

BROADBAND BREAKTHROUGH:

INFRASTRUCTURE PLANNING TOOLS for RURAL FARMING COMMUNITIES

by ANN TREACY

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Broadband Delivers Opportunities
and Strengthens Communities

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EXECUTIVE SUMMARY

Imagine you live in a rural community where your kids cannot access a remote classroom or do homework online while you try to log into work because your home does not have the broadband connectivity it needs. Your cell phone does not work a quarter mile outside of town. And, on a snowy day, no one can participate in school or work via Zoom because the only options for broadband are wireless or satellite and both are impacted by weather. You have heard about fiber-optic networks being deployed, but they pass you by every time. You realize broadband deployment is not going to happen in your community unless you get involved. With \$42.45 billion in federal funding coming from the Infrastructure Investment and Jobs Act to the states, now is the time to act.

This report follows the journey of five rural counties in Illinois (Edgar, Hancock, McLean, Ogle, and Schuyler) that did just that—they enrolled in the Broadband Breakthrough community engagement and broadband planning program and used the resources and open-source tools the program provides to pursue a better broadband future.

The program focuses on **rural farming communities** because today, broadband is a necessary tool to innovate farming practices and allow for sustainable, targeted, and efficient resource use. Agriculture production is poised to enjoy a significant productivity increase with the use of technology and data management. But what is known as “precision agriculture” is constrained by lack of access to high-performance broadband service. Farmers need connectivity in the farmhouse, in the farm office, and in their fields to increase crop yields and quality while more efficiently using inputs like fertilizers, pesticides, and irrigation water. And farming communities need broadband to benefit from online applications in health, work, and learning, to spur economic development, and to enhance quality of life. Inadequate broadband limits productivity and growth, and, according to the United Soybean Board’s 2023 [strategic plan](#), it hinders “the ability of farmers to connect to markets, information, and each other.”

Current measures of internet access have not accurately captured the scope of the rural broadband problem, nor do they help chart a path forward.

With support from the **United Soybean Board**, the Benton Institute for Broadband & Society gathered collaborators for *Broadband Breakthrough* who helped communities understand their broadband needs, assets, and options. Benton’s other community engagement and broadband planning program in Illinois, [Accelerate](#) (which Benton has rolled out in four additional states), relied on many of the same relationships and methods:

- The **Illinois Broadband Lab**, a collaboration driven by the **Illinois Office of Broadband** and the **University of Illinois System**, presented **maps** of where robust broadband is and is not in these five counties so communities and their chosen internet service providers can focus on where to build reliable networks capable of robust download and upload speeds.
- **University of Illinois Extension** helped communities create **surveys** that asked residents about the quality of their broadband service, including speeds. Illinois Extension analyzed survey results for the communities and educated them on how to use the data.

For the first time, these surveys directed specific questions to farmers about applications they use that rely on broadband and whether the quality of broadband impacted that work. Surveys

also asked farmers about their willingness to host fixed-wireless equipment on a grain elevator or other vertical asset on their farm.

For *Broadband Breakthrough*, we introduced new resources to communities through two additional research collaborators:

- A research team at **Illinois State University (ISU)**, through funding support from the **Illinois Innovation Network**, provided two open-source tools:
 - **Tool I** helped communities quantify the value of high-performance broadband based on its impact on the farming economy. This demonstration of the positive impact robust broadband has on soy and corn production can help farmers and farming communities justify investments and plan and leverage infrastructure to deploy precision agriculture tools.
 - **Tool II** mapped vertical assets that might be used while deploying broadband networks. Communities were able to match these GIS maps with Illinois Extension survey results.
- A **Wireless Research Center** report helped communities assess the benefits and challenges of various modes of wireless broadband in a rural setting as a supplement to wired connectivity.

Finally, **Illinois Soybean Association** became an invaluable partner introducing Benton to the ISU researchers, fostering a relationship with the Illinois Farm Bureau, providing convening space and support, leveraging its network of 43,000 soy farmers for essential communications outreach, and providing future funding for continuation of the *Broadband Breakthrough* program in Illinois.

The five Illinois farming counties gathered team members who, over the course of the 16-week program, became community broadband champions. They took their understanding of local needs, assets, politics, and appetite for risk and combined it with program tools and resources and their newfound knowledge about broadband technologies, local providers, business partnership models, and funding sources. The result: a community broadband action plan that will guide each county's next steps on their broadband journeys, including undertaking feasibility studies that will determine the cost of deployment.

Broadband deployment is a timely topic, as unprecedented federal funding is funneling to the states and will be invested in building networks within the next five to seven years. This report offers a close look at the planning these five communities have undertaken to find provider partners to apply for grant funding to build better networks. The **Illinois Office of Broadband**, as well as other state offices of broadband, encourage and, in fact, reward community involvement and support in infrastructure funding applications.

The goal of *Broadband Breakthrough* and this report is to help other rural farming communities understand the value of improved broadband access—and the resources, tools, and work required to get better broadband and chart a path for smart farming.

Those who do not prepare and encourage investment in their communities will be in danger of continuing to watch fiber pass them by and resources go to other communities.

INTRODUCTION: THE IMPORTANCE of BROADBAND in RURAL COMMUNITIES

Access to broadband provides economic development opportunities, allows children to learn from home during a pandemic or a snow day, and helps people access health care remotely. But in rural communities, broadband access takes on special significance because of its potential impact on farming economies.

Farmers make money in pounds and bushels. For example, a hog farmer sells direct to market or public auction; the goal is to get more pennies per pound. For corn and soybeans, it is dollars for bushels per acre. The goal is the same: to get the best price per unit. Unfortunately, many key factors that determine the price per unit are out of the farmer's control: weather and market price, which both can be fickle. Precision agriculture focuses on conserving resources and maximizing control where possible; each penny a farmer can save producing and processing their product makes a difference.

Precision agriculture is the science of improving crop yields by supporting real-time decision-making based on technology sensors and analysis tools. Precision agriculture gives farmers a power unimaginable just a few years ago: greater control over inputs and outputs as they measure the impact in real time.

As noted in the Benton Institute for Broadband & Society's 2020-2021 project, *The Future of American Farming: Broadband Solutions for the Farm Office, Field, and Community*, new inventions and practices in agriculture in the past 90 years have allowed yield to increase by 400 percent while inputs have remained relatively flat. New inventions today often require broadband. And high-speed internet gives access to real-time data, such as market prices and weather forecasts, which are also important for farm decision-making. Data collected by precision technology may need to be aggregated and uploaded for analysis before the information can become actionable. Yet 60 percent of U.S. farmers and ranchers do not believe they have the broadband they need to run their businesses.

A final report to the United Soybean Board (USB) for *The Future of American Farming*, suggests that USB, Qualified State Soybean Boards, and farm bureaus can “play a role in inviting farmer leaders to participate in crucial community engagement efforts so that this critical sector can have a voice in how the billions of federal dollars for broadband deployment and adoption will be spent.” Broadband Breakthrough introduces tools that support farmers and invites them to be a part of this community engagement and broadband planning process. Several farm bureau managers were active in their community leadership teams, and precision agricultural topics helped farmers and other community members appreciate the importance of broadband to farming industries.

Farming communities understand the increasing importance of broadband to the agricultural economy, but they are challenged by current internet service provider return on investment (ROI) models. In an urban or suburban model, cost and ROI are calculated based on population density.

Future of American Farming

The Future of American Farming: Broadband Solutions for the Farm Office, Field, and Community looks at how and why farmers and farming communities need better broadband:

Broadband is not an end in and of itself; instead, the transformative power of broadband lies in its ability to connect users to solutions. A broadband connection to a rural farm not only improves the farmer's ability to use precision agriculture in the field, but also increases her opportunities for remote training, telemedicine, and social connection in the farm office. A farmer's family can use that connection, too, for remote school days and telework opportunities, just like any other family. In the community, that network might enable new jobs and businesses and improve access to health care resources. Gerard Hayes, CEO of the Wireless Research Center of North Carolina, points out that "as you broaden the applications, you can lessen the cost of deployment."

But the impact of broadband on the farm will be felt beyond the farm:

By 2050, the world will need to increase its food supply by 70 percent to 100 percent to meet food demand. Robert Tse, senior policy adviser to the United States Department of Agriculture, identifies why this will be a challenge: "There's only two ways you're going to meet that demand. It's either you have more land—which we don't have, and in fact the amount of land in the United States is shrinking—or you increase yield." Increased yield, he argues, will have to come from broader adoption of precision agriculture.

It behooves all of America to make choices that support rural areas and farming communities, and *The Future of American Farming* sets out specific recommendations to expand broadband, improve use, and meet the needs of the whole country.

A provider looks at how many locations or passings can be served in a square mile, the cost to get broadband to those homes and businesses, and then the potential return based on how many of those locations will become subscribers.

The equation is different in rural areas because there are fewer potential subscribers per square mile and the needs of those subscribers are different. As *The Future of American Farming* notes, large telecommunications providers, accountable to their shareholders, have not had the market incentives to build out or upgrade infrastructure in much of rural America, absent large federal subsidies.

According to Jade Piros de Carvalho, director of the Kansas Office of Broadband Development, "Viewing 'efficiency' only through the lens of cost-per-passing ignores the disproportionate economic gains that

"Viewing 'efficiency' only through the lens of cost-per-passing ignores the disproportionate economic gains that broadband can bring to rural areas."

broadband can bring to rural areas." With broadband, residents have access to teleworking, telehealth, remote education, and smart agriculture. With telework, more—and more diverse—jobs are available. Telehealth eliminates long drives to health care facilities and provides an alternative when local hospitals close. With remote education, people in rural communities can attend college without moving away, which can be a

boon if there are family or farm responsibilities to attend to and there are no higher-education options close to home. "Farmers' operations are increasingly dependent on broadband-enabled equipment for real-time access to markets, applications of inputs, and the ability to sell products," says Piros. Broadband brings the world to rural citizens without taking away the rurality of the community—a job in a big industry is available via remote work without a big company moving to town.

SECTION I

CHARTING a PATH FORWARD for RURAL FARMING COMMUNITIES: INTRODUCTION to the PLANNING TOOLS

As part of community engagement and education over the 16-week program, Broadband Breakthrough introduces two open-source planning tools that can help agricultural communities see the economic value of broadband, accurately assess their existing broadband infrastructure, and plan a level of service optimal for residential and agricultural needs.

A team of Geographic Information System (GIS) experts from Illinois State University's Department of Geography, Geology, and the Environment created new broadband infrastructure planning tools with support from the Illinois Innovation Network's Sustaining Illinois Seed Funding program. Broadband Breakthrough field-tested these tools in the five Illinois pilot communities. Having been tested in Illinois, the open-source tools are available across the United States.

Tool I, *Quantifying Agricultural Production in Areas Unserved and Underserved by Broadband*, demonstrates and maps the impact of robust broadband on current soybean and corn crop production to encourage investment in rural areas. The tool quantifies the difference high-speed broadband can make in increasing output—measured in bushels and dollars.

Tool II, *Mapping Vertical Assets*, maps existing vertical assets that may be utilized to help offset deployment costs and support wireless network infrastructure to expand broadband availability, particularly in farmers' fields.

ISU's tools provide farmers and community leaders with resources that can help leverage broadband investment to improve agricultural productivity and address other community connectivity challenges.

ILLINOIS STATE UNIVERSITY (ISU) TOOL I: UNDERSTANDING the ECONOMIC VALUE of BROADBAND

As part of the federal Infrastructure Investment and Jobs Act (IIJA), the National Telecommunications and Information Administration (NTIA) is distributing \$42.45 billion in Broadband Equity, Access, and Deployment (BEAD) Program funds to states and territories. They are explicitly charged with creating plans to make sure every business or residential location has access to broadband.

While these teams understand the value of broadband access to the local and state economies, they nevertheless had to convince some in their communities that public money spent on broadband is an investment worth making. The five counties used the ISU tools to convey the value of broadband to agriculture so community members and local policymakers could easily appreciate the potential upside regardless of their expertise or relation to the agriculture sector.

In an overview from ISU researcher John Kostelnick, the creator of Tool I, he discusses the reasons the geographic and economic analysis of corn and soybean production can be helpful to communities. “An important consideration as broadband priorities are determined is the additional economic gain that might result in rural areas due to additional crop production resulting from precision farming

that requires fast and reliable internet speeds for data upload and download in farm operations,” says Kostelnick. “In other words, how much additional economic productivity may be realized annually in unserved and underserved areas if [fixed wireless] broadband access is expanded for farmers to utilize precision agriculture to its fullest potential?”

The IIJA defines an area as “unserved” if there is no internet access service offered at 25 Mbps download and 3 Mbps upload (25/3 Mbps) or above. An “underserved” location has broadband service above 25/3 Mbps, but below speeds of 100/20 Mbps.

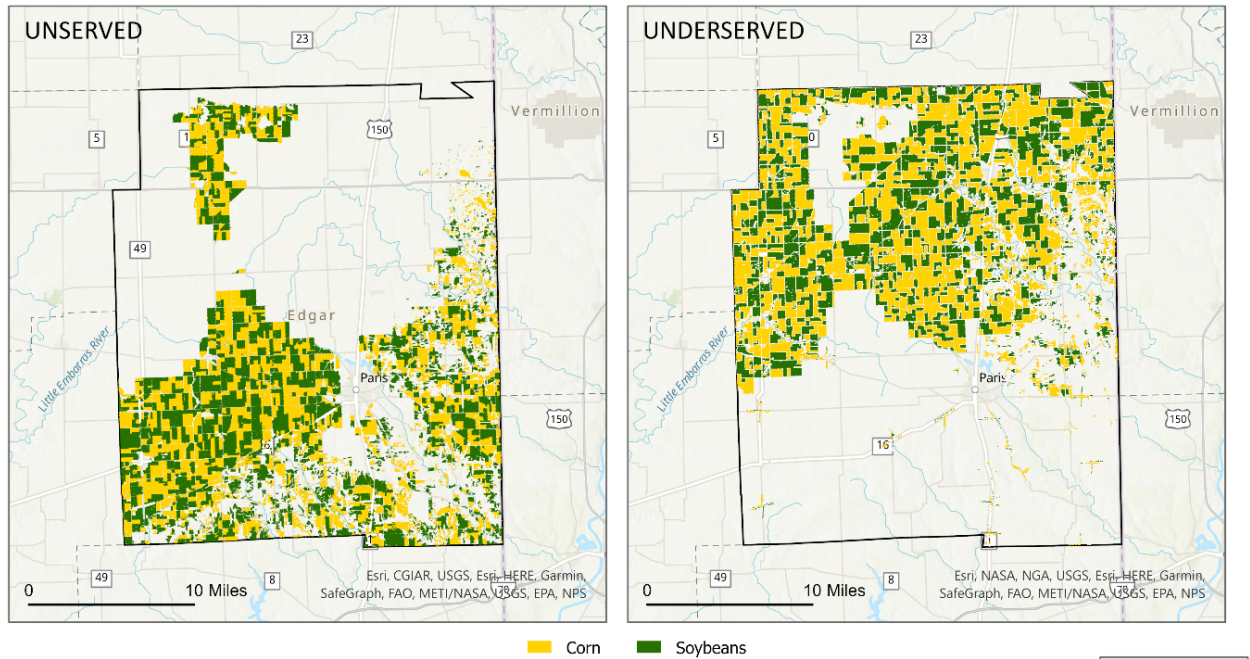
Kostelnick created maps for each of the five Broadband Breakthrough counties. Each county used the analysis to help spur its planning, knowing that a demonstration of the impact of robust broadband on current crop production can help farmers and farming communities justify investments in both time and money as they plan and leverage infrastructure to deploy precision agriculture tools.

Because this tool is open source, “the methodology may be adapted by communities who wish to assess the agricultural gains that may accompany expansion of broadband coverage,” concludes Kostelnick.

Tool I Example: The maps below show areas that are unserved (left map) and underserved (right map) by broadband. They also show areas that produce corn (yellow) and soybeans (green). The tables spell out the economic growth the county would realize if broadband access were improved in these areas, assuming increased average yields of 3.6 percent for corn acres and 3.8 percent for soybean acres, following the findings of [LoPiccolo \(2021\)](#).

The results are stunning, for instance, in Edgar County: with a population of 16,500, the model predicts that the county would see a \$10,656,654 increase in output each growing season.

EDGAR COUNTY (2021)



EDGAR COUNTY

| | Current Production | | Additional Production | | | Current Production | | Additional Production | |
|--------------|--------------------|-------------------|-----------------------|--------------------|-----------------|--------------------|-------------------|-----------------------|--------------------|
| | Acres | Bushels | Bushels | Value | | Acres | Bushels | Bushels | Value |
| CORN | | | | | SOYBEANS | | | | |
| Unserved | 68,920 | 14,328,548 | 515,828 | \$2,785,470 | Unserved | 71,051 | 4,916,755 | 186,837 | \$1,997,284 |
| Underserved | 88,056 | 18,306,822 | 659,046 | \$3,558,846 | Underserved | 82,356 | 5,699,015 | 216,563 | \$2,315,054 |
| Total | 156,976 | 32,635,370 | 1,174,873 | \$6,344,316 | Total | 153,407 | 10,615,769 | 403,399 | \$4,312,338 |

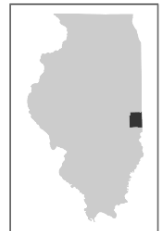


FIGURE 1: Illinois State University (ISU) Tool I: Map for Edgar County (Additional maps for Hancock, McLean, Ogle, and Schuyler counties are available in ISU's [Quantifying Agricultural Production in Areas Unserved and Underserved by Broadband report](#).)

These estimates are conservative because they only consider additional yields from corn and soybean production and do not quantify gains for other agricultural industries (e.g., dairying, livestock). The estimates also do not include broader economic gains, such as increased overall gross domestic product or employment growth, which can also accompany broadband expansion in rural counties (Spell and Low 2021). Likewise, the estimates do not account for labor savings and time efficiency in operations for the farmer, who may otherwise need to transmit data manually in precision agriculture operations in the absence of reliable internet that facilitates seamless, uninterrupted data upload and download to and from the cloud. More broadly, the estimates do not consider the non-economic benefits of broadband, such as environmental gains that may result with increased precision agriculture due to reduced use of fertilizers and pesticides and improved water management.

Even with these caveats, the potential increase in value paints a compelling picture using 2021 data across the five Illinois pilot counties:

| COUNTY | ADDITIONAL PRODUCTION VALUE - CORN - | ADDITIONAL PRODUCTION VALUE - SOYBEANS - | TOTAL ADDITIONAL VALUE |
|-----------------------------|--------------------------------------|--|------------------------|
| EDGAR | \$ 6,344,316 | \$ 4,312,338 | \$ 10,656,654 |
| HANCOCK | 4,983,905 | 3,296,469 | 8,280,375 |
| McLEAN | 7,291,381 | 5,035,828 | 12,327,209 |
| OGLE | 6,969,762 | 2,386,371 | 9,356,133 |
| SCHUYLER | 1,283,122 | 875,981 | 2,159,103 |
| TOTAL for 5 COUNTIES | \$ 26,872,486 | \$ 15,906,987 | \$ 42,779,474 |

TABLE 1: 2021 Additional Production Value of Corn and Soybeans With More Robust Broadband

The Future of American Farming examines the value of broadband in farming and how savings can accrue with the use of precision agriculture. For example, yield monitors, mounted on combines using wireless connections, which measure the amount and location of material harvested moving through the machine, can be used to create yield maps. These yield maps are then downloaded to operations centers. In the spring, the same yield maps are uploaded to the planter, which can then use them to optimize seed placement. That cooperation between machines can save 10 percent on seed placement costs. Farmers can now use John Deere’s See & Spray technology (as well as other drone technology under development) to disperse herbicide only when and where weeds are detected, reducing herbicide use by 77 percent on average. These technologies not only save farmers money but also reduce the risk of chemical damage to the environment—but only if they have the data connectivity needed for utilization.

ILLINOIS STATE UNIVERSITY (ISU) TOOL II: MAPPING VERTICAL ASSETS

“Expanding broadband internet coverage to farmers and residents in rural areas is a complex challenge that likely will involve many different technologies and creative strategies,” says ISU’s Jonathan Thayne, the creator of Tool II.

“One solution,” Thayne says, “is to connect tall structures to a broadband network from which a signal can provide wireless coverage to multiple farms with internet repeaters. In this regard, line-of-sight wireless signals broadcast from vertical assets with adequate line-of-sight may be beneficial for spanning middle-mile and last-mile connections to allow tractors and farm implements to download and upload necessary data needed to support precision agriculture.”

ISU helped each *Broadband Breakthrough* county identify high points—such as silos, barns, and towers—and map these “vertical assets.” Some of these high points are privately owned or leased; others, such as cell towers, are owned by private companies or local governments. The method employs the use of visible/near-infrared aerial imagery and Light Detection and Ranging (LiDAR) data, both of which are collected regularly by state governments in partnership with federal agencies and are often freely available throughout the United States. The methodology may be adapted by communities who wish to identify and map vertical assets as part of a broadband planning process.

Tool II Example: ISU created a web map for each county to identify vertical assets on high-resolution imagery and other base maps. The web map includes an interactive tool to filter vertical assets based on a specific height range. Each web map also includes a catalog with example vertical assets found in the county, a picture of each asset type, and height ranges that can be used to identify specific types of assets through the filter tool available in the web map.

Once created, the counties can see where potential assets are located and can layer these maps with their community surveys and speed test results. With these maps, they can determine which assets are in areas unserved or underserved by broadband. The surveys even track residents who have indicated that they would be willing to provide access to assets on their land to improve local broadband service.

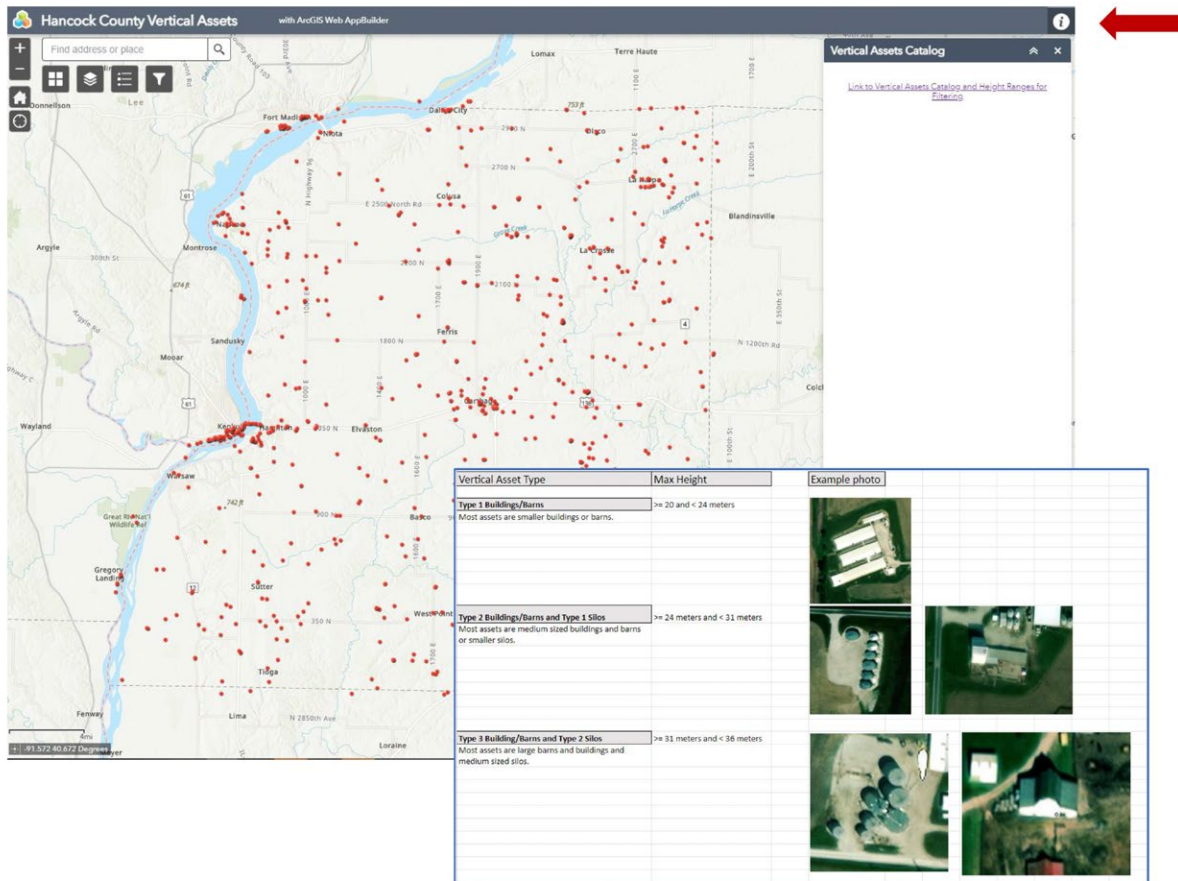


FIGURE 2: Image from Vertical Asset Map for Hancock County

WIRELESS RESEARCH CENTER REPORT: WIRELESS CONNECTIVITY OPTIONS

All the pilot communities received a crash course on the various modes of wireless broadband and the signal strength of each from the Wireless Research Center (WRC), a research partner in Broadband Breakthrough. The WRC helped the teams learn that the modern farm requires mobile connectivity and that extension of that connectivity beyond the home or farm office can best be achieved by wireless networks.

The WRC examined the characteristics of different wireless options with an eye toward defining which uses are best for farming communities. There are numerous solutions, from commercial cellular carriers including 5G and LTE (long-term evolution) to private systems (Citizens Band Radio Service, or CBRS) to provide that connectivity. The WRC’s report, [*Wireless Technologies for Rural Farming Communities*](#), goes into greater detail on each technology and how they meet different needs.

| TECHNOLOGY | TYPICAL RANGE | BANDWIDTH (DOWNLINK) | COST |
|---------------------------|-----------------------------|----------------------|-------------|
| 4G LTE | 25 MI (MAX) | 35 MBPS TYPICAL | \$\$ |
| 5G | | 70 MBPS TYPICAL | \$\$ |
| WIMAX (FIXED WIRELESS) | 4-6 MI TYPICAL; UP TO 30 MI | 30-40 MBPS | \$\$ |
| WI-FI | 150’ INDOOR; 300’ OUTDOOR | 20 MBPS | \$ |
| LORA | 3 MI (URBAN); 10 MI (RURAL) | 27-253 KBPS | \$ |
| BLUETOOTH | .25 MI | 125 KBPS-1 MBPS | \$ |
| CBRS | 6-20 MI | 20-200 MBPS | \$\$-\$\$\$ |

TABLE 2: Comparison of Wireless Technologies’ Range, Data Rates, and Relative Cost

Whether on vehicles, farming equipment, or remote sensors, there is a need for voice and data connectivity over the reach of the entire farm. At the heart of the farm network is the broadband connection, usually at a fixed location. Each farm’s solution will be unique based on requirements, technology availability, and economics.

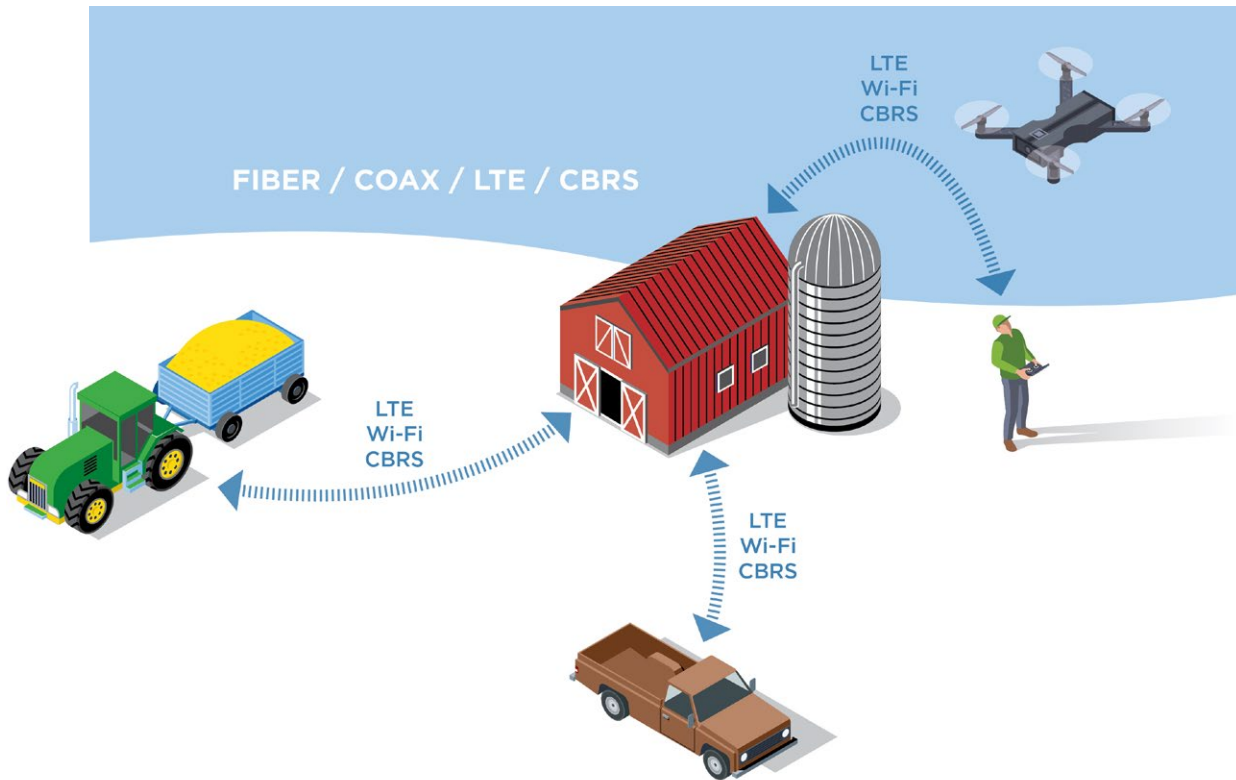


FIGURE 3: Wireless Connectivity on the Farm

There are numerous options for providing wireless connectivity on a farm. The right solution depends on each farm's unique requirements and economics.

In *Broadband Breakthrough*, the communities learned about the challenges and opportunities of wireless networks. The good news is that they can be deployed more quickly and less expensively than fiber. And even where fiber networks are already available, wireless networks provide mobility that is essential to precision agriculture.

The maps and knowledge are powerful tools for creating a tangible plan for better broadband. The maps make conversations with potential providers easier. Knowledge evens the playing field for negotiation and planning.

SECTION II

FIELD TESTING the PLANNING TOOLS THROUGH the *BROADBAND BREAKTHROUGH* PROGRAM

This engagement and planning process opens the door for a more robust discussion around resource allocation decisions at the local and state levels by reframing the debate and ensuring a level playing field for rural agricultural communities.

The Illinois State University (ISU) Tool I provides a strong, measurable economic rationale for broadband infrastructure investment in rural farming communities, and the ISU Tool II and the WRC report provide ways to facilitate better wireless and cellular connectivity in farmers' fields.

The *Broadband Breakthrough* program provided county leaders a process by which to field-test and validate the usefulness of these resources in select rural farming counties in Illinois through an education and engagement program intended to begin the process of planning and assessing the costs of broadband infrastructure investments.

This engagement and planning process opens the door for a more robust discussion around resource allocation decisions at the local and state levels by reframing the debate and ensuring a level playing field for rural agricultural communities.

THE *BROADBAND BREAKTHROUGH* PROGRAM

We followed five communities as they worked together during the *Broadband Breakthrough* process to create a plan to build better broadband networks. The communities met weekly for 16 weeks and succeeded in accomplishing the following. Communities

- Built and convened a local leadership team to drive and champion broadband;
- Modified and distributed community broadband surveys, including speed tests, to measure needs and collect personal stories, using the post-survey data analysis provided by Illinois Extension to guide their broadband action plans;
- Gained an understanding of the local marketplace by examining Illinois broadband maps, county maps of agricultural production areas that are unserved and underserved by broadband, and vertical asset mapping tools to outline potential fixed wireless network spots;

- Developed a unique community broadband vision;
- Learned how to interview current and prospective broadband providers;
- Created a communication plan to spur survey uptake and educate and engage the whole community;
- Learned about various broadband technologies and their suitability for infrastructure investment;
- Considered current and alternative ownership and partnership models to better assess prospective broadband provider partners;
- Familiarized themselves with federal, state, and local funding and financing tools;
- Heard from experts about broadband's impact on agriculture and hurdles to implementation; and
- Wrote a community broadband plan including short-term and long-term community broadband goals.

Each community joined the program from a different starting point in the process. Some had been working on broadband for a few years; others were entirely new to the subject. But at the end of the program, participants from each county gave a presentation on their progress. They spoke confidently about fiber optics and fixed wireless. They understood financing options. They shared the community vision, goals, and more. Some had immediate plans (and funding!), while others set out with a general direction, a local team, and a commitment to continue and assess costs of various deployment options.

MEET the COMMUNITIES

EDGAR COUNTY: UNDERSTANDING NEEDS and FINDING PROVIDERS to MEET THEM

Edgar County borders Indiana. Approximately 90 percent of the almost 17,000 people who reside in the county live in incorporated municipalities. Paris, the county seat, is the biggest town.

Through the *Broadband Breakthrough* program, the Edgar County broadband team learned about broadband planning, including local needs and the providers that served the county. Importantly, the Edgar County Broadband Breakthrough team realized that it needed to try to work with the providers to create a cohesive solution to expand broadband to everyone.

The Edgar team found that broadband providers are assessing the market without consulting local communities. In Paris, where the population density is high, that means too many providers overcrowding rights of way and accidental fiber cuts.

The Edgar team found that broadband providers are assessing the market without consulting local communities. In Paris, where the population density is high, that means too many providers overcrowding rights of way and accidental fiber cuts.

Outside of Paris, there are small, local wireless providers prioritizing personal business decisions over community needs. The wireless providers are concerned about competition from fiber providers but are not interested in upgrading their own service from wireless to fiber.

The community became more engaged. Local public funding is not an option for the county government, but it is prepared to support and work with providers.

The Edgar County team set a goal to see ubiquitous broadband networks that are at least scalable to speeds of 100/100 Mbps.

FAST FACTS:

- Size: 624 square miles
- Population as of July 1, 2022: 16,433 people
- Population density (2020): 27.1 inhabitants per square mile
- Median household income (2017-2021): \$50,843/year
- Poverty rate: 13 percent (U.S. poverty rate is 11.5 percent; Illinois poverty rate is 11.9 percent.)

HANCOCK COUNTY: TWO FEDERAL GRANTS MAKE ALL the DIFFERENCE

Hancock County borders Iowa and is on the Mississippi River. It competes with Keokuk, Iowa, for attracting residents and businesses; one way to improve its appeal is to get better broadband. Agriculture makes up approximately 70 percent of its gross domestic product.

Tourism is part of the local economy because Hancock is home to sites meaningful to The Church of Jesus Christ of Latter-day Saints. But many visitors unfortunately leave frustrated with broadband access in the area, and their unsent social-media posts are lost marketing opportunities to build local tourism.

The Hancock County team knew they had to educate residents and persuade them to get engaged and excited about deploying better broadband networks. The [website](#) they built explained broadband terminology and used a clever illustration about the timing of video game download speeds to show the benefits of fast, reliable internet. Because of the county's topography, heavy reliance on agricultural production, and focus on ubiquitous broadband, the team needs to look for a fiber-wireless hybrid solution.

During the program, McDonough Telephone Cooperative (MTC), a local broadband provider, received an [\\$18 million grant](#) from the U.S. Department of Agriculture's ReConnect Program to deploy fiber-to-the-premises in Hancock and surrounding counties. Another provider, NextLink, received \$4 million from the Federal Communications Commission's Connect America Fund and Rural Digital Opportunity Fund to deploy wireless broadband in the area.

The grants are a windfall for the area. Having gone through the Broadband Breakthrough process, Hancock County's team is well positioned to work with providers to maximize community benefits—and the team will continue to look for funds to support additional deployment of better broadband networks.

FAST FACTS:

- Size: 814 square miles
- Population as of July 1, 2022: 17,244 people
- Population density (2020): 22.2 inhabitants per square mile
- Median household income (2017-2021): \$58,188/year
- Poverty rate: 11.9 percent

McLEAN COUNTY: AN OPEN ACCESS MODEL

McLean County, in central Illinois, is the home of Illinois State University and has a considerably larger population and population density than the other counties in the *Broadband Breakthrough* cohort, including in their county seat of Bloomington. The county team relied on paid county staff for leadership but had a robust team composed of their farm bureau, a regional planning commission, and ISU staff.

The McLean team gathered 135 pages of stories from community members, including one about a man with stage IV cancer who uses a cell phone to access email and apps to communicate with health care providers 120 miles away.

Surveys indicated that residents want better broadband and are willing to pay for it. The McLean team gathered 135 pages of stories from community members, including one about a man with stage IV cancer who uses a cell phone to access email and apps to communicate with health care providers 120 miles away.

Since participating in *Broadband Breakthrough*, McLean's team has created an ongoing effort called Accelerate Access McLean County (AAMC) to pursue quality broadband access for all residents. The team wants to pursue an open access model network plan, has identified two possible providers, and just received an \$80,000 grant from the Illinois Office of Broadband to help pay for a feasibility study.

FAST FACTS:

- Size: 1,183 square miles, the largest county by land area in Illinois
- Population as of July 1, 2022: 171,141 people
- Population density (2020): 144.5 inhabitants per square mile
- Median household income (2017-2021): \$70,339/year
- Poverty rate: 13.4 percent

OGLE COUNTY: THREE YEARS INTO a FIVE-YEAR STRATEGY with PLANS A, B, and C

A veteran of the Benton Institute's Accelerate program, Ogle County in north central Illinois is in the third year of a five-year broadband strategy. Attaining better broadband for precision agriculture is the focus of this current effort.

Results from community broadband surveys highlighted community frustration with internet connections. The broadband team recognizes that the county needs a fiber backbone throughout the county before it can work on last-mile solutions.

Having developed broadband provider partnerships, the Ogle County team has a plan that is ready to be put into action. Leadership is investing county American Rescue Plan Act (ARPA) funds and other monies into networks and plans to continue to aggressively pursue grants.

Since participating in *Broadband Breakthrough*, the team is focused on sustainability of its plans and keeping up on technology changes and new funding opportunities.

FAST FACTS:

- Size: 759 square miles
- Population as of July 1, 2022: 51,351 people
- Population density (2020): 68.3 inhabitants per square mile
- Median household income (2017-2021): \$67,534/year
- Poverty rate: 8.4 percent

SCHUYLER COUNTY: CREATING a BROADBAND MAP that INVITES INTERNET SERVICE PROVIDER PARTNERS

Schuyler County in west central Illinois has the smallest population and the lowest population density in the cohort. The terrain is varied. Rushville, the largest city, and the county seat, has fiber but only 37 percent of the county's population lives within the city.

The Schuyler team recognized that, due to the county's size, the county government is unable to form a cooperative or become a broadband provider itself. Since participating in *Broadband Breakthrough*, the team has used the surveys and maps to divide the county into zones for phased broadband expansion that will make it easier for the team to attract and collaborate with multiple providers and seek funding based on the needs of each zone.

This work has placed the Schuyler team at the head of the decision-making table.

FAST FACTS:

- Size: 437 square miles
- Population as of July 1, 2022: 6,746 people
- Population density (2020): 16 inhabitants per square mile
- Median household income (2017-2021): \$58,447/year
- Poverty rate: 12.3 percent

BROADBAND BREAKTHROUGH PROCESS and COMMITMENT

Broadband Breakthrough communities go into the process knowing that the program is designed to cover a lot of ground in a short time. With the guidance of a knowledgeable broadband coach, county team members learn about broadband technology, policy, and financing.

The 16-week *Broadband Breakthrough* program provides leaders with a path forward to better broadband services in their communities through:

- **Facilitated weekly meetings;**
- **Leadership education via archived webinars, expert presentations, and peer group discussions;**
- **Information gathering, including community surveys, broadband provider interviews, broadband map review, and community meetings; and**
- **Step-by-step broadband planning.**

Some of the county teams brought in people with specific skill sets as they needed them, but they found it was valuable to have a core team that was engaged in the weekly meetings from the beginning.

The makeup and commitment of the local broadband leadership team are critical. Teams should have at least eight to 10 members who have signed pledges to actively participate throughout the 16-week program and commit to attend all or most of the weekly meetings. Team members can represent diverse perspectives and include people from the following sectors: county government, education, business, health care, local housing associations, and the Farm Bureau. Passion for the cause is often more important than technical knowledge.

Where available, a dedicated staff person or volunteer leading the tasks, coordinating calendars, and managing the local process is a key to success.

Broadband Breakthrough Weekly Curriculum

Cohorts meet weekly online to learn from experts, then meet with their teams to start community broadband action planning. The experience includes an on-site visit with the program's community broadband coach and ends with each community presenting its community broadband plan.

- **Pre-Week 1: Orientation Session**
- **Week 1: Program Overview and Broadband 101**
- **Week 2: Community Broadband Surveys (with agriculture-focused questions) and Speed Tests**
- **Week 3: Broadband Mapping and Illinois State University Tools**
- **Week 4: Creating the Broadband Vision and Interviewing Broadband Providers**
- **Week 5: Coalition Building and Communicating the Broadband Vision**
- **Week 6: Fiber-Optic Overview (including middle-mile/open access considerations)**
- **Week 7: Wireless Broadband Overview**
- **Week 8: On-site Community Visits (including local broadband summits and farm visits)**
- **Week 9: Ownership and Partnership Models**
- **Week 10: Feasibility Studies**
- **Week 11: Federal, State, and Local Financing Options**
- **Week 12: Agriculture as a Broadband Driver**
- **Weeks 13 and 14: Community Broadband Planning Sessions**
- **Week 15: Community Plan Presentations**

BUILDING BROADBAND COMPETENCIES

The *Broadband Breakthrough* process is learn-and-do. For many of the county teams, technology and broadband are new knowledge areas, so there is plenty to learn each week. But there are experts who help along the way. The goal is not to become network engineers but to be able to ask questions and understand answers. The teams become familiar with technology, including fiber and wireless options, policy, and financial topics.

The teams also learn how community assets impact network development, especially how community assets can offset a provider's cost of deploying a wired or wireless network. Knowing where the community assets are and providing access to those assets gives a community more leverage in discussions with providers.

Teams also learn to determine the local community's tolerance for risk, the level of interest from providers in serving the county or parts of the county (and how to work with them), and ways to find funding. These factors make each community broadband plan unique.

Each community evaluates four possible models for broadband provision before choosing a path:

1. **Private internet service provider (ISP) ownership and operations/private-public financial support;**
2. **Cooperative ownership and operations (electric or telephone);**
3. **Public ownership/public operations; and**
4. **Public ownership/private operations.**

Each community has its own reasons for selecting a path or potential paths; deciding on a model is a function of community culture and politics, perceived attractiveness for broadband development, and existing relationships with broadband providers. For example, McLean County knew that the local appetite would not support a public- or government-owned network solution. In Edgar County, the leadership team recognized that uneven competition and ISP interest throughout the county was going to be a challenge. So it decided to remain flexible, yet engaged, in terms of supporting multiple ISPs in the county.

Counties learned to be creative, open, and aware of all the funding opportunities available—even if they were awarded, as with McDonough Telephone Cooperative's \$18 million USDA grant, at the start of the program! Having a community vision, data, and MTC as a member of the Hancock team will ensure that deployment will meet the long-term needs of the county.

The good news is that funding is available in unprecedented amounts, though the rules for funding programs are complex and varied. Communities should take steps now to prepare for funding opportunities; the Broadband Breakthrough program encourages teams to have a community vision, know local supply and demand through provider interviews, community broadband maps, and surveys, and understand the local appetite for investment and risk.

SECTION III

INTEGRATING the TOOLS Into the COMMUNITY BROADBAND PLANS

The broadband teams in the five counties had a variety of tools to build their final community broadband action plans. These tools included: the state of Illinois broadband maps, broadband surveys (with agriculture-focused questions) and speed tests, the two tools created by Illinois State University, and the wireless information from the Wireless Research Center.

BROADBAND MAPS and SPEED TESTS

Broadband maps help communities, providers, funders, and policymakers determine which areas need better broadband networks and how to apportion available funds. Accurate mapping means funding opportunities can be better targeted.

Traditionally, broadband maps, such as the [Federal Communications Commission \(FCC\) National Broadband Map](#) and the [Illinois Broadband Map](#), are created based on information submitted by broadband providers. The providers tend to report advertised speeds, which may not be what a customer experiences. And the maps are quickly out of date because the information is not collected in real time. The teams used the maps to target survey deployment in parts of their counties, especially in areas unserved and underserved by broadband.

Broadband Breakthrough
Unserviced and Underserved Locations-FCC Maps Data

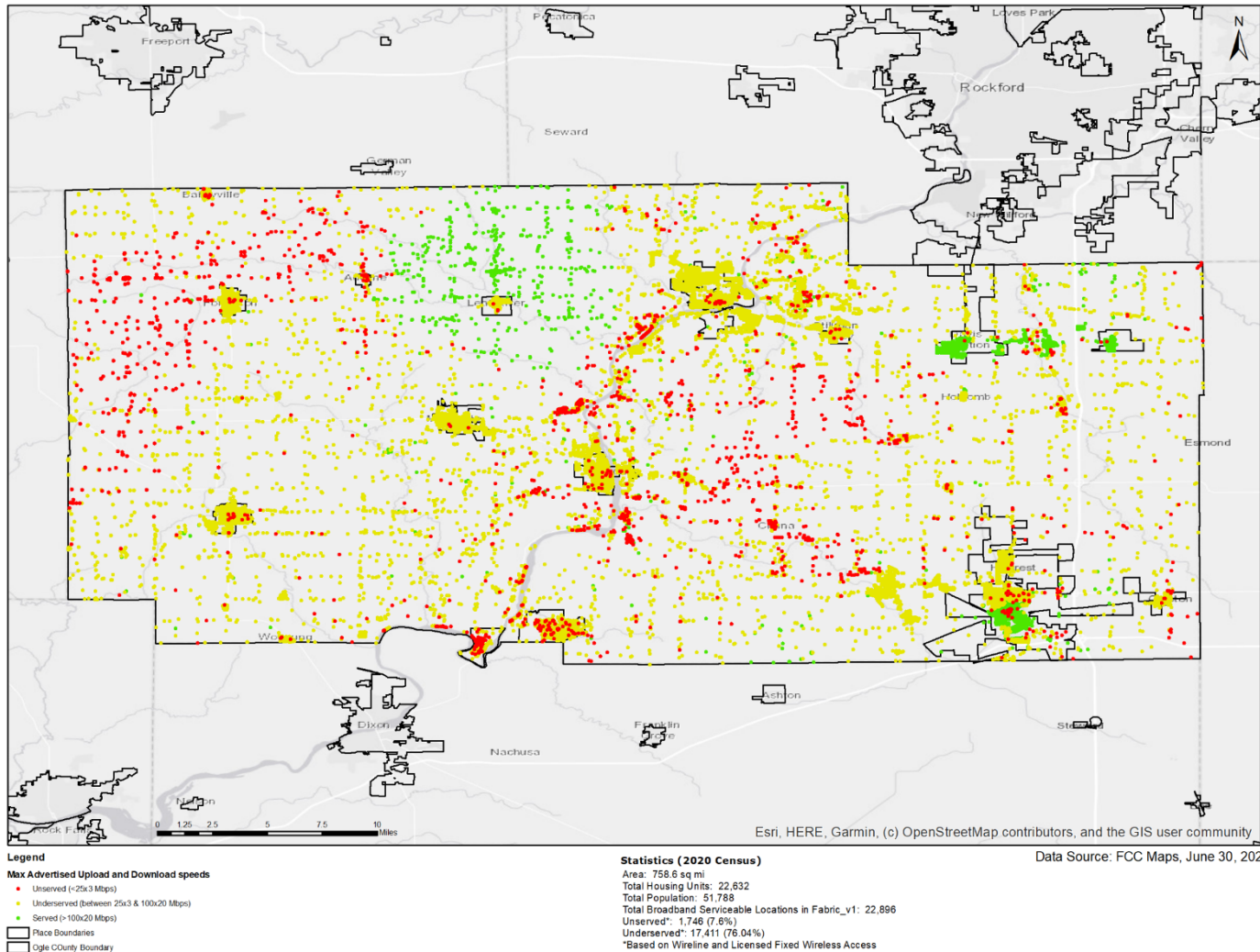
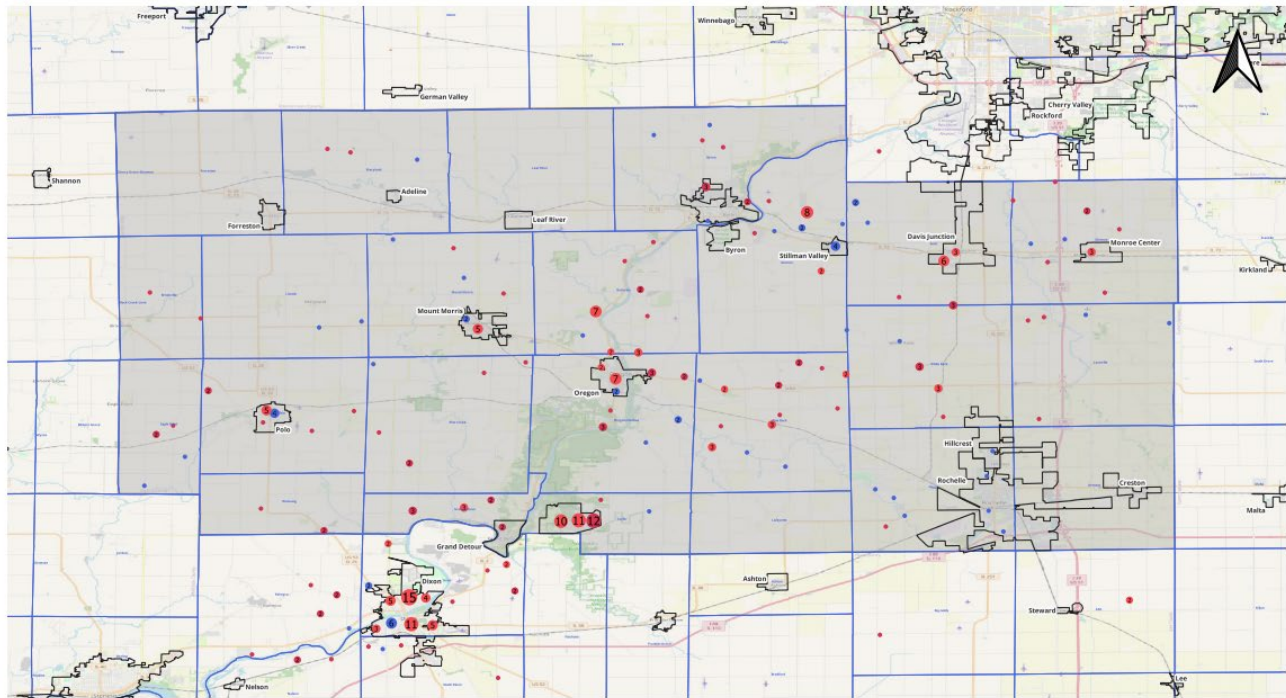


FIGURE 4: Federal Communications Commission Map of Unserved and Underserved Locations in Ogle County Based on 2022 FCC Broadband Maps Data

Broadband Breakthrough teams invited residents to take a broadband speed test to measure current service levels from their location via [speedtest.net](https://www.speedtest.net). A speed test must be run from a resident’s home, office, or field using a computer or a smartphone if it is connected to a local Wi-Fi network. Then the state of Illinois mapping expert, Shubhika Agarwal, built maps based on those results.

Broadband Breakthrough Survey Unserviced and Underserved areas based on Fixed Broadband Speed Tests- Ogle County



Map Legend



FIGURE 5: Unserved and Underserved Location Areas of Ogle County Based on Speed Tests

Even with the survey’s smaller sample, the data is more current and can help validate some of the FCC and state of Illinois map findings, as well as identify other areas of need that might be missing from the official maps. For devising strategies to address the need, it is helpful to analyze the speed test data results in relation to affordability, digital skills, and broadband use data (also collected as part of the survey), as these parameters greatly affect consumer choices of broadband service packages from available service options.

The community broadband maps serve to:

- Validate or challenge existing broadband maps that federal and state funders use to determine funding eligibility;
- Indicate which locations are served, underserved, and unserved by broadband;
- Allow for filtering by location, provider, and other characteristics to determine customer satisfaction with their service, their level of interest in getting better service, and other factors; and
- Help make decisions and prioritize areas with the greatest need.

Comments from Illinois County Surveys

Below are comments collected from people who took the community surveys.

COMMUNITY SURVEYS

Broadband Breakthrough provides a survey tool that county broadband teams can modify based on local need. University of Illinois Extension worked with the teams to understand and maximize results.

A respondent can complete the survey in five to 10 minutes. Although it includes some technical questions, such as the type of broadband connection a location has, most of the questions are intentionally written for a lay audience.

The survey asks about existing service, technology in the home, how the internet is used, what people might do with better broadband, and how much they are willing and able to pay. The teams also ask survey takers whether they would be interested in allowing access to vertical assets on their properties, as discussed in Section II. Finally, there is room for residents to tell their broadband stories.

Teams also distribute paper surveys and, in some cases, translate surveys into Spanish to widen participation. Teams integrate the paper results into the mapping tool. McLean County, for example, received more than 50 paper surveys and 135 pages of residents' broadband stories.

PROMOTING COMMUNITY SURVEYS

Once communities modify and finalize their surveys, each county focuses on promoting the survey to encourage people to take it. For example, a team member in Ogle County volunteered to visit each Friday Fish Fry with paper surveys to encourage participation. Participants also found that a text reminder from someone the recipient knew was a motivator and increased responses. Schuyler County reached out to the local community college to encourage students to take the surveys. McLean held a press conference and was able to talk about the survey on television news. Several communities sent notes home with students' weekly packets or included the survey in utility bills. One county talked about placing ads or flyers on the doors of toilet stalls in the bathrooms of local bars.

Midway through the program, the Ogle County *Broadband Breakthrough* team started to worry about over-messaging residents. The team learned some tactics, such as texting, for getting folks to take the survey.

- **Currently I have broadband at my office in town and the speeds are great. Outside of town is a different story. My farm, which is 3 miles north of Rushville, has no access to high speeds. With the growing demand of farming devices needing access to the internet, it is definitely a disadvantage of having my shop outside of town. I farm various locations throughout the county where I barely have enough signal on my phone to make calls. We live in an age where agriculture and other various businesses are on the cutting edge of implementing technology for applications in our sectors where we will not have the broadband infrastructure to handle it moving forward.**
- **Satellite internet is our only option. Had Hughes net and was extremely slow and unreliable. Have used hotspots off the phone to work from home. Just set up Starlink but it is extremely pricey at \$110 a month.**
- **Had Frontier with .08 Download. Used 2 different 3G Companies that both went out of business. Used US Cellular and AT&T Home Service but very limited and we reached our data cap quickly so service slowed. Used Cass Com Max Satellite but service spotty due to distance signal had to travel and was paying \$80/mo. Now using T-Mobile Home Internet for \$50/mo and am happy with signal and speed.**
- **The internet goes off a few times daily.**

The percentage of respondents helps to make a business case for investing in better broadband networks, but the stories gleaned from the surveys light the fire to get it done by persuading people to get involved and serve as advocates for better broadband in their communities.



FIGURE 6: Findings from Schuyler County Community Survey

- Very slow and gets worse as the month goes on especially in the evening. Always unstable.
- We live in the country and have switched providers 2 times since we purchased our home 3 years ago. I have increased our Gigs 2 times in the hopes of having better service but never noticed a difference in service—only in what I pay; the service is still the same. I cannot stream videos, Netflix can only be used by 1 person at a time if it is working, it's hit or miss. If it is raining or storming, the internet is always out. I also work from home a lot which is very frustrating, not being able to meet deadlines.
- We've had Starlink satellite internet for about a year. They just raised the price again to \$120/mo. The service has been great for us so far with no issues. During the day I typically get speeds of around 100 Mbps down and 10-15 Mbps up. Evenings are slower with more traffic. We have a 1 TB data cap and once crossed we'd be deprioritized after other traffic. We haven't been using more than around 500GB/mo though. Am afraid the price will keep rising but we have no other options other than back to cellular hotspots. T-Mobile home internet may be an option as they expand their network.

MAPPING SURVEY and SPEED TEST RESULTS

The McLean County team used its maps to demonstrate the uneven access to broadband service in the county. The map showed that locations in town had good service; areas outside town did not.

McLean used the maps that Illinois Extension created with survey data to highlight also where customers were dissatisfied with their current providers. The data helped document frustration with customer service and with reliability of service. The data also can highlight potential provider partners in areas that have happy customers.

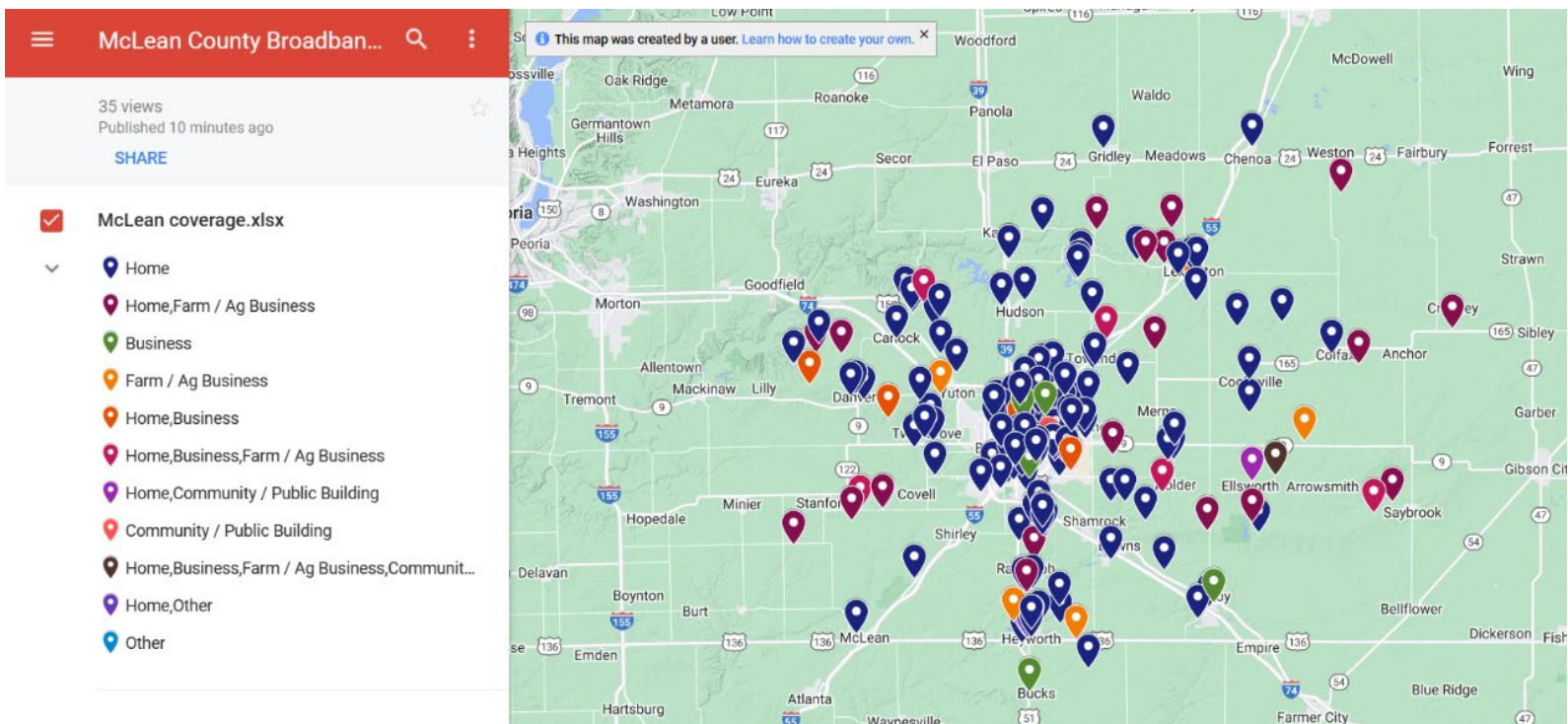


FIGURE 7: McLean County Community Broadband Map

ILLINOIS STATE UNIVERSITY (ISU) AGRICULTURAL PLANNING TOOLS

QUANTIFYING AGRICULTURAL PRODUCTIVITY GAIN with IMPROVED BROADBAND AVAILABILITY: ISU TOOL I

The Hancock County team knew that economic impact would be a driver for broadband planning because, as sometimes happens, not everyone was sold on the need for broadband at the onset. Farmers were skeptical, especially if the deployment of better broadband meant providing access to their land to a potential provider or provider subcontractor. Farmers expressed worry about damage to their fields and that aerial broadband wires would be hung too low, inhibiting movement of equipment. Farmers understand the value of the land; they understand easements (access to private property) better than many urban and suburban residents.

As part of its final presentation to the cohort, the Hancock County Economic Development group [created a website](#) to educate the community about broadband and share results from its community survey. These results compared survey responses with ISU Tool II data to determine that 65 percent of farmers and agribusinesses reported a willingness to host fixed wireless equipment on a grain leg or other vertical asset on their farm.

The website also had a whole section dedicated to “The Future of Hancock County Agriculture,” showcasing the overall economic impacts of developing reliable, high-speed internet for all of Hancock County using ISU Tool I.



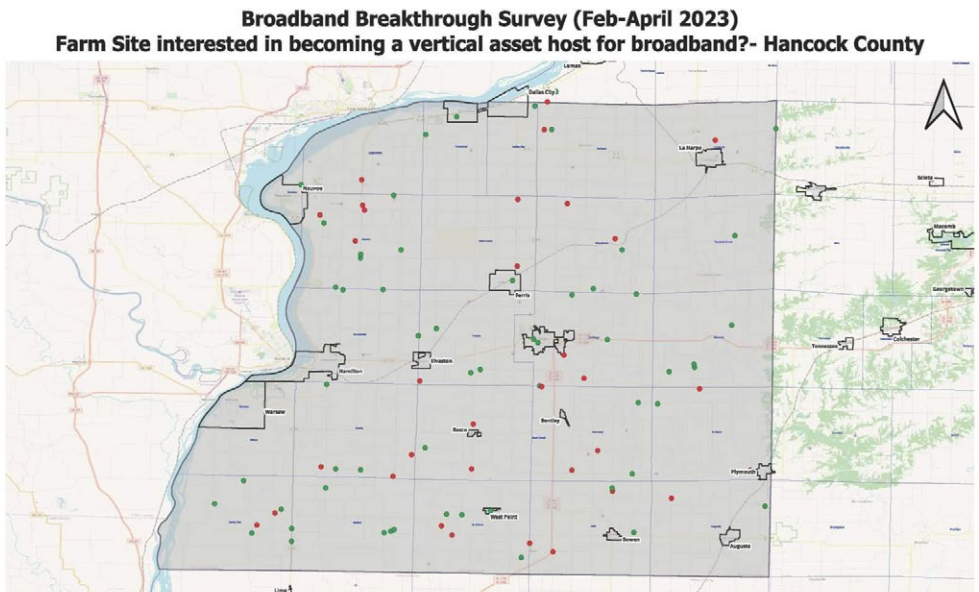
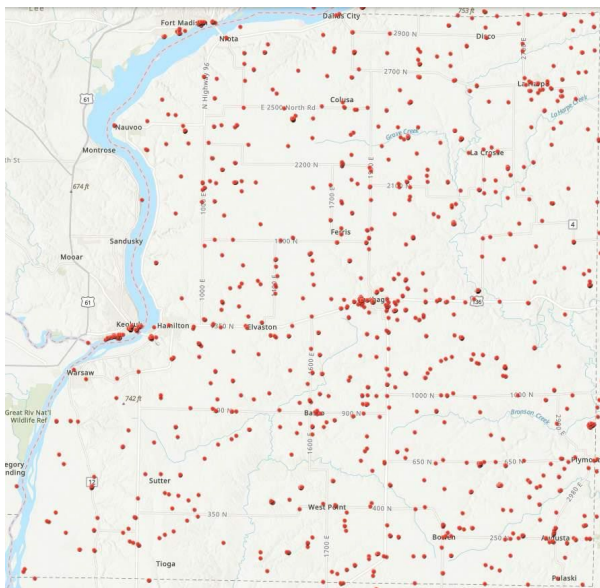
The team used ISU’s customized maps and economic predictions to detail the direct, indirect, induced, and overall economic impacts of better broadband. Direct impact is increased corn and soybean production; indirect impacts are the business-to-business purchases that take place in the supply chain and stem from an increase in farm productivity. As farmers spend money with their suppliers, this spending is shown in indirect benefit. Induced effects are the values stemming from household spending after removal of taxes, savings, and commuter income.

FIGURE 8: Economic Benefits of Broadband—Hancock County Website

WIRELESS HELPS to MEET UNIQUE NEEDS of RURAL AREAS: HIGH-POINT ANALYSIS—ISU TOOL II

Hancock County’s team knew it needed a solution that incorporated wired and wireless services, since 70 percent of the county’s gross domestic product is agriculture.

The team heard from small family farmers and large corporate farms that fiber was not available and wireless was not reliable. One farmer noted, “Wireless here is like a beach: The waves come in and out.” Another said cellular coverage worked only if you stood near one window at the farm. They have looked at fixed wireless solutions but found that the corrugated metal outbuildings interfere with the signals.



Map Legend
Farm Site interested in becoming a vertical asset host for broadband? Place Boundaries Township Boundaries Hancock County Boundary
• No
• Yes

FIGURE 9: ISU Tool II High Points and Survey Results—Hancock County Website

These are business people with equipment increasingly reliant on a connection in the field. Not having sufficient broadband is costing them time and money. Planning to meet the needs of farmers today is not enough; farmers recognize that they need to plan for the future of farming.

Rural areas will always need a mix of wired and wireless solutions. Precision agriculture requires wireless broadband to monitor crops in the field, soil nutrients, equipment, and nearly every aspect of farming.

Rural areas will always need a mix of wired and wireless solutions. Precision agriculture requires wireless broadband to monitor crops in the field, soil nutrients, equipment, and nearly every aspect of farming.

The Hancock County team toured Carroll Family Farms in Carthage, which produces corn and soybeans and raises pigs. The farm uses both wired and wireless connectivity—wired broadband in the office and main

buildings and wireless options in the field and outbuildings. Importantly, Carroll Family Farms wants to see solutions built for the future, as the manager notes: “Sitting here today, we can’t fathom where we’ll be in five years.”

WIRELESS MEETS UNIQUE NEEDS of PRECISION AGRICULTURE: WRC REPORT

As part of its work, Wireless Research Center undertook looking at the locations of current cell towers within each of the five counties in *Broadband Breakthrough*. The WRC collected the data, accurate as of April 2023, from the cellmapper.net website, which uses crowdsourced data from cell phone users to record network availability. The wireless industry is constantly improving its coverage and availability, particularly with the rollout of 5G capability, so this information should be considered a snapshot in time.

These maps, along with other internet coverage predictions provided by the state of Illinois, helped the WRC to make a rough initial assessment of cellular coverage of the five counties.

Based on this information, the WRC created simulations based on the assumption of deploying new towers in areas of the county using CBRS technology to provide internet connectivity to areas with poor or nonexistent cellular service. These simulations are not intended to be a deployment plan, but rather a hypothetical design to demonstrate the capabilities of adding more wireless resources within the county. The maps are based on CBRS technology predictions, but cellular providers and wireless ISPs (or WISPs) may likely have greater coverage areas due to the lower frequencies used for those services.

Following are examples from McLean County.

Fiber Is the Gold Standard and Necessary for Wireless Deployment

Fiber is the gold standard in the world of broadband because of its unmatched capacity, extended reach, reliability, longevity, flexible deployment, and low maintenance cost. Fiber-optic networks can also be expensive to deploy, especially in rural areas with lower population density and varied terrain. This means that a phased build approach may be required.

Conversations about rural broadband access tend to focus on connections to homes and businesses, but precision agriculture increasingly requires reliable connectivity to the field. In the field, farmers rely on wireless connectivity—such as fixed wireless and mobile cellular—to make real-time strategic and logistical decisions about their land, crops, animals, equipment, and farm facilities.

For wireless deployment, a challenge is that for each base station or access point, there is a need for a wired connection to the network, preferably fiber. This limits the siting of wireless towers somewhat, since if existing wired infrastructure is not easily available for connection, the cost of running cable or fiber to that base station or access point can be significant.

Despite the challenges wireless technologies may entail, they do have the advantage of being able to turn on connectivity to large swaths of users quickly in comparison to wired services. Infrastructure costs can also be less than those for wired services, although not insignificant. Wireless excels at being the “last mile” or “last acre” solution when fiber is available relatively close to an unserved area. The key to deploying a reliable and successful wireless solution is a well-engineered system.

| CELLULAR PROVIDER | FIXED WIRELESS PROVIDER |
|-------------------|-----------------------------|
| T-Mobile | New Wave Net Corp |
| AT&T | Nextlink Residential |
| Verizon | Rise Broadband |
| | Verizon Wireless |
| | Watch Communications |
| | Wireless Data Net |

FIGURE 10: Wireless Providers in McLean County
Note: Some wireless providers may only serve portions of the county.

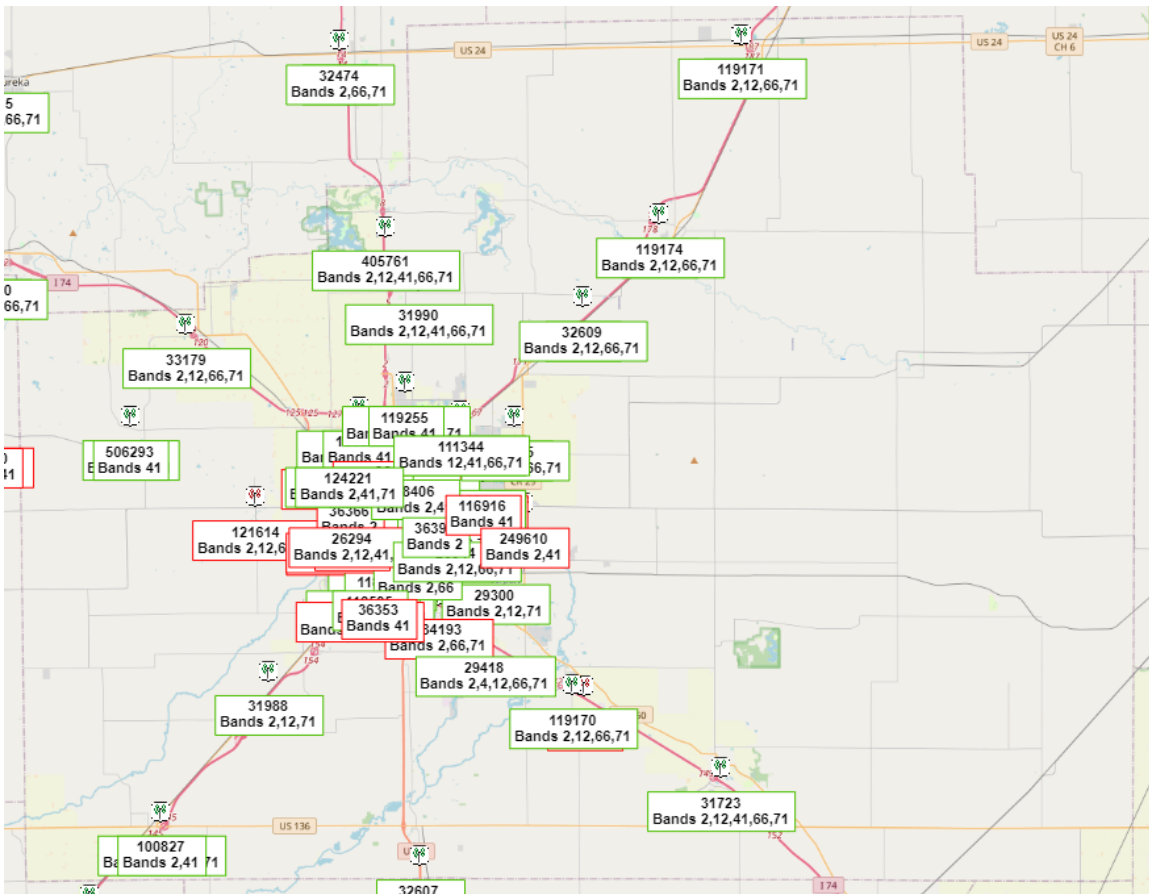


FIGURE 11: T-Mobile LTE Cell Sites in McLean County, 64 cell sites

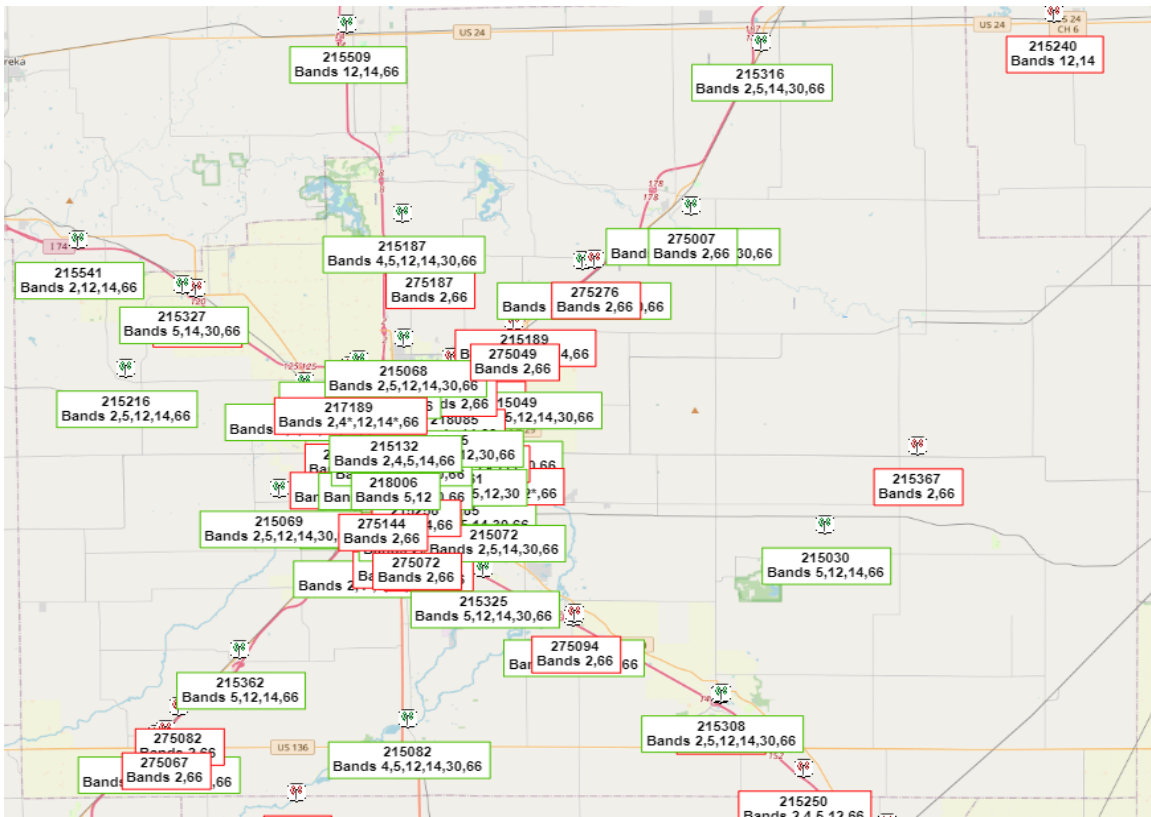


FIGURE 12: AT&T Mobility LTE Cell Sites in McLean County, 80 cell sites

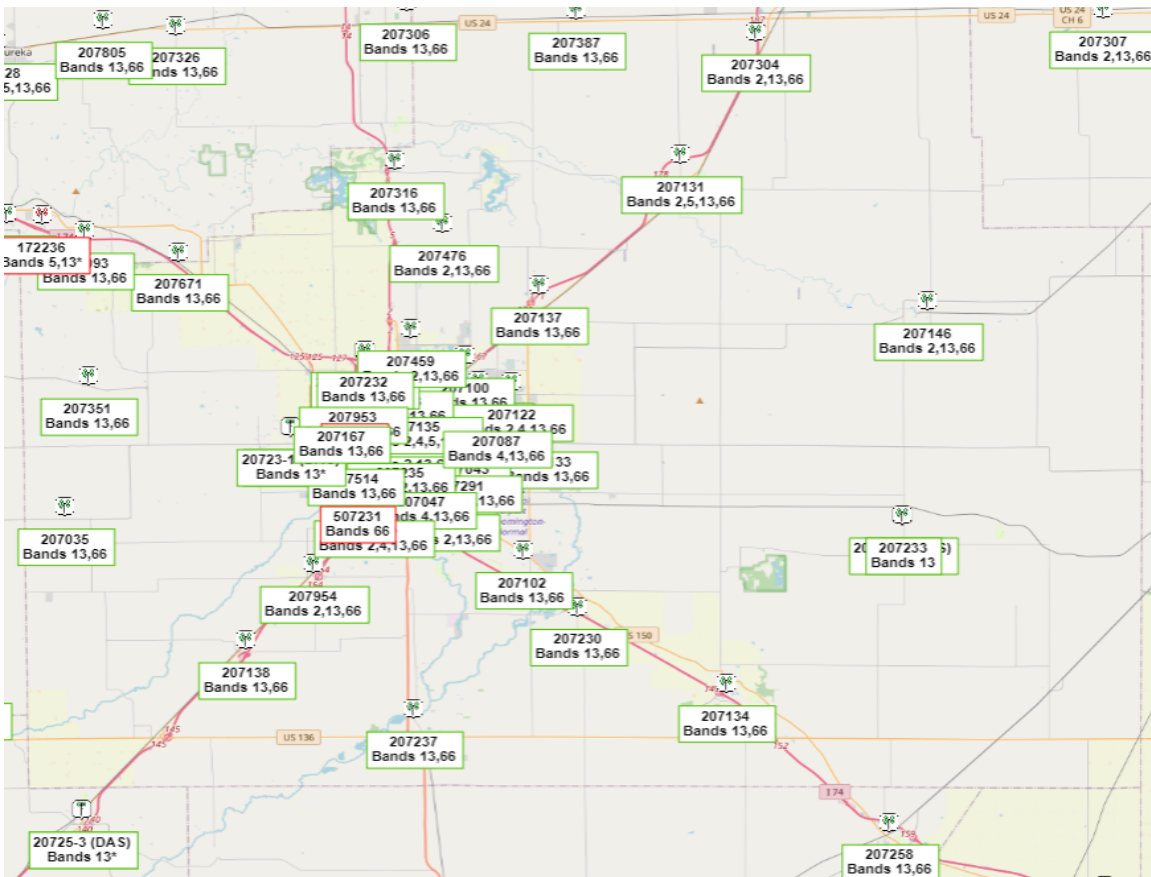


FIGURE 13: Verizon LTE Cell Sites in McLean County, 47 cell sites

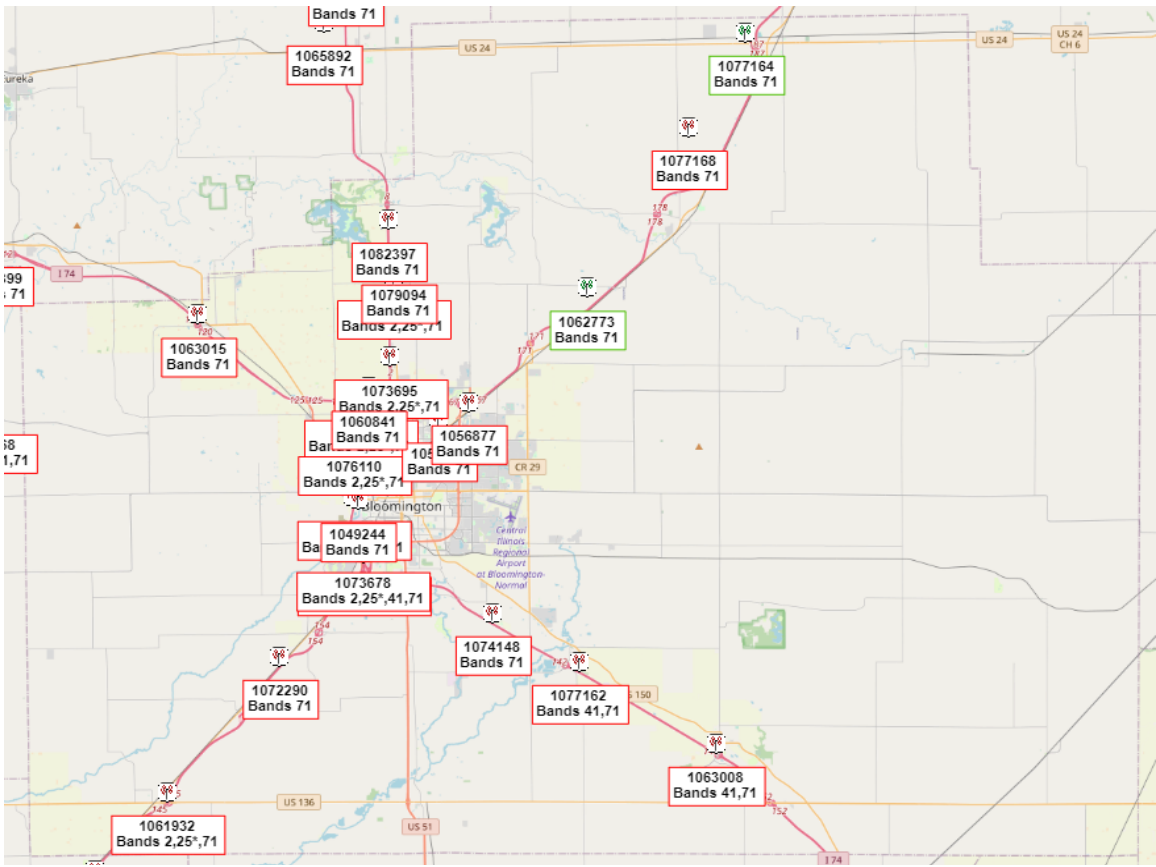


FIGURE 14: T-Mobile 5G Cell Sites in McLean County, 24 cell sites

Unserviced Areas (All Fixed) and Density of Households

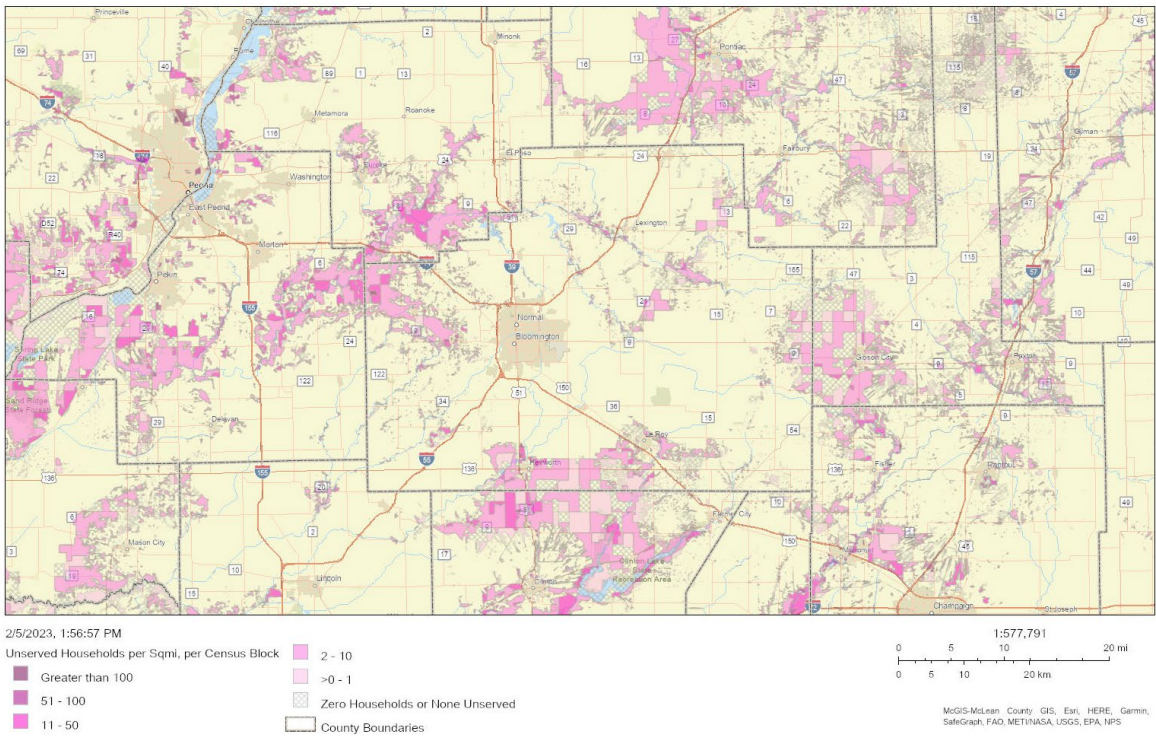


FIGURE 15: Unserviced Areas (All Fixed) in McLean County Showing Density of Households (courtesy of State of Illinois)

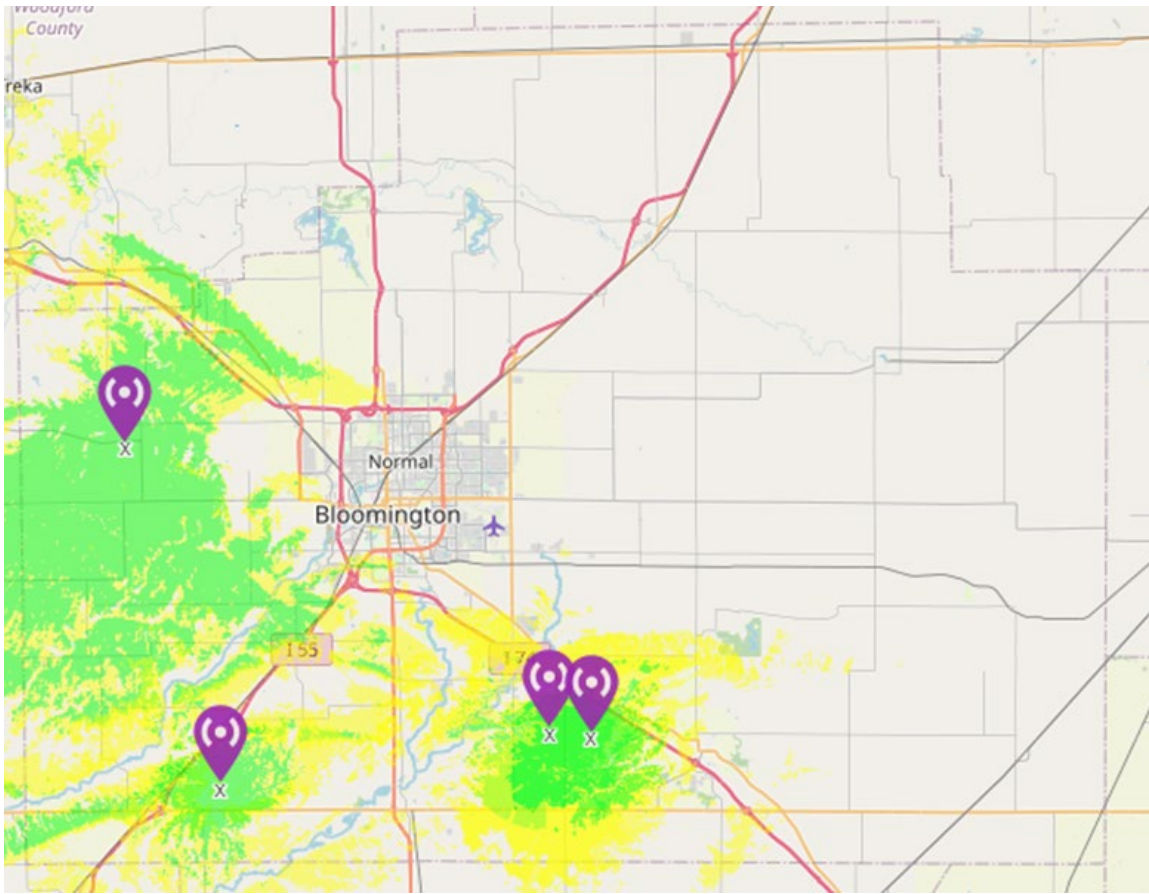


FIGURE 16: WRC Simulation of Coverage in McLean County With 5 CBRS Towers
([Link to WRC report for Edgar, Hancock, Ogle, and Schuyler counties](#))

SECTION IV

DEVisING BROADBAND PLANS

Five counties began the *Broadband Breakthrough* journey, and five counties completed the course. Over the course of 16 weeks, these five teams learned the technology and business lessons and organized to be effective broadband champions for their communities using many of the tools at their disposal.

Each had the same coach, created a broadband vision for their communities, and had access to the same tools: state of Illinois broadband maps, community surveys and speed tests, the two ISU tools, and the WRC wireless profile.

The Illinois broadband maps show which areas of the county were unserved and underserved by broadband service. The community surveys and speed tests demonstrated the need for better broadband. The ISU Tool I demonstrated the value of broadband to farming communities. The county maps presented in the ISU Tool II and WRC profiles introduced how wireless can be a part of community plans, particularly to bring connectivity to farmers' fields.

A community vision sets out what the community wants to achieve, and the community plan outlines ways to make that happen. These are the first two steps of many toward deploying better broadband.

EDGAR COUNTY: MANAGING LOCAL ISPS is LIKE HERDING CATS

Broadband planning was entirely new to the Edgar County team when it started *Broadband Breakthrough*. It was challenging because service throughout the county is uneven and communication between broadband providers and community leaders has been minimal.

In the county seat, there is competition and service from fiber providers—so much competition that the rights of way have become crowded and unmanageable. Outside of the city, Edgar County has multiple fixed wireless providers that serve small areas.

Many are active in the community and well liked. Their customers are relieved to have any service, but they are being held back. The broadband team wants to find long-term solutions, and the existing wireless providers are worried that that may not be good for their businesses. Maintaining the balance will be a challenge moving forward; open communication will be important.

The team members plan to aggregate need and develop a unified plan to help them communicate with providers and take control in setting expectations. The goal is getting service scalable to 100/100 Mbps. The team is interested in funding, but no local funds are available for matching grants.

Broadband Breakthrough May 4 2023 FINAL PRESENTATIONS



FIGURE 17: *Broadband Breakthrough* Final Presentations—May 4, 2023

HANCOCK COUNTY: \$22 MILLION GRANT AWARDS DURING the PROGRAM

Hancock County created a vision that focused on community needs, especially local agriculture:

High-speed internet access will build upon and support the county's educational, health, and economic development, and will have a direct impact on improved crop yields and farm efficiency.

The Hancock County team celebrated the \$22 million in awards local providers received during the *Broadband Breakthrough* program, but it also recognized that \$22 million will not deliver ubiquitous broadband. It is advocating for additional local and state funding. The team is also telling interested broadband providers that Hancock County Economic Development is available to help them develop grant applications and funding proposals.

The team will continue on as Grow Hancock Broadband and will work to get broadband to everyone. The team uses its [website](#) as a communication tool and plans to meet with local groups to promote broadband and answer questions about the community broadband plan.

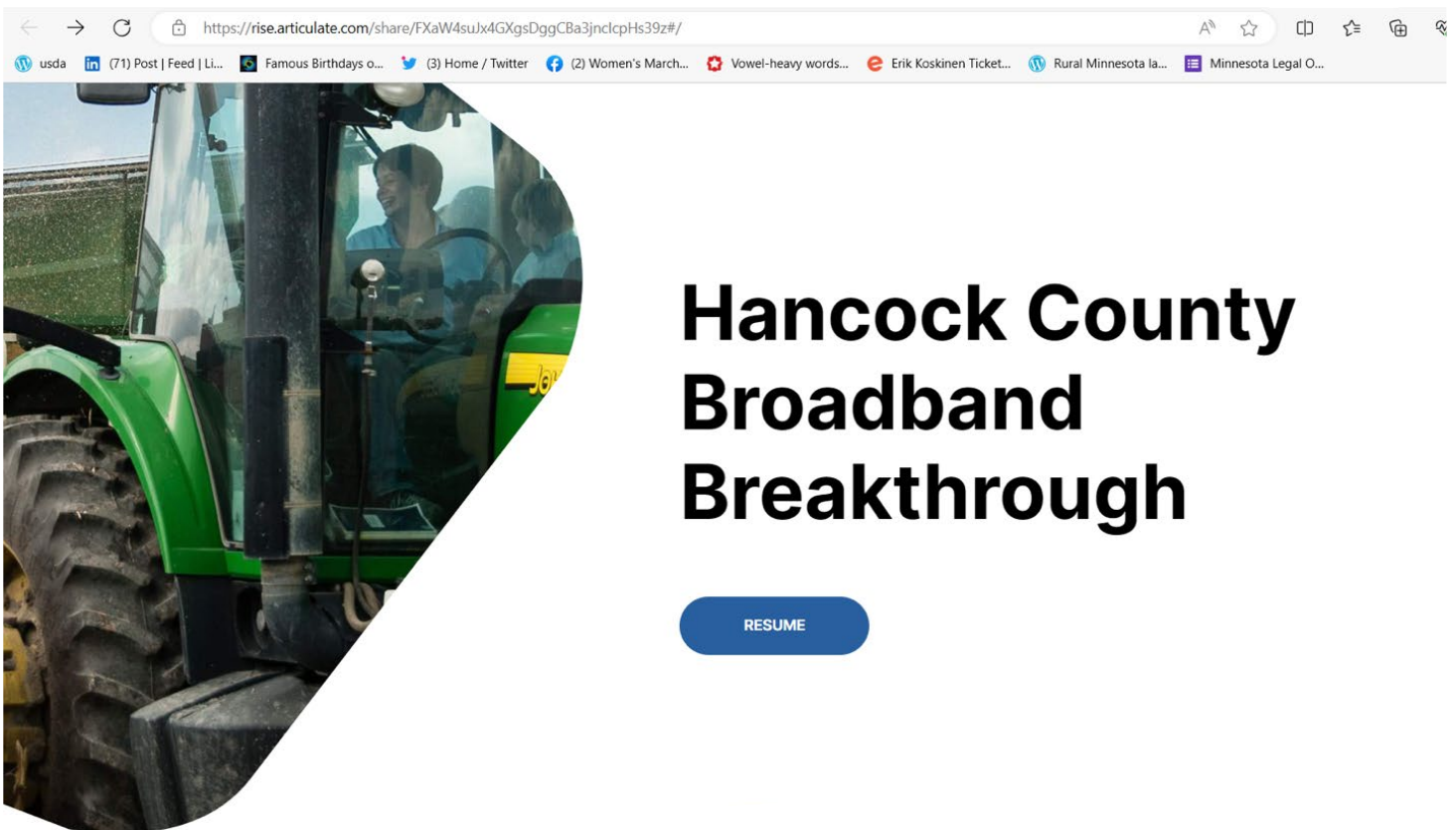


FIGURE 18: Hancock County Broadband Breakthrough Website

McLEAN COUNTY GOALS: BALANCING UNEVEN ACCESS and COMPETITION

McLean County created a vision that centered on choices and ubiquitous access:

Accelerate Access McLean County strives to expand access for all residents to quality choices for reliable, affordable, and robust high-speed internet services to promote economic prosperity, foster educational opportunities, and improve quality of life.

McLean's county seat (Bloomington) is a large city with several ISPs that have been pursuing funding to build broadband networks in the city without communicating with local leaders. Outside of Bloomington, there is much less competition. The McLean team talked to a number of providers to encourage better communication. The team is interested in public-private partnerships and wants to find a way to make sure county residents and businesses have ubiquitous broadband even if that means a hybrid solution of fiber and wireless.

The team will continue to work on broadband issues, especially mapping existing fiber throughout the county. The team supports local providers by investigating funding options and looking at ways to improve permitting processes for broadband deployment.

The team unveiled its new community broadband logo at the final session and will continue to promote broadband expansion. It applied for, and received, an \$80,000 grant from the Illinois Office of Broadband to conduct a feasibility study.



Accelerate Access McLean County

FIGURE 19: McLean County Community Broadband Logo

OGLE COUNTY GOALS: KNOWLEDGE EQUALS LEVERAGE

The Ogle County team started *Broadband Breakthrough* with more experience than the other counties: It was already three years into a five-year broadband plan. That added experience made its plan more specific. The community vision is inclusive:

Ensure availability of reliable, high-performing, high-speed, affordable broadband to all residents, businesses, organizations, and farms in the north central Illinois region that promotes educational, economic, and information opportunities.

And the team identified urgent issues:

- A middle-mile network is essential to providing high-speed broadband service to residents, businesses, and institutions;
- Innovation on farms and in other rural settings are severely hampered by lack of access to robust broadband;
- The agriculture industry and the changing ways farmers operate are largely dependent on strong internet connectivity in rural communities;
- Rural broadband providers have difficulty raising prices to cover the costs associated with ever-growing demand for broadband capacity; and
- One of the most vital needs is modern and durable infrastructure.

The Ogle County team used powerful videos to reach local community members, policymakers, and funders.

At the final presentations, Ogle County was awaiting word on federal funding for a middle-mile broadband proposal it had submitted with a local provider, which unfortunately it did not get. But the broadband team is undeterred and continues to seek funding for a partnership with a local provider, Syndeo, to build a fiber network.

The Ogle County team is prepared to help fund a network. The county board is committed to providing affordable broadband to everyone in the county. The team plans to keep meeting to enact its plan and continue to engage with the public.

"We have called and begged and offered any solution we can think of to all area providers. We've even offered to pay for additional infrastructure to bring reliable internet to our house. No success. We tried satellite internet but our geographical location made the connection exceedingly unreliable."

"Multiple times a day my internet just stops working, even when you are in the middle of something, so you have to click refresh internet when a box pops up. On average about every 3 months the service goes out sometimes for 3-5 days. We live in the country so there isn't much choice."

"We have satellite internet, it is unreliable, slow, and we have to buy it by the Gb. If it is cloudy, windy, or rainy the internet doesn't work. Also, we often run out of data. It is expensive compared to my friends and family's providers. It is completely insufficient for working from home. Was a total nightmare doing e-learning with the kids."



SCHUYLER COUNTY GOALS: A ZONED APPROACH to GETTING BETTER BROADBAND

The Schuyler County Broadband Planning Team focused its vision on fiber:

Create a county-wide fiber-optic network that connects every person, family, visitor, and business with the opportunities provided by affordable and reliable high-speed internet.

The Schuyler County team knew that the county did not want to become a provider, so it started looking for a solid partner. The team wants ubiquitous fiber, not a hybrid solution.

Schuyler County created a map (see below) that divides the county into broadband zones. This way, a provider (or providers) could serve an area or areas based on ability yet also meet the needs of the community. In theory, this should leave no area unserved by broadband. The team is prepared to work with different providers in each zone.

The Schuyler broadband team will continue its efforts, including plans for a broadband summit as an opportunity to meet with numerous providers. The team is working on a digital equity plan, investigating funding options, and exploring options for a feasibility study.

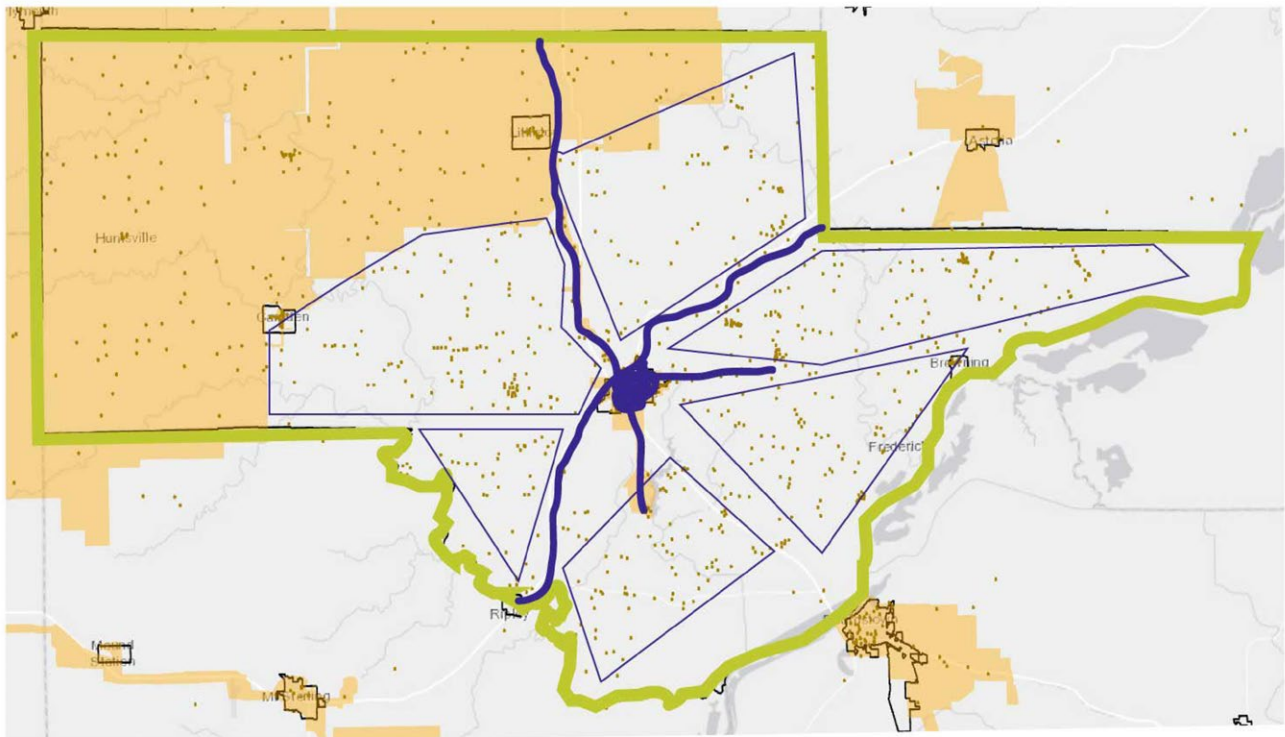


FIGURE 20: Schuyler County Broadband Zones

PUTTING COMMUNITY BROADBAND PLANS into ACTION: FEASIBILITY STUDIES

All the participating counties have committed to continuing the effort to improve local broadband. For many, the logical next step is conducting feasibility studies performed by engineering and telecommunications business consultants. Feasibility studies establish specific broadband deployment costs, implementation strategies, business pro formas, and financing requirements.

Feasibility studies use mapping and market research to create a gap analysis for the community. Studies will determine the community needs, preferences, tolerance for risk, and budget. The study can present possible broadband options and pricing, including customized engineering based on existing infrastructure, terrain, and other factors. Finally, the study can include a financial analysis of those possible solutions, including some recommendations for funding.

In short, the feasibility study can get a community one step closer to its goal. The Illinois Office of Broadband just introduced its *Digital Equity Capacity Kickstarter (DECK)* program, which provides an opportunity for community-based organizations, nonprofits, political subdivisions, public libraries, and public schools to apply for up to \$50,000 in project-specific grant support. Applicants can submit funding requests for broadband access expansion feasibility studies. McLean County, one of the five *Broadband Breakthrough* communities, applied for funding from the DECK program and received an award.

SECTION V

DRAWING LESSONS from BROADBAND BREAKTHROUGH

THE IMPORTANCE of LOCAL LEADERSHIP in BROADBAND PLANNING

Broadband Breakthrough is first and foremost a community engagement program that recognizes that communities have specific needs, opportunities, and challenges that will shape their broadband plans.

No one will understand those needs better than members of the community. The first step for *Broadband Breakthrough* communities is to find and engage a team of local leaders committed to focusing on the broadband plan. The team can engage the whole community and work with industry experts to understand the implications of various solutions. For rural communities, that means getting farmers involved. The farm bureau or crop associations are a good place to start making connections.

Some communities, such as Ogle County, have been meeting for a while; others have not. Communities need to have a solid team of eight to 15 members from day one, and often teams add members as they go along. But building a team can start with one person—such as Schuyler Isley, executive director of Schuyler County’s Economic Development Commission (the shared name is a coincidence), who met Benton’s broadband coach, Bill Coleman, at a conference and decided to find a team and enroll in the program. Sam Harnack, executive director of Hancock County Economic Development, started the process after hearing about Broadband Breakthrough from a colleague. Sam noted that local interest was almost overwhelming:

“I had plenty of interest and support since fast internet affects so many different industries and we are lacking so much in our rural areas. In fact, I believe I had more interest than I needed. There were a few organizations that wanted to send four to six people, and I had to ask everyone to send only one or two people to join us so we didn’t get overwhelmed with the amount of people involved.”

Personal and community connections are helpful when forming the team and later getting the public engaged in taking the survey and speed tests and supporting the final broadband plan. Some weeks, the most valuable player of the team is the person willing to make personal calls to get people engaged.

The leadership team should be composed of people with a variety of skills and connections in the community. Having a technology or broadband background is not necessary because the weekly curriculum familiarizes members with the basics.

Local teams include:

- Economic development directors;
- County board members or other local policymakers such as mayors or township board members;
- County information technology or GIS directors;
- School representatives, such as superintendents or technology coordinators;
- Librarians;
- Hospital or health clinic personnel;
- Residents;
- Local business community or Chamber of Commerce members; and
- Farmers, farm bureau managers, agriculture equipment dealers, or agriculture co-op managers.

Some communities include a local internet service provider (ISP) or electric or telephone cooperative on their team; others do not. The perspective and technical expertise of an ISP can be helpful, but its presence should not prevent the community from looking at alternative providers. Communities should make sure that incumbent providers will be receptive to a community's vision and not just interested in maintaining the status quo.

TOOLS and RESOURCES HELP COMMUNITIES DEFINE NEED, VALUE, SOLUTIONS

Broadband Breakthrough communities signed up to improve broadband access because they understand that without reliable connectivity, community goals cannot be met.

Broadband Breakthrough communities signed up to improve broadband access because they understand that without reliable connectivity, community goals cannot be met. But that intuitive understanding is not enough; they need to quantify and detail the local need. County teams did this by reviewing state broadband maps, asking community members to provide feedback on their experiences in a community survey, and assessing availability and quality of service through broadband speed tests.

Broadband maps are the starting point for a community broadband plan. Leadership teams identify the areas with the worst broadband and with the most fervent potential customers—either those who have no broadband or those whose service is under speeds of 25/3 Mbps. The survey also identifies who is unhappy with their current service and is willing to change providers if an alternative is offered—providing important marketing information for any new entrant.

Community surveys help quantify challenges and provide customer stories. Encouraging more people to participate in the survey maximizes its value. Gathering information from residents, businesses, and institutions helps pique community interest and encourages people to get engaged; questions aimed at farmers mean that their voices are heard. The results give each community a starting point and recognition of the collective technological and geographical pain points.

The *Broadband Breakthrough* program introduces resources aimed at rural farming communities. A research team at Illinois State University (ISU) provides two open-source tools to help communities see the value of high-performance broadband and its positive impact on the farming economy, specifically on soy and corn production. This can help farmers and farming communities justify investments and plan and leverage infrastructure to deploy precision agriculture tools. A second ISU tool mapped vertical assets that might be used while deploying broadband networks.

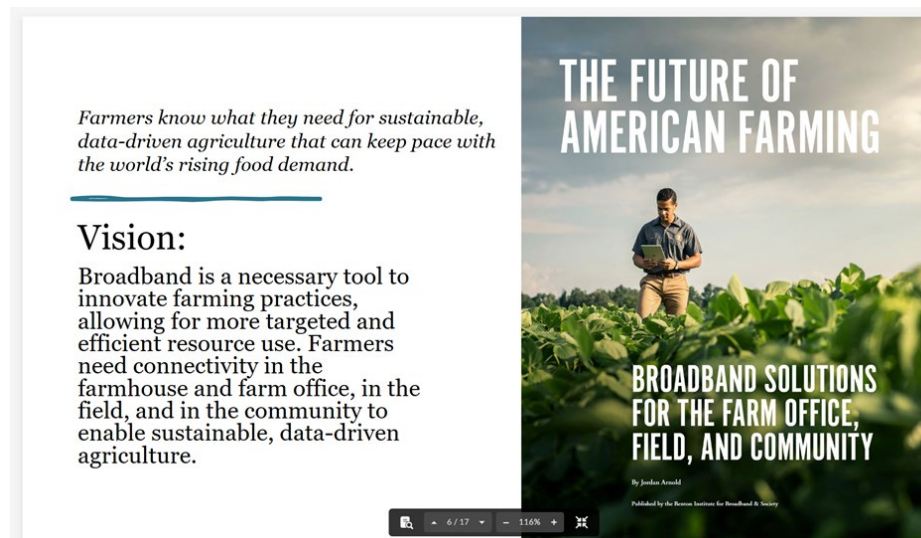
The WRC report helped communities assess the benefits and challenges of various modes of wireless broadband in a rural setting as a supplement to wired connectivity.

A COMMUNITY BROADBAND VISION is ESSENTIAL

Most of the *Broadband Breakthrough* communities came into the process with a vague notion of wanting better broadband. Ogle County, which had undertaken an earlier community engagement program, even set out to reexamine its previous vision, open to modifying, or at least confirming, its prior vision statement.

A vision is a short statement that focuses and inspires the local community to work on improving broadband access. The best visions look to the future. They can be vague or specific, depending on the community. For example, Schuyler County is focusing on fiber. That means saying no to wireless connectivity options. The other communities mention broadband but do not specify types of technology.

The community broadband vision becomes the cornerstone of a communications plan for the community. Encouraging community members to take the surveys and speed tests becomes the call to action.



UNDERSTANDING BROADBAND TECHNOLOGIES, OWNERSHIP MODELS, and FINANCING OPTIONS EMPOWERS COMMUNITIES to FIND the RIGHT PROVIDER PARTNERS

Through the *Broadband Breakthrough* program, communities assess the variety of ways that local governments can be involved, partnership options with internet service providers, and the community's tolerance for financial risk.

Interest from local, national, and emerging providers dictates many of the broadband solution options a community will have available.

Talking to broadband providers can be intimidating in the same way as talking to a car mechanic or a doctor. You want to work with someone who knows more than you do—yet be able to understand them. The Ogle County team recognized that learning more about broadband made it a stronger partner; team members have better leverage now that they understand broadband technologies and potential business partnership models.

In addition to the knowledge they gained through the program, communities gathered tips to make the conversations with providers easier. Most teams identified a subcommittee to manage provider interviews, with at least two members at each interview. They always did the interviews in person and had the providers come to them.

Talking to broadband providers earlier rather than later helps get them involved in the process. Providers can offer a level of expertise in recommending technology solutions, and they know about existing and planned infrastructure in the community. With provider involvement, however, the county team must hold firm to prioritizing community needs over the needs of any one provider.

Some communities are prepared to invest in better broadband infrastructure through a grant or subsidy, or simply by providing technical assistance and letters of community support as providers seek outside funding. Some communities are not.

The five *Broadband Breakthrough* communities all had different positions. Ogle County is prepared to invest in a network and is actively seeking grant funding with a specific provider. Schuyler County feels that it is too small to consider becoming a provider, but the team is looking to provide technical support to interested providers, including grant writing support. McLean County is a much larger county, but its team knows that constituents would prefer minimal government involvement. Considerations such as local budget, public staffing, and local politics influence tolerance for risk.

Federal and State Funding Opportunities

A VARIETY of FUNDING SOLUTIONS CAN DIVERSIFY COMMUNITY OPPORTUNITIES

The COVID-19 pandemic increased the dependency on broadband as quarantines required people to work, learn, shop, and more online. The pandemic also shone a light on the uneven access across the United States, but especially in rural areas, where fewer homes have access to broadband. The federal government responded with funding during the pandemic and is continuing to invest in broadband infrastructure through several channels.

Broadband Breakthrough communities learned not just about the range of federal, state, and local broadband funding opportunities available but also how to best position themselves to maximize access to those funds.

NTIA will administer ~\$48B through four programs that drive high-speed Internet access, affordability, and adoption



| NTIA will administer ~\$48B of funding from the Bipartisan Infrastructure Law | | | | FCC to administer \$14.2B | |
|--|---|--|--|---|--|
| BEAD \$42.45B Broadband Equity, Access & Deployment Program A program to get all Americans online by funding partnerships between states or territories, communities, and stakeholders to build infrastructure where we need it to and increase adoption of high-speed Internet. | DIGITAL EQUITY \$2.75B Digital Equity Act Three programs that provide funding to promote digital inclusion and advance equity for all. They aim to ensure that all communities can access and use affordable, reliable high-speed Internet to meet their needs and improve their lives. | TRIBAL \$2.00B Tribal Connectivity Technical Amendments A program to help tribal communities expand high-speed Internet access and adoption on tribal lands. | MIDDLE MILE \$1.00B Enabling Middle Mile Broadband Infrastructure A program to expand middle mile infrastructure, to reduce the cost of connecting unserved and underserved areas. | For Affordable Connectivity Program, which replaced the EBB program | USDA to administer \$2.0B Via the Rural Utilities Service |
| | | | | Private Activity Bonds \$0.6B Authorizes State and local governments to use private activity bonds for rural broadband | |

Source: National Telecommunications and Information Administration (NTIA) Internet for All

In March 2020, Congress passed the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which provided \$100 million to the U.S. Department of Agriculture's ReConnect program to help communities deploy better broadband networks in rural areas. Initially, those funds were distributed as **loans and grants**.

In December 2020, Congress **established a \$1 billion grant program at the National Telecommunications and Information Administration (NTIA)** to support broadband connectivity on Tribal lands throughout the country. Congress also established a \$300 million broadband deployment grant program at NTIA to support broadband infrastructure deployment to areas lacking broadband, especially rural areas, called the Broadband Infrastructure Program (BIP). Also, \$285 million went into the Connecting Minority Communities Pilot Program, which helps historically Black colleges and universities, Tribal colleges and universities, and minority-serving education institutions buy internet service and equipment as well as hire and train information technology personnel.

Enacted in March 2021, the American Rescue Plan Act created the Coronavirus State Fiscal Recovery Fund which provided \$219.8 billion to states, territories, and Tribal entities for fiscal year 2021 and will remain available until December 31, 2024. While no money is earmarked for broadband, funds can be used for local economic recovery purposes, including broadband infrastructure. A parallel fund, the Coronavirus Local Fiscal Recovery Fund, provided \$130.2 billion to local governments and counties for fiscal year 2021 and will remain available until December 31, 2024. Again, no money is earmarked for broadband, but funds can be used for a variety of purposes, including broadband infrastructure. The American Rescue Plan also established the \$10 billion

CONCLUSION

Communities need broadband to survive and thrive. The need for broadband in rural farming communities is unique because of the rise of precision, or data-driven, agriculture.

Many rural communities are being left behind because commercial broadband providers find that rural population density and terrain make broadband network deployment expensive, difficult to recoup capital costs, and unlikely to get a return on investment for shareholders. Ongoing operating costs and network maintenance also need to be factored into broadband deployment plans. With unprecedented state and federal funding available to build broadband networks by 2030, communities and their broadband provider partners are positioned to change the economics of rural farming community broadband deployment.

Five counties in rural Illinois (Edgar, Hancock, McLean, Ogle, and Schuyler) participated in *Broadband Breakthrough*, a community engagement and broadband planning program. Over 16 weeks, they attended weekly sessions that were part education and part community action to get them ready to create a community broadband action plan. The program used broadband maps, surveys, and speed tests and piloted three new agricultural tools from ISU and the WRC to help each community get closer to utilizing better broadband to promote larger community goals and chart a path forward for smart farming.

They learned that a solid broadband plan requires local leadership. Local leaders, using a set of program-provided tools, are best able to determine community broadband need, existing infrastructure, and local community appetite for investment. With outside expertise and coaching, they can create a broadband plan unique to community needs and assets.

At first glance, the *Broadband Breakthrough* communities seem alike. Certainly, the stories of life without reliable or adequate broadband are similar: Kids can't get homework done, adults can't work remotely, no one can access telemedicine, communities can't recruit or retain businesses, real estate loses value, and people can't access government services and participate in civil society. The potential solutions are also similar, including fiber and wireless options. But each county has a unique geography, culture, politics, and people, and therefore each plan is unique.

Each community runs its own race with a common goal of improving broadband access. Some races are faster, some are slower, some feel like an uphill climb, and others a coast.

Coronavirus Capital Projects Fund (CPF), which supports critical capital projects that enable work, education, and health monitoring in response to the public health emergency. Many states opted to dedicate CPF support to deploying broadband infrastructure.

In November 2021, the federal government passed the Infrastructure Investment and Jobs Act (IIJA) and authorized \$1.2 trillion for transportation and infrastructure, including a \$65 billion investment for broadband deployment, affordability, adoption, and digital equity. The Broadband Equity, Access, and Deployment (BEAD) Program is providing states and territories with \$42.45 billion to expand high-speed internet access by funding planning, infrastructure deployment, and adoption programs. The funding will be distributed through the 56 states and territories that have signed up for the Internet for All initiative.

In June 2023, NTIA announced the BEAD allocations for each state and territory. States are now in the process of developing Five-Year Action and Digital Equity Plans to map out their strategies to deploy networks and encourage broadband adoption. The funding is unprecedented, and communities that are prepared to apply for funding will have a great advantage.

Congress also made \$1 billion for the **Enabling Middle Mile Broadband Infrastructure Program**, which provides funding for robust, high-capacity national and regional networks. This investment should lead to a reduction in the cost of bringing high-speed internet to unserved and underserved communities.

In August 2023, the U.S. Department of Agriculture **announced** an additional \$700 million, funded by the IIJA, for loans and grants to connect rural areas in 22 states.

The Benton Institute for Broadband & Society keeps a close eye on funding announcements, provides explainers about funding opportunities, and **updates readers as developments happen**.

Going through an engagement process that gives communities access to open-source tools—that measure broadband needs, show the positive impact robust broadband has on agricultural outputs to justify investments, and offer wireless solutions that supplement wired connectivity—makes it easier to get over the barriers and ready communities to receive their fair share of this once-in-a-generation federal and state broadband funding.

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Broadband Delivers Opportunities
and Strengthens Communities