best suited to different applications.

	RELIABILITY	SPEED	AFFORDABILITY	BEST USES
5G	Requires line-of-sight. Trees, buildings, and sometimes weather can impact reliability.	Eventually more than 1 gigabit to devices in ideal conditions, but often slower based on environmental factors and congestion.	Mobile plans often have restrictive data caps with overage fees and throttling.	Well suited for mobile uses, like cell phones and smart transportation, in densely populated areas.
FTTH	Very reliable connectivity not impacted by environmental conditions.	No known limits on speed with providers commonly offering 1 gigabit or even 10 gigabits.	Varies by the provider with locally-based networks offering the best prices.	Ideal option for fixed Internet access at a home or business in both urban and rural areas, using Wi-Fi to connect most devices.

FCC Small Cell Order Hurts Local Control

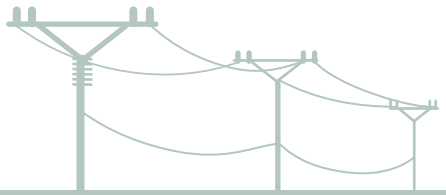
In late 2018, the Federal Communications Commission (FCC) adopted an Order that limits how municipalities and local governments can negotiate with carriers over 5G small cell deployments. By preempting local authority, the FCC has undermined the ability of communities to promote digital equity, to the benefit of national telecom companies.

Don't Fall for Big Telecom's 5G Hype

Wireless technologies like 5G are complementary to robust, wired networks. On their own, 5G networks will not achieve key goals, such as connecting rural America and closing the digital divide.

Additional Resources

- The Wireless Industry's 5G Hype is Funny and Overblown from New America
- Moving Toward 5G: What Cities Need to Know from Next Century Cities
- Guide to FCC Small Cell Order from Next Century Cities
- FCC Stomps on Local Control in Latest Small Cell Order from the Institute for Local Self-Reliance
- Dive Deep Into 5G with Mobile Expert Sascha Segan from Community Broadband Bits Podcast
- Straight Talk About 5G from Community Broadband Bits Podcast
- Will 5G end up leaving some people behind? from NBC News



Community Networks

ILSR Institute for Local Self-Reliance

MuniNetworks.org | ILSR.org
Published August 2019

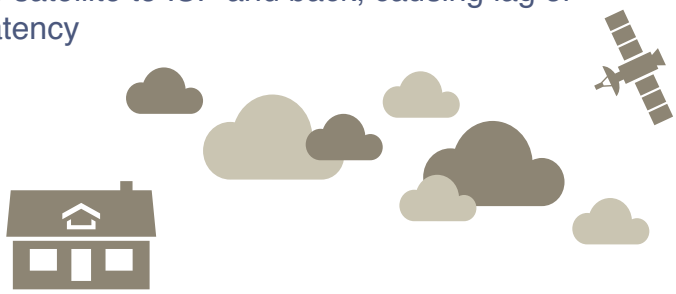
Satellite Is Not Broadband

In 1996, Congress recognized the need for both urban and rural communities to have high-speed Internet service and passed the Telecommunications Act to encourage deployment across the entire U.S. New technologies have helped bring high-quality connectivity to more people than ever before, but many rural Americans still don't have access to broadband.

High-quality connectivity needs to be fast, affordable, and reliable. Satellite is none of the three.

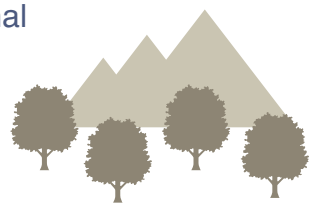
High Latency

- Signal travels long distance from home to satellite to ISP and back, causing lag or latency



Unreliable Connections

- Natural phenomenon, such as trees, hills, and clouds can interfere with signal
- Erratic performance and dropped connections are common

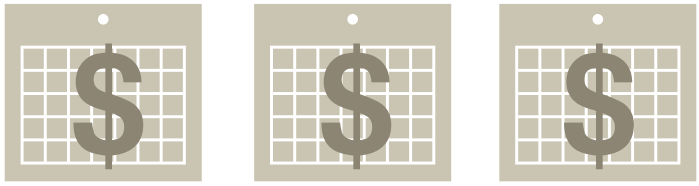


Slow Speeds

- Subscribers rarely reach minimum federal standards for broadband, regardless of advertising claims
- Maximum speeds require optimal conditions

Bad Service Plans

- Often require long-term commitments
- Service costs may increase after subscribers sign a contract
- Data Caps drive up the cost and interfere with subscribers' service until next billing cycle



"If it rains, or if it snows, or if they need to [listen to] a podcast or they want to watch anything educational, do research, listen to teachers online, they cannot do so because the connection ping time is so bad and on top of that, it uses too much of our plan…. Our kids can't do their homework at home."

— Gerald Pine, Retired USAF; Eureka Springs, AR
Comment to the FCC

Banner County, Nebraska.
Public Domain Image from Wikimedia Commons

Community Networks

ILSR Institute for Local Self-Reliance

September 2018

Rural areas need Internet access on par with urban areas.

Education

K-12 education in both rural and urban areas relies heavily on online resources. If satellite Internet service can handle the required upload capacity, uploading homework often uses up allocated data, driving up the cost of a family's plan. Rural kids who must rely on satellite Internet service are steps behind their urban peers.

Distance learning is a necessity when colleges and technical training programs are too far away from home. Satellite Internet access prevents rural residents from improving their economic opportunities through education.

Healthcare for Seniors and Veterans

Slow upload speeds prevent rural Americans from using telehealth applications if they depend on satellite Internet access.

Economic Development

Rural industries such as agriculture and food processing increasingly rely on high-speed Internet access for daily operations, including real-time commodity price reporting and Just-in-Time inventory management. Other companies seek out rural and exurban areas with fiber connectivity for large data centers and distribution centers. Satellite Internet does not have the capacity to meet the needs of these businesses.

Peaceful rural areas can also attract families, enhancing the tax base and strengthening the community. People can establish home-based businesses or work remotely, but satellite Internet access limits the ability to do so.

Calling Satellite Internet "Broadband" Means Leaving Rural Communities Behind

The fact that we can access the Internet using satellites is a triumph of technology. But it is better suited to truly remote locations, like in largely unsettled areas of Alaska and northern Canada. Satellite is not a long term solution for the vast majority of rural America that already has a wire running to the home for electricity. It may be useful while rural communities are waiting to be connected with better options, but embracing satellite as a long term solution condemns those regions to rapidly declining property values and few opportunities for economic development.

Franklin, Nebraska.
Public Domain Image from Wikimedia Commons

Community Networks

ILSR Institute for Local Self-Reliance

Broadband 101

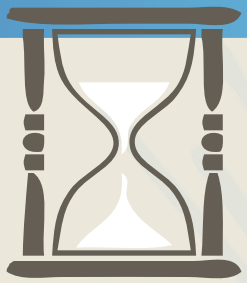
A handy guide to the **basics of broadband terminology** and **technology for policymakers and concerned citizens.**

ILSR
INSTITUTE FOR Local Self-Reliance

Basic Terminology

- **Bits** are the base unit of information in computing. Network speeds are usually measured in "bits per second"
  - 1 **Kilobit** (Kbps) = 1,000 bits transferred per second (bps) Dial-up connections are 56 Kbps
  - 1 **Megabit** (Mbps) = 1,000,000 bps; about 30 seconds to download an MP3 song
  - 1 **Gigabit** (Gbps) = 1,000,000,000 bps; about 10 seconds to download an HD movie
- **Bytes** are the base unit for file size and used in computing monthly caps
- FCC Definition of "**broadband**" is minimum speeds of 25 Mbps downstream and 3 Mbps upstream; many uses of connectivity require faster speeds than the minimum of 25/3
- **"Download"** is the speed, measured in bits, that your computer receives data
- **"Upload"** is the speed that your computer sends data
- **"Symmetric"** connections are comparable in upload and download speeds. DSL and cable often has upload speeds 5-10x slower than downstream. Businesses increasingly need symmetric connections to maximize productivity

Traditional Technology



- **DSL** uses the copper telephone lines to deliver access to the Internet. Common DSL downstream speeds are .5 to 6 Mbps, though they can get up to 40 for people living very close to the equipment that generates the signal. Upstream speeds are often below 1.5 Mbps and rarely exceed 4.
- **Cable,** fittingly enough, uses a cable network to deliver services. Speeds commonly vary from 6-30 Mbps download and 1-3 Mbps upload on standard tiers. Some cable companies offer 100 Mbps down and 10 Mbps up for a hefty premium. However, **cable networks are shared**, meaning you may not achieve the advertised speeds during periods of peak usage due to congestion from your neighbors.
- **Wireless** Internet access is a complement to wired connections, not a substitute. Many 4G networks have **caps that strictly limit usage**. For more on wireless, see our Wireless Fact Sheet.

http://muninetworks.org/content/wireless-internet-access-fact-sheet

Common Broadband Goals

- Faster speeds now
- Affordable service
- Reliable performance
- Universal access
- Scalable Networks (often fiber-optic) that allow capacity to grow as a rapidly as demand

Fiber Optics

- The Gold Standard.
- Basic idea: Lasers shoot pulses of light across very thin strands of glass.
- Fiber optic networks are **reliable**, **resilient**, and use technology that offers nearly **unlimited** expansion. They have fewer points of failure than copper and cable networks.
- Fiber strands last for **decades** and capacity can be increased by upgrading the lasers on each end without having to lay new fiber.
- The high cost of new fiber networks is mostly the labor to put the cables in place on poles or in conduit underground; operating costs are lower than for cable, DSL, or wireless networks.

Cable and DSL Are Inadequate

- 21st Century businesses require faster connections – "basic broadband" is not sufficient
- DSL/Cable technology is unreliable: Interrupted Service = Lost Revenue
- Cable and DSL advertise "up to" speeds – actually reaching those speeds is rare

"All the Internet-connected, data-hungry gadgets that are coming to market sent a strikingly clear message: we're going to need faster broadband networks."

FCC Chairman Genochowski, 2013

COMPETITION

- In many industries, market competition ensures good outcomes. Unfortunately, cable and Internet networks are, and will remain, largely uncompetitive.
- Most of us have two options at home for Internet access. DSL is the slow, less expensive option and cable a more expensive, faster option.
- Wired telecommunications networks are a **natural monopoly** - they have very high upfront capital costs and declining marginal costs. This makes **robust competition all but impossible**... and Wall Street knows it.

"We're big fans of [Comcast's] Video and High-Speed Internet businesses because both are either monopolies or duopolies in their respective markets."

SeekingAlpha.com, 2012

Learn More – Increase Your Understanding – Impress Your Friends, Neighbors, and In-Laws!

To learn more about broadband and the Internet, check out our other fact sheets, case studies, reports, podcasts, and more on **MuniNetworks.org**

Brought to you by the Institute for Local Self-Reliance at **ILSR.org**

ILSR
INSTITUTE FOR
Local Self-Reliance

WIRELESS INTERNET 101

ILSR
INSTITUTE FOR Local Self-Reliance

Wireless is the technology that today most resembles magic. We want to be mobile, not tethered. Our desires notwithstanding, the future of telecommunications is more complicated than simply removing wires.

Consider your home network. You likely use a Wi-Fi router to share a DSL or cable wired connection to your home. Even as wireless devices become increasingly common, most homes will still have a wired connection (ideally using fiber optics).

There is no single "wireless" technology. There are many different standards, speeds, and issues. Your phone may support 4G LTE, Wi-Fi, and Bluetooth – each is unique in capacity and limitations.

BASIC TERMINOLOGY

Spectrum: This is the entire range of electromagnetic wavelengths from the colors we see to frequencies used by radio and television broadcast stations. The Federal Communications Commission (FCC) regulates how the spectrum may be used and by whom.

Licensed spectrum: Specific ranges of radio wavelengths that may only be used by those holding licenses from the FCC. Technologies include 3G, 4G, LTE, WiMax, and others.

- **3G, 4G:** G is short for "Generation" of commercial cellular network. However, marketing departments have perverted these designations so the 4G used by AT&T is not the same as 4G used by Verizon, etc.
- **LTE:** "Long Term Evolution" is a wireless standard (4G) used by most cell phone companies to deliver cellular wireless services, most often to mobile phones.

Unlicensed spectrum: Specific ranges of radio wavelengths dedicated to a commons that anyone may use, often with power limits. Includes microwaves, garage door openers, Wi-Fi, cordless phones, and others.

- **Wi-Fi:** Sometimes confused with "wireless." Wi-Fi is a specific set of wireless protocols commonly used by computers and mobile devices. Many different firms manufacture Wi-Fi devices that meet standards to communicate with each other.

Fixed Wireless: Connects two non-mobile locations, such as between a house and tower. The antennas are often directional to allow higher power and faster speeds than used for mobile phones.

Data Caps: limits on the amount of data a device may use over a period of time.

KEY POINTS

Cell phones do not use satellites. The signal travels from your phone to an antenna, likely on a tower (as shown on left) within a few miles of your location.

Wireless networks require wires. When your cell phone connects to the tower, the signal travels via wires to a processing hub, then again via wires to another antenna to connect "wirelessly" to the call recipient.

Wireless networks require better fiber optic networks. The explosion of wireless demand requires higher capacity fiber optic connections to antenna sites. Wired and wireless networks complement each other; they are not substitutes.

Home Wi-Fi connections are often already faster than the Internet connection. Your wireless network may peak at 54 Mbps or more whereas your Internet connection may only be 5-10 Mbps.

REAL WORLD MEASUREMENTS

Today's mobile wireless technology alone does not meet our demand for fast Internet access. 4G wireless is slower than modern wired cable connections.

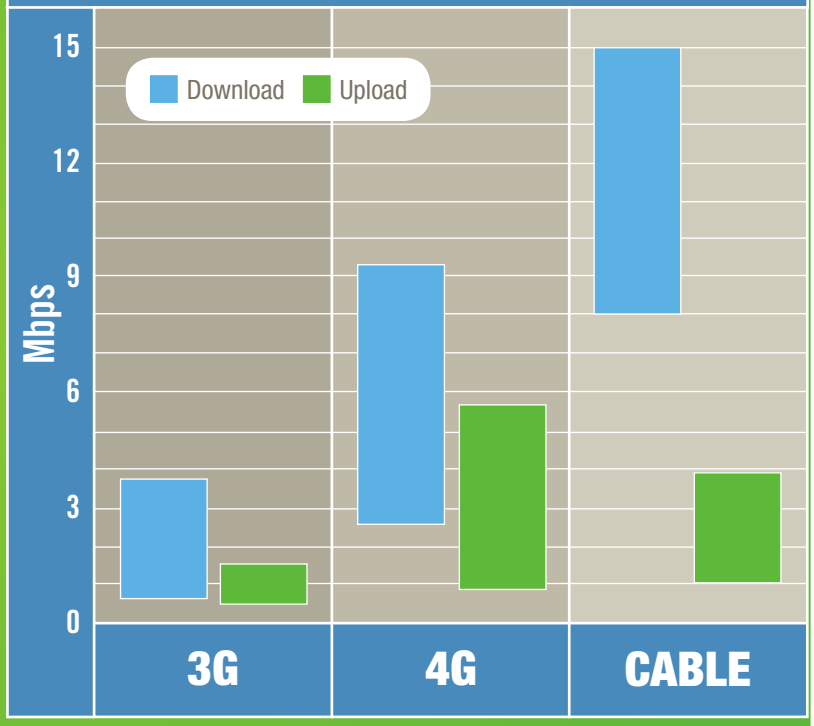
Though wireless speeds continue to improve, each tower is shared by many users whereas home wired connections are shared by comparatively fewer users. As a result, these wireless connections are unlikely to overtake modern wired connections in the home.

In 2012, PC World tested wireless Internet services from four mobile carriers in 13 U.S. cities. 3G was comparable to home DSL connections and 4G a bit slower than home cable connections. Both download and upload speeds were tested. Cable reference based on PC World tests of multiple cable companies' standard tier.

PC WORLD SPEED TEST RESULTS

3G Download / Upload	4G Download / Upload
Fastest: 3.84 / 1.44 Mbps	Fastest: 9.12 / 5.85 Mbps
Slowest: .59 / .56 Mbps	Slowest: 2.81 / .97 Mbps

COMMON SPEEDS (in Mpbs)



DATA CAPS

Wireless Internet providers often impose **data caps** that discourage subscribers from using certain applications, most notable streaming video. These are generally business decisions, not technical limitations. Nonetheless, they are a reason wireless is not replacing wireline connections at home.

Exceeding **data caps** results in overages or interruptions in service that make wireless alone an expensive solution for businesses that regularly transfer large amounts of data.

Wireless providers justify data caps as a means of managing **congestion**, but consumer advocate groups argue the real motivation is maximizing revenue. An analogy is trying to manage rush hour traffic jams by limiting how many miles one can drive per month.

WIRELESS LIMITATIONS

Objects such as trees, hills, and buildings can degrade wireless signals.

Satellite Internet service is wireless but is expensive and suffers from technical limitations. We have not found anyone subscribing to satellite Internet when a DSL or cable option was available.

Congestion can result when too many devices are attempting to share the same antenna. This can be resolved by deploying more antennas, each of which should have a fiber connection. Cities with ubiquitous fiber networks can offer better wireless options.

ADDITIONAL RESOURCES:

Collect all of our Internet-Related Fact Sheets at MuniNetworks.org/fact-sheets

Broadband Bits Interviews with Dewayne Hendricks

New America Foundation - Wireless Future Project

Public Knowledge - Mobile Innovation

Free Press - Save the Internet

For more information, visit MuniNetworks.org

@CommunityNets ; broadband@muninetworks.org

ILSR INSTITUTE FOR Local Self-Reliance

Next Century Cities

The Opportunity of Municipal Broadband

The Federal Communications Commission estimates that 21 million Americans don't have access to broadband internet (though this analysis has been widely proven to underreport the scale of the problem).[1] Municipal broadband networks provide an opportunity to connect the unconnected to the essential twenty-first century infrastructure. Over 500 municipalities have invested in creative public networks, using a variety of models to connect rural and underserved communities. Building a municipal network is rarely a community's first choice, but cities and towns have taken it upon themselves to connect residents to broadband when existing cable and telephone companies have chosen not to offer competitive services.

The Benefits of Municipal Networks

Municipalities use a variety of funding methods to build broadband networks. Most use funding mechanisms without direct taxpayer dollars, such as revenue bonds, loans, or Tax Increment Financing.

Longmont, Colo. financed its city-wide fiber network through revenue bonds, putting no financial burden on the taxpayer.[2] Residents in **Islesboro, Maine** voted to accept a slight property tax increase to finance the bond that paid for their fiber network. The cost of funding the bond was comparable to the price they had been paying for poor quality DSL service.[3]

For more information: How municipal networks are financed; Creative funding sources for fiber infrastructure

Municipal networks are not a small undertaking but can provide immense long-term benefits to a community even beyond improved internet access.

Chattanooga, Tenn.'s municipal network EPB not only retired its telecom debt, but revenues from fiber services were so high that the electric utility was able to forego several rate increases.[4] **Virginia Beach, Va.** leverages its fiber network to connect the city's government buildings, schools, fire stations, and more. By connecting these anchors directly as opposed to purchasing service from an ISP, the city saves at least $500,000 per year.[5] **Portland, Ore.** had been paying $1,310 per month per site to a private ISP to connect its schools. The district eventually switched to a publicly owned network, and was able to connect schools to a speed 40 times greater for just $616 per month per site.[6]

For more information: Municipal networks deliver local benefits; Community broadband creates public savings

Why We Need Broadband

Americans need access to broadband in order to start businesses, compete for jobs, complete homework assignments, apply for a mortgage, find a polling location, and much more.

Connecting Communities

Next Century Cities

The Benefits of Municipal Networks

Municipal networks provide the robust access necessary for job growth and economic development.

Lafayette, La.'s network helped attract new technology businesses to town, diversifying the local economy which had previously been dependent on oil and gas. In **Chattanooga**, the fiber network is estimated to have created up to 5,200 new jobs and up to $1.3 billion in economic and social benefits in the community between 2011-2015.[7]

Fiber utilities can drastically improve utility efficiency and city cost savings.

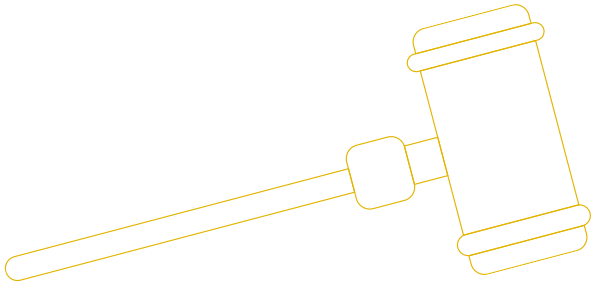
Lafayette's "smart" electric grid uses fiber to monitor power and alert the city when there's an outage. As a result, the average length of a power outage in **Lafayette** is one quarter the state average, which saves ratepayers about $25 million per year.

Locally owned networks are committed to local success.

Municipal networks are small, and the people who run them are members of the community themselves, creating a high level of visibility and accountability that is often not present with larger ISPs. Typically, the result is exceptional customer service, a vested interest in the community, and awards (see: Ammon, Id.; Longmont, Colo.; and Clarksville, Tenn.).

What's Holding Us Back

Municipal broadband networks present an opportunity to connect communities to this vital future-proof infrastructure —but many states have legislation in place that outright bans or de facto bars municipal networks from being built. Conservative analysis shows that over 11 million Americans—over half of the country's estimated unconnected population—who do not have access to broadband live in states where municipal networks are barred or outright banned by state legislation.



How States Can Help

States can facilitate connectivity by:

- Allowing local governments the authority to build and manage network infrastructure and offer broadband services
- Including municipal governments among eligible awardees in broadband grant and loan programs

Find more information about the hundreds of municipal broadband success stories from the Institute for Local Self-Reliance's Community Broadband Networks Initiative and from Next Century Cities.

Sources

[1] https://docs.fcc.gov/public/attachments/FCC-19-44A4.pdf
[2] https://muninetworks.org/content/longmont-prepares-vote-fiber-bonds-community-broadband-bits-episode-68
[3] https://muninetworks.org/content/islesboro-maine-finalizes-fiber-agreement-mainland
[4] https://muninetworks.org/sites/www.muninetworks.org/files/2017-05-TPA-boondoggle-rebuttal-final.pdf
[5] https://muninetworks.org/sites/www.muninetworks.org/files/2017-virginia-fact-sheet.pdf
[6] https://ilsr.org/wp-content/uploads/2012/11/fact-sheet-public-finance.pdf
[7] http://ftpcontent2.worldnow.com/wrcb/pdf/091515EPBFiberStudy.pdf

E. GLOSSARY

GLOSSARY

ADSL: Asymmetric Digital Subscriber Line - This is a type of digital communication technology used for transmitting digital data over traditional copper telephone lines. ADSL is a common method for providing high-speed internet access to homes and businesses. The term "asymmetric" in ADSL refers to the fact that it allows for different data transfer rates in the upstream (from the user to the internet) and downstream (from the internet to the user) directions. Typically, ADSL provides a much faster downstream speed compared to the upstream speed. This is because it is designed to cater to the typical internet usage pattern where users download more data (e.g., web pages, videos, and files) from the internet than they upload.

Backhaul: Backhaul refers to the part of a telecommunications network that connects the core or backbone network to smaller subnetworks or distribution points. It is a crucial component in the overall network infrastructure, as it facilitates the flow of data between various network segments, ensuring efficient data transport.

Bandwidth: commonly refers to the speed of internet service, measured in bits per second.

Broadband: Commonly refers to high-speed internet access that is always on and faster than traditional dial-up access. Broadband includes several high-speed transmission technologies, such as fiber, wireless, satellite, digital subscriber line, and cable. For the Federal Communications Commission (FCC), broadband capability requires consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps.

Broadband Adoption: The use of broadband in places where it is available, measured as the percentage of households that use broadband in such areas.

Broadband Serviceable Location (BSL): a business or residential location in the United States at which mass-market fixed broadband Internet access service is, or can be, installed.

CO: Central Office - is a facility used by a telecommunications service provider to manage and distribute telecommunications services, including landline telephone, broadband internet, and sometimes other services like DSL, ISDN, or traditional fax services. These central offices play a critical role in connecting customers to the larger telecommunications network.

Dark Fiber: Unused fiber infrastructure that has not been "lit" with Internet service. When someone is building a fiber network, the cost of adding more fiber than immediately required is negligible and the cost of having to add more fiber later is very high. Therefore, many include dark fiber in projects – fibers that can be leased to others or held in reserve for a future need.

Digital Divide: The gap between those of a populace that have access to the internet and other communications technologies and those that have limited or no access.

Digital Equity: Parity in digital access and digital skills that are now required for full participation in many aspects of society and the economy. Digital equity links digital inclusion to social justice and highlights that a lack of access and/or skills can further isolate individuals and communities from a broad range of opportunities.

Digital Inclusion: Access by individuals and communities to robust broadband connections; internet-enabled devices that meet user needs; and the skills to explore, create, and collaborate in the digital world. Digital inclusion programs can be used to promote digital equity.

Digital Literacy: The ability to leverage current technologies, such as smartphones and laptops, and internet access to perform research, create content, and interact with the world.

Download Speed refers to the rate at which digital data is transferred from the Internet to a computer. How quickly you receive online data like texts, images, and videos is based on download speed.

DSL: Digital Subscriber Line - DSL refers to a technology that provides high-speed internet access over traditional copper telephone lines. It allows for a faster internet connection than dial-up and is a common method for broadband internet access in many areas.

FTTC: Fiber to the Curb (or Cabinet) - It is a broadband internet service delivery architecture that combines fiber-optic technology with traditional copper or coaxial cables to provide high-speed internet access to homes and businesses.

FTTH: Fiber to the Home - It is a type of broadband internet service delivery architecture that uses optical fiber cables to provide high-speed internet access directly to residential homes and businesses.

FTTN: Fiber to the Node - It is a broadband internet service delivery architecture that combines fiber-optic technology with traditional copper or coaxial cables to provide high-speed internet access to homes and businesses.

FTTP: Fiber to the Premises – same as FTTH is a broadband internet service delivery architecture that provides high-speed internet access by extending fiber-optic cables directly to residential homes, businesses, or other types of properties.

Gbps: Gigabits per Second - It is a unit of data transfer speed used to measure the rate at which data is transmitted or received over a network or data connection. A gigabit is a unit of digital information that represents one billion individual bits.

Gig- Shorthand for 1 gbps (1,000 mbps) download speeds. More colloquially, a speed fast enough that any number of applications can use the network without creating congestion.

HFC: Hybrid Fiber-Coaxial – same as FTTN

Internet Service Provider (ISP): an entity that provides access to the internet and the services available, which a customer buys internet from.

IoT: Internet of Things - It refers to a network of physical objects or "things" that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the Internet. These objects can be everyday items such as appliances, vehicles, wearable devices, industrial machines, or even buildings.

Jitter: Jitter refers to the deviation or variability in the timing or periodicity of a signal or event. It is commonly used in the context of digital data transmission, electronics, and telecommunications. Jitter can manifest as small, random variations in the timing of signal edges, which can lead to problems such as data errors or reduced performance in various systems.

Latency: is a measure of the delay or lag in data communication over the internet or any other network. It represents the time it takes for data to travel from the source (sender) to the destination (receiver) and back. Latency is typically measured in milliseconds (ms).

LOS: Line of Sight - refers to the unobstructed and direct path between two points that enables visual or electromagnetic communication. Line of sight is important in fields like wireless communication and optical communication, where obstacles or terrain can block signals.

Mbps: Mbps: Megabits per Second - t is a unit of measurement used to express data transfer speeds in telecommunications and computing. Megabits per second measure the rate at which data is transmitted or received over a network or data connection. A megabit is a unit of digital information that represents one million individual bits.

PING: Packet Internet Groper - When you PING a host, your computer or device sends a small data packet to the target host's IP address and waits for a response. The primary purposes of using the PING command are checking network connectivity and measuring latency.

Public Service Commission (PSC): an agency responsible for the regulation of Wisconsin public utilities, including those that are municipally owned. The PSC staff's the Wisconsin Broadband Office (WBO), which leads statewide efforts to expand access, adoption, and affordability. WBO provides support to residents seeking internet access, manages broadband grant programs, compiles broadband service maps, and builds capacity through planning and outreach.

RF: Radio Frequency refers to the range of electromagnetic frequencies that are commonly used for wireless communication and broadcasting. RF waves are a type of electromagnetic radiation, which includes various forms of energy traveling through space in the form of oscillating electric and magnetic fields. RF waves occupy a specific portion of the electromagnetic spectrum, typically ranging from about 3 kilohertz (kHz) to 300 gigahertz (GHz). This range includes frequencies commonly used for radio broadcasting, television, cellular communication, Wi-Fi, and many other wireless technologies.

SDSL: It is a type of digital communication technology that provides high-speed internet access over standard copper telephone lines. Unlike Asymmetric Digital Subscriber Line (ADSL), which offers different upload and download speeds, SDSL provides equal upload and download speeds. This symmetry is particularly advantageous for businesses and applications that require consistent data transfer rates in both directions.

SVI: Social Vulnerability Index (SVI) is a widely used tool in the field of disaster management and public health that assesses the vulnerability of communities to various natural and man-made hazards. It was developed by the Centers for Disease Control and Prevention (CDC) in the United States and is primarily used for disaster preparedness, response, and recovery efforts.

Upload Speed: refers to the rate at which online data is transferred from a computer to the Internet. Sending emails, video calling, and uploading pictures to the internet requires good upload speed.

VDSL: Very-high-bit-rate Digital Subscriber Line - It is a type of digital subscriber line (DSL) technology used for high-speed internet access over traditional copper telephone lines. VDSL is an improvement over earlier DSL technologies like ADSL (Asymmetric Digital Subscriber Line) and SDSL (Symmetric Digital Subscriber Line) in terms of data transfer rates.

Wi-Fi: a technology that produces a wireless local area network allowing a computer or other device to connect to the internet wirelessly. Equipment in the device communicates with the Wi-Fi router, which is connected to the network with some type of physical cable or wire. Examples include the Wi-Fi in a home or hotspot at a coffee shop.