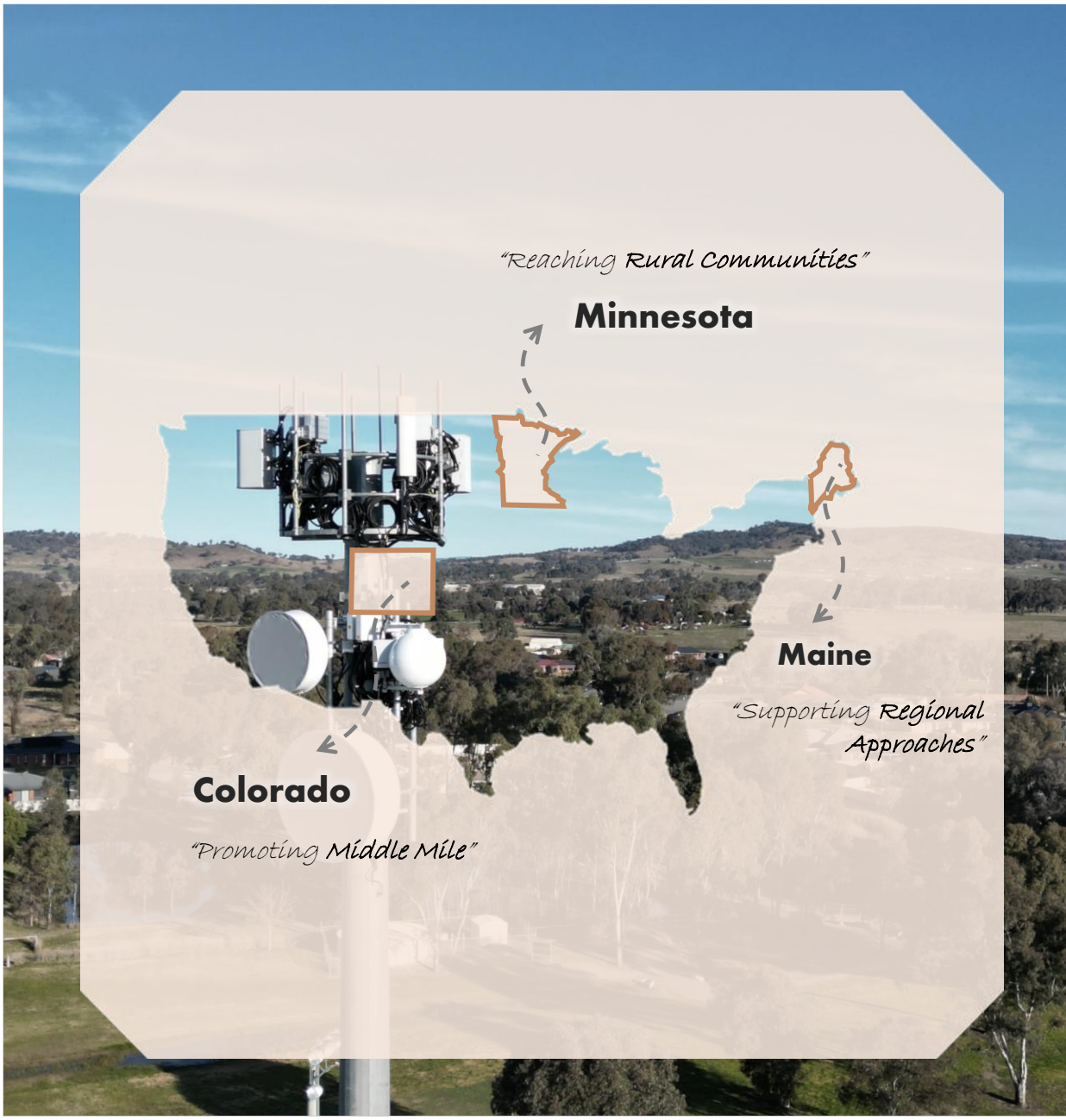

INNOVATIVE STATE STRATEGIES FOR RURAL BROADBAND:

Case studies from Colorado, Minnesota and Maine

July 2024

Authors: Natassia A. Bravo and Mildred E. Warner

This project was conducted under the supervision of Professor Mildred E. Warner in the Department of City and Regional Planning at Cornell University. Funding support was received from The Pew Charitable Trusts. Additional funds were provided by the USDA Hatch Multi-State project and the National Institute of Food and Agriculture grant # 2021-67023-34437. The full report can be found at labs.aap.cornell.edu/node/882.

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The full report can be found at labs.aap.cornell.edu/node/882.

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Introduction

Disparities in urban-rural access to broadband infrastructure have been linked to place-based barriers such as low population density, remoteness, and a challenging terrain. Broadband deployment in rural areas is costly, and the low rate of return provides little incentive for Internet Service Providers. State broadband programs are tackling the cost barrier with broadband grants, which play a critical role in offsetting the costs of buildout. To access these funds, rural communities and providers must meet a number of eligibility criteria and requirements – such as matching a percentage of the project's costs or applying as a public-private partnership. This study looks at local cases in Minnesota, Colorado and Maine to understand the relative role of state broadband policy, local leadership and private investment in extending broadband coverage to rural areas.

This research builds on a previous analysis by Bravo and Warner of state broadband grants awarded between 2014 and 2020, across 17 states.[1] We present a series of case studies of state-funded rural fiber broadband projects in Colorado, Minnesota and Maine, to learn about how rural recipients leverage state and federal broadband funds, navigate financial and regulatory constraints, and develop innovative place-based solutions. We conducted interviews with the individuals and organizations in charge of these projects, to assess the unique challenges and opportunities faced during their development. This report provides insights from a broad range of actors from the field, including representatives from broadband coalitions, local governments and the broadband industry.

Our report shows that rural broadband deployment must be approached with a "regional mindset." Rural communities are partnering with each other to pique the interest of Internet Service Providers and secure state broadband grants. Broadband advocates are working with state broadband programs to draw support for rural projects, and to develop policy that better serves rural interests. Rural electric cooperatives are providing access to critical infrastructure, such as fiber and poles. State broadband programs facilitate both traditional and innovative solutions – from public-private partnerships with local Internet Service Providers, to publicly-owned open-access networks.

State broadband policies can expand or limit the choices available to rural communities. Overlaps of state and federal rules, narrow definitions of broadband access, and capture by incumbents can restrict access to state broadband funding. Our findings suggest that, to ensure state funds reach communities with limited resources, rural communities will need more nuanced and flexible grant requirements, and to be allowed meaningful participation in the design of state program policies.

Purpose and contribution of this study

State broadband programs have long played a critical role in subsidizing deployment, and will be in charge of awarding incoming federal funds from the $42.45bn Broadband Equity, Access and Deployment (BEAD) Program. This report studies the impact of prior state policy on rural broadband projects, and identifies financial and regulatory barriers that may be significant for the distribution of BEAD funds. Insights from our case studies show state policy can ease or perpetuate challenges in rural deployment.

We give special attention to the role of local government in developing applications and implementing projects. We show that rural communities and states are approaching rural connectivity with a regional mindset. They are banding together to aggregate demand, pool resources, pique the interest of providers and increase their chances to access state funding. We also identify a number of challenges faced by rural communities, including the need for flexible eligibility requirements, overlaps of federal and a state authority, and a lack of regulatory mechanisms that hold providers accountable. Our cases show that well-meaning state rules and mechanisms, like eligibility requirements and challenge processes, can be used by private providers to undermine local projects.

Highlights

- Flexible eligibility criteria allow communities to explore various models of network ownership and operation – from public-private partnerships to publicly-owned broadband networks. A broad array of choices allows rural communities to retain

control over the network's design and development, and provides leverage when negotiating with Internet Service Providers.

- State mechanisms like challenge processes can be used to facilitate market capture. Internet Service Providers can halt grant applications from competitors and lock communities out of state funding. There is a need for mechanisms to hold providers accountable, so rural communities do not miss out on grant funding opportunities.
- Overlaps of federal-state funding rules impact rural broadband efforts. In some states, areas become ineligible for state funding if other federal, state or local funding has already been awarded. These areas might be simultaneously ineligible for BEAD, which is a federal program. States will need to abide by the program's rules when distributing BEAD funds.
- Broadband advocates and coalitions play a critical role in gathering community support for broadband fiber projects, identifying grant funding opportunities, building a relationship with the state's broadband program, and lobbying for policy changes that benefit community interests.

Background

Despite significant federal and state investment in order to achieve universal access to high-capacity and reliable broadband Internet, the digital divide persists.[2] Uneven broadband access has been linked to several factors, including challenging geography, demographic and socio-economic characteristics, market dynamics, technology costs and regulation.[3] Rural areas tend to lag behind in terms of availability and adoption.[4] Deployment in low-density areas is expensive, as networks must cover long distances to reach as many customers as possible. The result is that there is little to no competition, leaving communities without broadband access or reliant on one or two incumbents, who will have little incentive to invest in upgrades.[5]

State funding can play a critical role in closing the digital divide.[6] This paper focuses on the role of state broadband programs, in charge of distributing incoming funds from the

$42.45bn Broadband Equity, Access, and Deployment (BEAD) Program.[7] Previous research finds that state policy matters for rural broadband – with mixed results: While state funding has a positive impact on broadband availability in rural areas, municipal restrictions hinder it.[8]

This paper provides insight on how rural broadband projects leverage state funding and navigate financial and regulatory barriers to expand coverage. Rural Internet Service providers struggle with limited financing and funding alternatives,[9] cumbersome grant requirements, and restrictions over combining funds from different sources.[10] Further hindering their financing options are inaccurate federal broadband coverage maps, which underestimate the actual number of unserved rural communities and potentially lock them out of funding.[11] Each state has a unique policy approach to facing these challenges, and our report provides insight on how these policies impact rural broadband projects.

State broadband programs

State broadband programs vary in terms of their policy design – eligibility criteria, grant requirements, priorities and goals – but similarly focus on increasing coverage in unserved and underserved locations.[12] States can use criteria to ensure that funds support broadband projects that meet specific technology and speed requirements; to encourage participation from public-private partnerships, and to support both last-mile and middle-mile deployment. Population thresholds are also used to target rural and low-density areas.[13]

Still, some barriers to participation remain. Sixteen states maintain restrictions on municipalities owning, building and/or operating broadband networks, and/or providing Internet service.[14] State programs require grantees to match a percentage of the project costs, which could become a barrier for rural and high-poverty areas.[15] Local governments are using part of their 2021 American Rescue Plan Act (ARPA) funding to match state funds.[16]

This study builds on an analysis of 17 state programs by Bravo and Warner,[17] which found that, between 2014 and 2020, rural broadband projects accounted for more than half

of rural broadband recipients. These projects were primarily fiber optic networks, and a significant amount were also public-private partnerships. In addition to the role of state policy, we were also interested in learning about the role of local governments.

Why did we choose these states?

We are interested in the interaction between local leadership and state policy. From a list of state broadband grant recipients, we selected three states with broadband programs that work closely with local governments (Colorado) and broadband coalitions (Maine and Minnesota). These states have a significant rural population, and also fund a broad range of provider types. We give especial focus to the challenges for rural providers, including telephone and electric cooperatives, and for publicly-owned networks.

Colorado's Department of Local Affairs provides funding for broadband planning and open-access middle-mile infrastructure in rural communities, and works directly with local governments.[18] Middle-mile infrastructure is key for rural broadband access, as it provides service to anchor institutions and can offset the costs of last-mile deployment.[19]

Similarly, Maine focused on developing a statewide middle-mile network, the Three Ring Binder, to support last-mile rural grant recipients.[20] Along with Vermont, Maine has one of the highest proportions of rural population,[21] and the state is making efforts to expand fiber access in rural communities.[22] The state also allows municipalities to partner with each other and form Broadband Utility Districts (BUDs), which will allow them to aggregate demand. BUDs are eligible for state funding.[23]

Finally, Minnesota has a significant footprint of small providers, including independent telephone companies and telephone cooperatives.[24] The state has a challenge process that allows ISPs to object to applications in areas that they serve, or where buildout is already underway. To submit a challenge, the state requires that ISPs participate in the state's data collection for mapping.

Table 1 (next page) shows some of the state policies relevant to the concerns outlined above, and that were observed in our case studies – how rural applicants navigate grantee,

provider and technology eligibility criteria, municipal broadband restrictions, match requirements and inaccurate mapping.

Table 1. State broadband program policies observed in our case studies.

	Eligibility criteria					Grant requirements	
	Grantee type	Technology, download / upload speeds	Authorized uses	Municipal broadband eligibility	Areas that also received federal funding	Required Match	Community support
CO DOLA	PPP's, local governments (1)	Tech neutral, subject to conditions ** (1)	Planning, Middle mile (1)	Required a referendum until 2023 (2)	Not specified	25-50% (1)	Grant is oriented towards local governments (1)
ME (*)	ISP's, political subdivisions, Broadband Utility Districts (3)	Tech neutral, must deliver service equal to 25/3 Mbps or above (3)	Middle mile, Last mile (3)	No restrictions (2)	Eligible for state funding (3)	25% (3)	Requires evidence of community support (3)
MN	ISP's, political subdivisions, cooperatives, PPP's (4)	Must deliver service equal to 25/3 Mbps or above (4)	Middle mile, Last mile (5)	Requires a referendum (2)	Ineligible for state funding (6)	50% (5)	Requires evidence of community support (5)

(*) Projects funded by the ConnectMaine Authority (2006-2021), now part of the Maine Connectivity Authority.
(**) In areas subject to municipal broadband restrictions, DOLA funds can only be used for "dark fiber" if the project benefits non-governmental users. "Dark fiber" remains unused until leased to an Internet Service Provider.

Data sources: (1) Colorado DOLA Broadband Program > Policies for Funding Local Government Broadband Planning and Infrastructure Projects; (2) BroadbandNow (2023); (3) ConnectMaine, Broadband Action Plan (January 2020); (4) Minnesota Broadband Grant Program > Border to Border FAQs; (5) 2023 Minn. Stat. 116J.395; (6) Orenstein (2021).

Federal broadband funding

Analysis of these state program features is valuable because it gives insights for the new federal policy initiatives. However, prior access to federal funding can affect an area's eligibility for state funding in Maine and Minnesota. Though this report focuses on state funding, we were interested in how state and federal grants interact in the same rural area. Below, we provide a brief description of federal funding mentioned in our case studies.

Recent funding

The American Rescue Plan Act (ARPA) allocated $350 billion to the Coronavirus State and Local Fiscal Recovery Funds (SLFRF), to be used for economic recovery – including broadband deployment.[25] States and local governments can tap into these funds to complement state broadband funding. SLFRF funds can be used to cover costs incurred between March 3, 2021, and December 31st, 2026.[26]

ARPA also allocated $10 billion to the Capital Projects Fund (CPF). CPF funds will flow through states, and they can be used for broadband projects. CPF requires that Internet Service Providers using CPF-funded infrastructure must participate in the Affordable Connectivity Program. They must also deliver Internet service download/upload speeds equal to or above of 100/20 Mbps, and be able to reach symmetrical speeds (100/100 Mbps). Maine and Minnesota are using CPF funds to support line extensions – meaning, to support reaching individual homes in areas that are already served.[27] While SLFRF funds began to flow as early as 2021,[28] CPF funds were not awarded until 2023.[29] Thus, our case studies mention use of ARPA funds, but not CPF.

Upcoming funding

The 2021 Infrastructure Investment and Jobs Act (IIJA) establishes programs that factor-in or center digital equity concerns. One of these programs is the Broadband Equity, Access, and Deployment (BEAD) Program, which will flow through states and support last-mile deployment and service to anchor institutions.[30] BEAD rules define unserved areas as those without access to 25/3 Mbps Internet service speeds; and underserved areas, as those without access to 100/20 Mbps. The program also provides a specific allocation for unserved locations in "high-cost areas", where the costs of deployment are higher than the average for unserved locations. Factors such as the area's remoteness, low population density and high poverty, will be used to calculate the number of "high-cost areas".[31] BEAD recognizes that rural and high-poverty areas will also struggle with local match requirements, and allows applicants from high-cost areas to request a waiver.[32]

BEAD funds will generally not be awarded to areas where other federal, state or local funds have been committed to provide broadband infrastructure equal to or above 25/3 Mbps.[33] The funds have not been released yet. All states submitted their initial proposals by December of 2023. As of April 30, 2024, proposals from four states were approved – Louisiana, Nevada, Kansas and West Virginia.[34]

Prior funding

In addition, there are several ongoing funding programs administered by federal agencies such as the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA), and the Rural Utilities Service (RUS). Two of these funding programs are mentioned in our report. The Broadband Infrastructure Program (BIP) provides deployment funds to partnerships between a state or one or more political subdivisions, and one or more Internet Service Providers.[35] The Rural Digital Opportunity Fund (RDOF) is a competitive bidding process, and applicants will need to deliver download/upload speeds of at least 25/3 Mbps.[36] Areas that have been pre-awarded RDOF funds will not be eligible for BEAD[37] – except, potentially, if RDOF funds have been used for satellite or fixed wireless.[38]

Implications of federal maps

Federal broadband availability maps have implications for state grant eligibility as well. Broadband coverage maps are powerful tools that impact how grants are allocated. They allow federal agencies and state broadband programs to determine which areas are "unserved", and thus eligible for funding. For example, Minnesota will not allow state funds to be used in areas where ISPs have been awarded federal funds.[39]

Until 2022, the FCC's Fixed Broadband Deployment Map was built using data submitted by Internet Service Providers. The map was criticized for misrepresenting the actual level of broadband coverage.[40] These maps were built at the census block level, and an ISP could claim an entire census block was "served" if at least one location was served, or could be served within ten business days. In addition, providers could report advertised

service speeds, instead of actual speeds.[41] These factors contributed to persistent underreporting of unserved and underserved areas. Over the years, several states established their own data collection processes and developed maps of their own.[42] Some, including Tennessee and Wisconsin, use the FCC data and supplement it with their own.[43]

In 2022, the FCC issued an updated version of maps. The National Broadband Map now contains two data sets. The first shows homes and businesses where retail broadband service is already available (served) or where it could be installed (unserved). The second shows where Internet Service Providers offer retail broadband service.[44] Because the map will be used to determine which areas are eligible for BEAD funds, states and local governments were invited to submit challenges in case the maps are not accurate [45]

Regional and local actors

While broadband policies are designed and implemented at the federal and state level, broadband largely remains a local issue. The geographic, demographic, socioeconomic and market factors linked to the digital divide are place-based.[46] Local governments fulfill several important functions, including: assessing local connectivity needs and developing local broadband plans; forming public-private partnerships with local ISPs or utilities; [47] and raising funds to meet grant match requirements.[48]

States like Minnesota are supporting small and independent providers serving rural communities.[49] Electric utilities have also emerged as viable partners for local governments and telephone cooperatives, potentially helping to save costs, overcome regulatory hurdles and streamline approval processes for fiber attachment to utility poles. They already deploy fiber to upgrade their electric grids, and excess fiber could be leveraged as middle mile infrastructure to be leased by rural, last-mile ISPs.[50] This report will examine how states support local and regional actors are working to expand broadband coverage.

Background on the Three State Broadband Programs

Colorado

Colorado supports rural broadband deployment through multiple, complementary channels, each targeting different infrastructure and applicant types. The Colorado Department of Local Affairs (DOLA) provides funding for broadband planning and open access middle-mile projects in communities impacted by mineral and energy production. The grants are awarded directly to local governments,[51] which are required to match between 25 to 50 percent of the project's cost.[52]

Until 2021, private Internet Service Providers could apply to the Department of Regulatory Agencies (DORA). Through the Broadband Fund, DORA provided funding for last mile deployment in unserved areas. These applications and challenges were evaluated by a board comprised by industry representatives, public officials and local citizens.[53] Broadband Fund grants are currently awarded by the Broadband Deployment Board,[54] which was moved from DORA to the Colorado Broadband Office in 2021.[55]

Making data sharing mandatory to address map deficiencies.

The state faces several rural connectivity challenges. One major concern are federal broadband availability maps, which underestimate the amount of BEAD funds needed in Colorado.[56] Federal maps use census blocks to measure access, which does not work for rural Colorado, where census blocks are large.[57] The state took a different approach: Until 2022, Colorado divided the entire state into plots using the Bureau of Land Management's Public Land Survey System. Today, Colorado requires providers planning to apply for state funding to participate on its annual data collection – in addition to submitting address-level data as part of their applications.[58]

Supporting network redundancy to address service outages.

Another concern are fiber cuts.[59] When fiber lines in a middle-mile network are damaged, entire communities that rely on these individual lines are left without Internet

access. Colorado provides funding to make networks redundant – meaning, for the installation of alternative fiber routes (Ban 2023).[60] One example is Project THOR, a high-capacity middle-mile network providing redundant fiber routes to 14 rural communities in western Colorado. It received $1.3 million in funding from the state's Department of Local Affairs.[61]

Lifting municipal broadband restrictions to increase participation.

Finally, the state addressed barriers to participation for non-traditional providers. Municipal broadband restrictions adopted in 2005 required communities to opt out of restrictions through a referendum in order to invest in a municipal broadband project. Otherwise, these projects were not eligible for state funding.[62] While several communities managed to opt out, most of the ones that did not were small and rural communities with limited resources.[63] BEAD rules encourage states to consider applications from non-traditional providers – such as local governments and public utilities.[64] To avoid hindering BEAD participation, the state lifted their municipal broadband restrictions on May 1st, 2023.[65] This paper looks at Colorado broadband projects that were awarded state grants before these restrictions were lifted.

In January of 2024, the state provisionally granted more than $113.5 million in grants to 13 applicants, most of which were state-based providers and municipal network operators.[66] The Colorado Broadband Office also expects BEAD funds to go non-traditional providers serving rural communities – small telecoms, rural cooperatives, local governments and nonprofits.[67]

Minnesota

Minnesota has been lauded for its approach to expand access to broadband infrastructure, bringing to the table public representatives and broadband advocates.[68] First established in 2014, Minnesota's Border-to-Border Broadband Development Grant Program provides funding for middle-mile and last-mile infrastructure in unserved and underserved areas.[69] Border-to-Border requires that grantees match 50 percent of the project costs. However, to

ensure funds reach low-density areas, the state also launched a dedicated program that allows up to 75 percent of the project cost to be matched by the state.[70] Minnesota also provides funding for line extensions: Individual residences and businesses submit applications, and the state reaches out to local ISPs to serve these locations.[71] The state aims to have all businesses and homes connected to at least one provider offering Internet service of at least 100/20 Mbps by 2026.[72]

Policies that expand or restrict the local role

Local governments play an important role in rural broadband deployment in the state. Minnesota counties have partnered with rural cooperatives and contributed with matching funds, or complemented state funding with grants and loans.[73] The state promotes local involvement by requiring that applicants provide proof of community support for the project.[74] Still, local governments are restricted from owning and operating their own broadband networks, unless they obtain a referendum of 65% of voters in order to own and operate their own telecommunications network.[75]

Challenge processes: A double-edge sword?

Because federal agencies and broadband offices do not necessarily coordinate, states were not always informed regarding which areas have received federal funding.[76] To avoid duplicative funding, Minnesota allows Internet Service Providers to challenge applications involving areas where these ISPs already provide service equal to or greater than the proposed project, or construction to provide such service is already underway. ISPs must contribute to the development of state maps in order to submit a challenge. To ensure that the process is not exploited, ISPs that default on their construction promises will be penalized – unless the failure is due to factors out of their control. During the next two grant cycles, any challenge process submitted by the penalized ISP will not serve to deny funding to an applicant.[77] Still, challenge processes have been subject to criticism for protecting private investment and failing to require that incumbents upgrade their infrastructure.[78] Challenge processes can particularly impact underserved communities with access to slow, unreliable and/or expensive Internet service.

Maine

A decade ago, the ConnectMaine Authority[a] took significant steps to support rural last-mile Internet Service Providers that had received state funding, but struggled without access to a high-capacity middle mile network.[79] The result was the Three Ring Binder, an open-access, middle-mile fiber network connecting over a hundred communities and six hundred anchor institutions.[80] Today, low population density and a challenging geography remain barriers to last-mile connectivity in the state.[81]

Between 2006 and 2021, ConnectMaine was in charge of providing funding for broadband planning and deployment in unserved and underserved areas. Planning provides an opportunity for communities to determine the best fit in terms of network ownership and operation – whether it will be publicly- or privately-owned, and whether to partner with an ISP or run an open-access network.[82] ConnectMaine required grantees to match 25% of the project's cost.[83]

ConnectMaine is now a unit of the Maine Connectivity Authority (MCA).[84] The latter was established in 2021 to manage incoming ARPA and IIJA funds.[85] MCA operates multiple programs – the largest being Connect the Ready, which provides funding for deployment in unserved locations.[86] Private Internet Service Providers are eligible for funding, as are regional utility districts and other public entities with an ISP partner. To ensure community involvement, private sector applicants are required to provide proof of community support.[87]

The state aims to invest in fiber, but is also considering alternative technologies that could be better suited for remote areas, like fixed wireless.[88] In addition, the state's "Reach Me and More" program provides grants to incumbents extending their infrastructure in unserved pockets in their networks.[89]

[a] Also known as "ConnectMaine" and "ConnectME".

Supporting alternative service delivery models where the market fails.

Regional utility districts are interlocal agreements between multiple municipalities and towns, which partner to bring essential services into rural areas by aggregating demand. Since 2015, Maine has authorized the creation of broadband utility districts, or BUDs, which can be financed through revenue bonds and are also eligible for state funding. BUDs with a private sector partner are eligible for funding from the state.[90] The MCA is also partnering with state financial entities to design funding opportunities for BUDs.[91] In 2022, the state provided funding for the expansion of the Maine's first operational BUD, the Downeast Broadband Utility.[92] This nonprofit organization was first established in 2017 by the towns of Baileyville and Calais, with the purpose of building out a fiber optic network to promote economic growth.[93] In 2021, three additional Maine coastal towns voted to establish another BUD and build an open-access, publicly-owned fiber network that will lease to last-mile Internet Service Providers.[94]

Subsidizing private telecoms at the expense of feasible public alternatives?

Still, public network operators have expressed concern about potential barriers to state funding for applicants with limited resources.[95] The state's narrow focus on deployment in unserved locations potentially disregards other key aspects in applications – for example, whether the network is privately- or publicly-owned, the provider type, the applicant's capacity to raise matching funds, and whether they already have access to substantial amounts of fiber.[96] Without taking these aspects into consideration, public funds are likely to subsidize large telecoms at the expense of underserved communities, which are considering going into debt to finance their own networks.[97] While unserved communities are prioritized by the state,[98] underserved communities still have access to slow, unreliable and/or unaffordable Internet service.[99]

These three state programs illustrate the main themes we wish to explore in this analysis. How do rural communities and ISPs interact with state programs and navigate state requirements and regulations like match requirements, technology and provider

eligibility criteria and municipal broadband restrictions? How do states requirements influence ISP participation in funding programs and address issues like inaccurate maps? Finally, what is the impact of challenge processes and state policies that prevent "overbuilding" on rural deployment?

Methodology

From a list of state grant recipients in each state, we selected recipients that met the following criteria: (1) The locations were rural, or rural-adjacent, according to their USDA Rural-Urban Continuum Code designation; (2) the providers were local and, preferably, non-traditional and innovative – rural telephone and electric cooperatives, and public network operators; (3) the technology delivered was fiber broadband, which is regarded as the gold standard of broadband speed, capacity and reliability. These case selection criteria were used to explore the role of states in supporting the deployment of high-speed, high-capacity broadband in rural areas. The cases illustrate how communities leverage public funds, navigate grant requirements and pursue creative, place-based solutions, despite low population density and limited fiscal capacity.

We reached out to local government representatives, nonprofit organizations and broadband providers from communities in the three states. Thirteen interviews were conducted between October 2023 and January 2024 with key actors involved in these state-funded broadband initiatives. Insights from these interviews and other project documents were used to develop the case studies. A list of interviewees can be found in each state case study.

Research question

This report examines the impact of state policy on the planning and implementation of rural broadband projects. How did local leadership harness community resources to access state funding? What were the geographic, financial and regulatory challenges that

rural broadband initiatives must navigate? How did state policy influence choices regarding network ownership, broadband technology and partnerships with providers?

Interview questions

The interviews covered six broad questions:

(1) *What are the most pressing concerns related to connectivity in your community?* This question explored specific factors contributing to low levels of access and adoption in rural communities, including low population density, remoteness, challenging geographies and capture by incumbents offering slow and/or unaffordable Internet service.

(2) How did these concerns shape the planning for this project – the providers you have partnered with, the choice of technology and speed, etc.? In the absence of interest from traditional Internet Service Providers, rural communities will need to consider alternative network models, like partnerships with electric cooperatives, or running their own broadband networks.

(3) What alternatives/partnerships were considered to address these issues? What were the challenges?

This question explored how communities interact with incumbents and cooperate with other municipalities, as well as alternatives that were considered before deciding on the current project design. For example, a community might have considered investing in their own municipal network at one point, but faced financial and regulatory challenges.

(4) *Does this project require multiple funding sources? How does ARPA fit into the funding structure*?

To meet match requirements and offset costs of deployment, communities often combine public and private sources – including pandemic relief funds, private capital and loans/grants from local government. Because different funding sources have their own requirements, recipients will need to plan how these funds are allocated.

(5) What are your future plans?

Rural broadband networks can struggle to remain in operation due to low demand. We explored their plans for long-term financial feasibility, and asked if they were considering applying for BEAD funds, and whether they foresee any challenges.

(6) *Were there projects or grant programs in other states that guided your process*?
This question allowed us to explore the role of cross-state coalitions and organizations that support rural broadband deployment and non-traditional providers.

Colorado – The Importance of Middle Mile Deployment

By Natassia Bravo and Duxixi (Ada) Shen

Colorado channels broadband funding through multiple sources that complement each other, each targeting a different type of grantee and purpose. The Colorado Broadband Deployment Board (BDB), formerly located within the Department of Regulatory Agencies (DORA), provides funding to traditional Internet Service Providers for last-mile projects. The Department of Local Affairs (DOLA) provides funding to local governments for middle-mile infrastructure and community planning.[100] In addition, the state provides funding to make middle-mile networks redundant – by installing alternate fiber routes in the same community, Internet outages can be prevented in case one of the lines is damaged.[101] Finally, Colorado has lifted some restrictions on non-traditional broadband providers. Since 2019, the State authorizes electric utilities to deploy broadband facilities within an electric easement, or to lease any excess capacity of such a facility (like excess fiber) to a broadband supplier. Electric utilities must create an affiliate to provide broadband services.[102] Since 2005, Colorado also prohibited local governments from owning, building and operating broadband infrastructure, or providing Internet service generally, unless residents voted to opt out of these restrictions.[103] The state lifted municipal broadband restrictions in 2023.[104]

We profile innovative partnerships deploying fiber in rural areas, and we are interested in how they leverage state support to address local connectivity needs. These initiatives offer a diverse range of approaches to rural broadband deployment. The case studies include: (1) Pagosa Springs Community Development Corporation (PSCHC), a nonprofit that manages the middle mile network co-owned by Archuleta County and the town of Pagosa Springs; (2) Delta Montrose Electric Association (DMEA), a local electric cooperative applying for funding to provide last mile service in Delta and Montrose County, and (3) Rio Blanco County, who owns and operates its own middle-mile network, and is one of two Internet Service Providers providing last-mile service as well.

The analysis below is based on expert interviews with key actors involved in these state-funded broadband initiatives, conducted by the research team in 2023 and in 2024. We interviewed representatives from a development corporation, an electric utility, and a county operations administrator.

Table 2. Colorado case studies

Location(s)	Interview with	Key actors	Key features
Archuleta County	Emily Lashbrooke, Executive Director, *Pagosa Springs Community Development Corp.*	• Pagosa Springs CDC, nonprofit, network manager • Town of Pagosa Springs and Archuleta County • Visionary Broadband, Internet Service Provider (ISP)	• Developed a middle-mile fiber network • Some fixed wireless deployment in remote areas • Used DOLA, DORA and ARPA funding • Town and county co-own the broadband assets, outsource the management to CDC
Delta County, Montrose County	Kent Blackwell, Chief Technology Officer, *Delta-Montrose Electric Association (DMEA)*	• DMEA, electric coop, network owner and operator • Elevate Internet, subsidiary of DMEA, an ISP	• DMEA already deployed fiber to upgrade their electric grid • Applied for state and federal funding to do the last mile
Rio Blanco County	Eric Jaquez, Operations Administrator, *Rio Blanco County's Operations Department*	• Rio Blanco County, network owner, operator and ISP • Cimarron Telecommunications, the other ISP in Rio Blanco • Bonfire, a broadband planning, engineering and construction consultant • Northwest Colorado Council of Governments (NWCCOG), in Project THOR	• Built an open-access, middle mile fiber-to-the-home network, using DOLA and county funds • Network is owned and operated by the county • Voted to get exempt from municipal broadband restrictions. • County is also one of the two ISPs providing last mile service

Archuleta County

Archuleta County, located in southwestern Colorado, spans over 1,355 sq. miles[105] and has an estimate population of 14,189. [106] The town of Pagosa Springs, its only incorporated municipality, is relatively isolated, due to being heavily surrounded by the San Juan National Forest. The latter spans over half of the county's territory into the Southern

Ute Indian Reservation. The county struggles with Internet outages, caused by cuts to the single fiber line that runs from the neighboring county, La Plata, and provides service to Archuleta.

Before gaining access to fiber, Archuleta residents mainly had access to dial-up Internet service. There was some dark fiber buried underground in the area, which was co-owned by the town and the county. The Pagosa Springs Community Development Corporation, a nonprofit, offered to manage the broadband assets in Archuleta, and develop the fiber middle mile network. In 2019, the Pagosa Springs CDC established the Archuleta County Broadband Services Management Office (BSMO), which is in charge of deployment and network maintenance. The town and the county equally contribute to BSMO through the Broadband Services Management Fund.[107]

In 2019, Visionary Broadband secured a $466,014.50 grant from DORA for a last-mile broadband project in the counties of Archuleta and Hinsdale.[108] ARPA funds were used to provide a match of $125,000. The funds were awarded to install new cell towers to fixed wireless Internet for 557 households in previously unserved or underserved areas. In addition, Archuleta received DOLA funding to create the first redundant fiber loop within Archuleta County.

In 2023, Archuleta County, La Plata County, La Plata Electric Association, Region 10 League for Economic Assistance and Planning and the Southern Ute Indian Tribe partnered to install fiber between Pagosa Springs and the Town of Ignacio, in La Plata County.[109] All parties contributed $500,000 each, to match a $2 million grant from DOLA's Energy/Mineral Impact Assistance Fund Grant Program.[110] This will serve as an alternative to the existing fiber line coming from La Plata County, where service often gets cut due to natural factors or construction accidents.

Delta County & Montrose County

The counties of Delta and Montrose are located in western Colorado. Delta County spans over 1,142.1 square miles,[111] and has an estimate population of 31,746 in 2023.[112] To the south is Montrose County, which spans 2,240.9 square miles[113] and has a population of 44,156.[114] There are several ISPs operating in the region, including CenturyLink and TDS Telecom on the telephone side, and Spectrum - Charter Communication on the cable TV side. However, Delta and Montrose residents struggle with the high-cost and poor reliability of the available Internet service, and general disinterest from incumbents to upgrade it. In 2015, members of the Delta-Montrose Electric Association (DMEA) saw an opportunity for DMEA to compete with Internet Service Providers.

DMEA is a local electric cooperative that operates in five counties, but primarily serves Delta and Montrose. The cooperative is governed by a board of representatives from nine regions within their service territory. In 2015, member-owners of the cooperative became aware of the ongoing construction of a fiber optic network that connected all of DMEA's electric substations, and requested that DMEA provide Internet service as well. In 2016, DMEA established their own broadband subsidiary, Elevate Internet. As a local electric cooperative, they have access to a network of poles that is part of their grid system, which facilitates the installation of aerial fiber. While DMEA/Elevate focuses on providing last-mile service, it also leases excess fiber to Region 10, a nonprofit focusing on providing middle-mile access to Internet Service Providers and to anchor institutions in six counties, including Delta and Montrose.

DMEA has received state funding from DORA for several last-mile projects in Colorado, including two grants to build in Delta County ($759,585 and $2,334,988, both in 2018), and two grants to build in Montrose County ($683,158.58 in 2019 and $1,431,083 in 2020).[115]

Rio Blanco County

Rio Blanco is a sparsely-populated county in northwestern Colorado, spanning over 3,221 square miles[116] and with only 6,569 residents (2023).[117] The main communities in Rio Blanco are Meeker, the county seat, and Rangely. Most of the county is public land, controlled by the Bureau of Land Management or the U.S. Forest Service. The county's sources of revenue include oil and gas, grazing, and ranching. Because of Rio Blanco's low population density, Internet Service Providers struggled to put together a viable broadband business model. They used the copper telephone lines or radio networks that were available in the county, which could not meet the current definitions of broadband. The county tried partnering with a provider to get fiber, with no success. The county then decided to build an open access, fiber-to-the-home network by themselves.

In 2014, the county voted to opt out of the state's municipal broadband restrictions. In 2015, Rio Blanco successfully obtained a $2 million grant from DOLA. The initial buildout was funded with DOLA funding and a county match that used revenue from oil and gas. For this grant, Rio Blanco partnered with a local electric cooperative, White River Electric Association, which already had certain easements in place and facilitated access to poles. Despite intending to outsource the network's management, Rio Blanco remains the network owner and operator. The county is also one of two last-mile Internet Service Providers in the area. When one of the two ISPs that leased fiber from Rio Blanco left due to low profits, the county stepped in and began offering Internet service. While the majority of customers subscribed to the other ISP, Rio Blanco remains committed to maintain an open access network and to promote competition.

Key findings

Key themes from the interviews illuminate the challenges and opportunities in broadband development in Colorado. Colorado DOLA and DORA each target a different type of broadband infrastructure and grantee, and play a pivotal role in addressing rural connectivity concerns. The state is supporting (1) middle-mile networks, which enable last-

mile Internet Service Providers to provide faster and reliable service; (2) network redundancy, which protects rural communities from Internet service cuts, and (3) partnerships with electric utilities, which facilitates access to critical infrastructure.

Colorado broadband programs focus on the middle-mile to address rural connectivity issues.

DOLA's dedicated support to middle-mile initiatives addresses one of the key concerns in rural connectivity – network redundancy, which is essential for reliable and uninterrupted broadband services in rural counties like Archuleta and Rio Blanco. In addition, access to a high-capacity, middle-mile network offsets the cost of last-mile broadband deployment in rural communities.

The geographic challenges have led many communities to rely on single fiber lines. Fiber cuts are a pressing concern in Archuleta County, where residents rely on the one line coming from La Plata County. Once the line is severed, which happens frequently, Archuleta loses all the connectivity. *"We lose cellphone signal, we lose landlines, we lose emergency management… We lose everything because a neighboring community cuts a line. […] And it cripples us, because we are up against a mountain. We're rural Colorado. We're a large county."* (Pagosa Springs CDC)

Colorado counties are leveraging state funds to achieve high-capacity and stable Internet service. Archuleta is using DOLA funds to address fiber cuts. First, DOLA funds were used to build the county's first internal redundant fiber loop, which will connect Carrier Neutral Locations. These facilities allow last-mile providers to install their equipment, and interconnect with the local middle-mile network.[118] With a redundant loop, fewer providers are affected if one of the lines gets cut. To address external fiber cuts, Archuleta is partnering with its neighbors, La Plata and the Southern Ute Indian Tribe, and a local electric utility, the La Plata Electric Association. They recently received $2 million from DOLA to install a second fiber path, which will run from the town of Ignacio (La Plata County) to Pagosa Springs. Ignacio is part of the Reservation, and the Tribe has

agreed to grant ownership part of its fiber to Archuleta, La Plata and La Plata Electric Association.[119]

A "regional mindset" enables solutions to broader rural connectivity issues.

The case of Archuleta, La Plata, Southern Ute Indian Tribe, and La Plata Electric Association, illustrates how broader connectivity challenges requires interlocal cooperation. According to the Executive Director of Pagosa Springs CDC, their DOLA grant was the direct result of monthly regional meetings, held by Archuleta, with Internet Service Providers and other communities' broadband offices. These meetings provide insight on the challenges these communities share, and open up opportunities for cooperation. *"A regional mindset is a good one to look at. Talk to your neighbor or your neighboring communities, and find out what they're doing. [Then you] don't have to reinvent."*

Interlocal cooperation contributes to broader network redundancy efforts as well. Rio Blanco County's local fiber network gets access to the broader Internet through Project THOR, a middle-mile network that serves fourteen rural communities in Northwestern Colorado. Project THOR built a series of redundant loops that provide communities like Rio Blanco with two fiber paths. The initiative leveraged fiber that was already installed, and funds were mostly spent in connecting existing fiber networks – including Rio Blanco's.[120] Project THOR was coordinated by the Northwest Colorado Council of Governments, and received funding from DOLA and local matches from the communities that participated in the project.

Public ownership to retain control over broadband development.

When applying for state funds, Rio Blanco has procured partners that assist with construction and grant writing, and that provide access to critical infrastructure. However, as the network owner and operator, Rio Blanco County is in charge of how the network is developed and funded. Public ownership allows the county to ensure the network's sustainability. For example, Rio Blanco is planning to use state funds to build its own connection between the county's two main communities, Meeker and Rangely. Currently, it

leases the fiber conduit, which has a different owner. In future, Rio Blanco will be able to lease the fiber and generate additional revenue.

Rural electric utilities play multiple roles in broadband – as local government partners, owners of critical infrastructure, and Internet Service Providers.

As owners of critical infrastructure, rural electric utilities are key partners to local governments applying for state funds. Archuleta partnered with La Plata Electric Association, which provided access to their poles so the county could complete their internal redundant loop. The two then partnered for the aforementioned DOLA grant with La Plata County and Southern Ute Indian Tribe. Similarly, Rio Blanco partnered with the local electric cooperative White River Electric Association, which granted the county access to their poles and electric easements. Rio Blanco and White River Electric Association, along with telecommunications provider Strata Networks, applied for the State's Capital Projects Fund grant to reach low-income homes that were still unserved.

In the cases of Archuleta and Rio Blanco, rural electric utilities are partners, but not owners or service providers. By contrast, the Delta-Montrose Electric Association (DMEA) owns the fiber, and established a subsidiary to provide Internet service. While electric utilities are not allowed to directly provide broadband services,[121] they can establish a subsidiary for that purpose. DMEA is an electric cooperative, and only considered providing broadband services at the request of its member-owners. The members had become aware that DMEA was installing fiber to connect their electric substations:

> *Our members rose up in awareness of that project, […] pleading with the co-op to get into the broadband service space. They were just tired of high-cost providers, poor reliability, just a disinterest to really improve their services in any meaningful way. The members stormed one of our board meetings […] and just pleaded their case.* (Delta-Montrose Electric Association)

Today, DMEA is leveraging new funding opportunities. The electric cooperative is applying for American Rescue Plan's Capital Projects Fund, which are managed by Colorado. State funds will allow DMEA to reach 95% of all its premises, and the rest will be covered with the cooperative's own money. In addition, DMEA's experience as an electric cooperative in the broadband space has contributed to the design of new federal broadband policy. Their Chief Technology Officer worked with state officials in drafting some of the rules of the Broadband Equity, Access and Development (BEAD) program.

Strict grant criteria may hinder innovative solutions.

State eligibility requirements can become barriers for rural communities (1) that already have access to fiber, but have not yet reached every home, and (2) where the terrain makes fiber deployment too expensive. Colorado broadband programs prioritize "unserved" areas – those without access to Internet service with download/upload speeds of at least 25/3 Mbps. While Rio Blanco is already ahead in this respect, the county still relies on state funding to reach unserved homes in the county. About 600 addresses, mostly low-income, can't afford the cost of getting connected to the network. However, Rio Blanco does not qualify for state funding, because there is already fiber available.

> *We just don't qualify because we already [are] so far ahead. […] If there's anything, it's making sure some of those grant programs are not so tailored, […] but allow people to be creative.* (Rio Blanco County, CO)

On the other hand, flexible technology eligibility criteria allowed Archuleta to explore alternate solutions where the cost of fiber deployment was prohibitive. Archuleta and their Internet Service Provider partner, Visionary Broadband, used state funds to build cell towers in areas that were previously unserved or underserved. The Executive Director of Pagosa Springs CDC acknowledges that fixed wireless is not as reliable as fiber, particularly with Archuleta's mountain terrain and stormy weather. However, at least short-term solutions are needed for remote areas.

ARPA funds ease the path towards state funding.

When applying for state funds, rural communities can use ARPA funds to provide a local match. When Archuleta County awarded a little over half a million dollars in ARPA funds to Pagosa Springs CDC and the Broadband Services Management Office (BSMO), the latter promised to leverage those funds to secure other grants. Since then, ARPA funds have been used for at least two grants: (1) $125,000 to match a $466,014.50 grant from DORA to build cell towers in unserved areas, and (2) $500,000 to match a $2 million grant from DOLA that will build a second fiber line between Archuleta County, La Plata County, and the Southern Ute Indian Tribe.[122] The Executive Director of Pagosa Springs CDC recommends: *"Leverage any funding you have. Go after it because it's out there right now with the IIJA funding, the BEAD funding. Right now, there's more money than we're ever going to see again in our lifetime."*

Conclusion and Implications for state policy

Rural connectivity in Colorado faces several barriers, including low population density, challenging terrains, remoteness, and lack of network redundancy. Resources are limited; therefore, tackling these shared challenges will require a regional mindset. State funds enable rural communities to develop their own broadband networks, and to partner with each other and plan alternative fiber routes. Electric utilities can provide access to critical infrastructure, like fiber and poles. These individual networks then provide fiber access to broader middle-mile initiatives like Project THOR.

Still, one critical challenge remains. Rural communities are likely to need multiple grants to reach every home, but progress can hurt their chances of getting funded. Since fiber access can satisfy the state's definition of "served", these communities become less of a priority for state broadband programs. In Rio Blanco, unserved homes can't afford to get physically connected to the county's fiber network. More nuanced program rules might be needed to help rural communities achieve universal service.

Minnesota – The Importance of Local Actors

By Edward Guo, Jane Bowman Brady, and Natassia Bravo

Minnesota's Border-to-Border Broadband Development Grant Program has been in operation for almost a decade, and its efforts to expand rural connectivity include supporting regional providers, addressing mapping inaccuracies, and collaborating with local broadband providers and community organizations. The state requires that providers have community support. It has awarded funding to rural telephone companies and cooperatives working closely with local governments.[123] To avoid duplicative funding, the state allows ISPs to challenge applications, but requires that they participate in their efforts to improve broadband availability maps.[124] The program's efforts are complemented by the Blandin Foundation, a nonprofit that assists rural communities with grants for planning and adoption initiatives, and helps them navigate the application process for state broadband funding.[125]

The analysis below is based on expert interviews with key actors involved in these state-funded broadband initiatives, conducted by the research team in 2023 and in 2024. The case studies were selected based on their rural locations and the use of non-traditional providers such as cooperatives. Recommendations by the state's Office of Broadband Development helped identify the key players to interview – from local government, local ISPs and citizen advocates. Projects profiled below cover four rural locations in the state.

Table 3. Minnesota Case Studies

Locations	Interviewees	Key actors	Key features
Le Sueur County	• Barbara Kline, Local Broadband Advocate • Bill Eckles, CEO of BevComm (ISP)	• County officials • Volunteer broadband taskforce • BevComm (ISP)	• $3 million in funding • Connected over 800 homes, farms, businesses, and institutions • Voluntary broadband task force
Hubbard-Itasca-Becker County	• Steve Howard, IT & Development Manager	• County officials	• Over $15 million in funding from state broadband grants

	at Paul Bunyan Communications (ISP)	• Paul Bunyan Communications (ISP)	• Connected thousands of households and businesses
Northeast Minnesota Counties	• Paul Brinkman, Executive Director of Northeast Service Cooperative (ISP)	• County officials • State Legislature • Northeast Service Cooperative (ISP)	• Secured $45.3 million in loans and grants • Built nearly 1,200 miles of middle-mile fiber
Fillmore County	• Jill Huffman, Chief Operating Officer for Harmony Telephone Company (ISP)	• County officials • Harmony Telephone Company (ISP)	• Over $5 million in funding from state broadband • Fiber to over 500 homes and businesses
State of Minnesota	• Bree Maki, Director of the State of Minnesota's Office of Broadband Development	• State Governor • State Legislature • State Broadband Office • County Legislatures	• Goal of 100 Mbps download and 20 Mbps upload by 2026 • $250 million in funding since 2014

Minnesota has been a leader in expanding state broadband access, even across rural counties. The state sets ambitious broadband goals, the most recent being to achieve 100 Mbps download and 20 Mbps upload from at least one provider available to all homes and businesses by 2026. It works to achieve these goals by allocating significant state funding to broadband expansion, having awarded over $290 million of grant money via its Border-to-Border program since 2014.[126] To learn from Minnesota's experience in expanding broadband, particularly in rural and unserved communities, the following case studies were conducted.

Le Sueur County

Le Sueur County is a largely rural county located outside the twin cities of Minneapolis and St. Paul, Minnesota. With a voluntary task force of county residents, the county managed to secure $3 million via three rounds of state funding that, combined with equity from internet service provider BevComm and local resources, connected over 800 homes, farms, businesses, and anchor institutions. To make broadband expansion more achievable across the entire county, Le Sueur County provided certain townships with

interest-free loans that allowed towns to meet their immediate match requirement for the state program, thereby lessening their financial burden.

The voluntary broadband task force organized a mailing campaign for line-extension programs in attempts to connect a previous provider's half-complete deployment to actual homes, allocated COVID relief funding provided via the CARES Act to enhance fiber backhaul, and attended county fairs to raise awareness on broadband issues.

Paul Bunyan Communications

Paul Bunyan Communications is a Minnesota-based co-op that began as a telephone company in 1950. After the passage of the Telecommunications Act of 1996, it began expanding its service area and added Internet to its services. With a goal of bringing economic vitality to the region, it has been rewarded with over $15 million of state broadband grants over 7 rounds and connected thousands of households and businesses with fiber across Central and Northern Minnesota.[127]

One of its most significant projects has been expanding fiber in Itasca County, St. Louis County, and Hubbard County. This project cost $1.78 million, with Paul Bunyan contributing $980,990, and the State of Minnesota contributing $802,620.[128] Paul Bunyan's rural work stands out because the internet service provider understands the cost of providing broadband is prohibitive for many counties, so the company works with local municipalities to seek funding for projects. They seek out local broadband advocates to be champions for their work. Paul Bunyan is an example of an internet service provider working in partnership with local communities to bring funding into rural areas.

Harmony Telephone (MiBroadband)

Harmony Telephone, now MiBroadband, is part of a collaboration between three area cooperatives: two broadband cooperatives and an electric cooperative. The collaboration was formed in 2018 to fill the connectivity gap in Southeast Minnesota and Northeast Iowa. The

broadband issue has really been the driving force for this partnership. In the rural counties these cooperatives serve, there are not enough resources to implement these projects without this partnership. The cooperatives have received over $5 million in state broadband funding for three projects that will ultimately extend fiber to over 500 homes and businesses in rural Fillmore County. The collaboration is the key to success in this case.

Northeast Service Co-op

The Northeast Service Cooperative (NESC) is a nonprofit public corporation established by the Minnesota legislature in 1976. Serving seven counties in northeastern Minnesota, it provides services ranging from group health insurance to supporting academic programs. NESC entered the middle-mile broadband arena in 2011 with the help of $45.3 million from a 50% grant and 50% loan program from the federal government through the Rural Utilities Service.

NESC is an example of a service provider partnering with last-mile providers and local governments for successful broadband expansion. NESC provides middle-mile fiber, so they seek out other providers who provide last-mile service. In addition, NESC partners with larger government agencies across the region, and has doubled its middle-mile fiber network to nearly 1,200 miles since 2014, serving as an important network backbone in the region.

Key findings

A number of common themes emerged regarding rural broadband development in Minnesota. First, the case studies show that state funding played an important role in expanding rural broadband coverage and promoting non-traditional providers. Second, local advocates have proven crucial in the planning and development of broadband projects. The case studies also demonstrate how localities are using creative funding mechanisms to bridge and mitigate state program deficiencies. Additionally, partnerships between stakeholders can enhance broadband projects. However, the case studies also identified a fractured regulatory broadband landscape which requires greater policy attention.

State funding plays an important role in supporting rural projects and non-traditional providers.

Minnesota's broadband policies focus on providing place-based subsidies to encourage private market actors to expand broadband coverage. Providers interviewed say that without state funding support, many areas that now enjoy fiber connection would not have been covered due to the lack of financial return. According to the CEO of BevComm, in some locations, the cost to connect per home could be between ten to fifteen thousand dollars. There is also the impression that every rural community that is remotely profitable is already served, where there is sufficient population density to justify the costs of deployment. "*All the good ones are taken*" one interviewee notes. Even though this speaks of the progress achieved by the state, it creates a challenge for Minnesota. How can the state encourage providers to build in the least profitable rural communities?

The state's approach revolves around smaller, local, non-traditional providers. All projects interviewed in this state case study are done with rural providers like electric and telephone co-ops. According to the Director of the State of Minnesota's Office of Broadband Development, the state prides itself on the strong cooperative model and believes such models enhance accountability: "*These [co-ops include] folks that live and work in these communities, they're accountable to each other, and just truly are going: What do our members need and how can we best serve them?*" The state also ensures accountability by requiring applicants to provide evidence of community support, and take into account whether there is a local government match. Thus, cooperating with broadband advocates and local governments leaders is a smart choice for providers that are applying for state funding.

Local advocates help initiate broadband projects.

Expanding broadband in rural Minnesota is difficult. Beyond diverse geographies dotted with lakes, forests, mountain ranges and mine pits, population density is often too low for providers to economically justify broadband expansion. The COO of Harmony

Telephone Company shares this sentiment, stating that there sometimes are less than four customers per every mile of fiber, making a financial return difficult without supportive funding.

Facing these challenges, local broadband advocates have stepped up and played a big role in initiating the broadband development process. The right advocate can serve as a spark that initiates connections between providers and residents and helps the community demonstrate need, resulting in successful state grant applications and broadband expansion. In addition, broadband advocacy is critical to bring the state's attention to the issues faced by rural communities:

> *One thing that […] has really been a loss, especially right now, is there was a rural broadband coalition, which had been very aggressive with the legislature […] The person who was running that got sick, and it just folded. So, we don't have any rural coalition anymore, either, that is taking on this with the legislature.* (Le Sueur County)

In Le Sueur County, local broadband advocates and the voluntary broadband task force worked with the county and initiated contact with local providers in order to understand what each provider was doing in the county and why providers were not building out to unserved areas. These initial contacts allowed BevComm and other providers to educate the county on the cost to build broadband. This eventually led to successful state grant applications with BevComm with the county putting in matching dollars. The task force's other activities, including mailing campaigns and county fair attendance, continue to raise awareness around broadband issues.

The Development Manager of Paul Bunyan Communications, which operates in the counties of Itasca, St. Louis and Hubbard, spoke highly of broadband advocates' work in project planning and initiation. Paul Bunyan first needs to determine the take rate of its service. and local broadband advocates can help distribute surveys that demonstrate community demand. The Manager notes, "*somebody that has a reputation, that hangs out in the coffee shop in the morning or at the bar at night…and brings up the topic and makes things happen"* really help pique the interest of providers like Paul Bunyan.

Localities use creative funding mechanisms to circumvent and mitigate program limitations.

To avoid overbuilding in areas with sufficient existing services, the state allows other providers with service in a given location (or plans to serve a given location) to "challenge" the grant application put forth by a provider. While the state makes the ultimate decision on whether the challenge is credible, an incumbent provider's opposition can seriously impact the success of grant applications that cover any "challenged" area.

Local leaders work to avoid such challenges. For example, in Le Sueur County, 30 households were not included in a state grant application in the County's Derrynane Township due to concerns that including them would lead to challenges by the incumbent provider and thus endanger the entire project. But the Township did not want to leave those households unserved. So, the Township and the provider came together and funded those remaining households out of pocket with a combination of federal funding, Township funding, and provider equity. Because the 30 households did not receive state funding, a potential challenge from the incumbent was avoided.

Localities have also provided loans to bridge deficiencies in the state program. For example, until recently, the state's Border-to-Border program required a 50% local match. This places a significant burden on smaller municipalities. To lessen this cost burden, Le Sueur County has provided some townships with interest-free loans to meet their immediate match requirement for the state program. This loan structure also protects localities from inflation risks that have soared in the past years. In Fillmore County, the County has provided Harmony Telephone with the option for a small loan amount with zero interest to be repaid over three years to help with upfront marketing to ensure broadband projects get enough subscribers to reach profitability.

Partnerships open up opportunities to pool resources.

Partnerships between broadband stakeholders facilitate rural broadband deployment. Northeast Service Coop (NECS) notes that both formal and informal partnerships are important. Beyond formal partnerships with last mile providers, larger units of government and other enterprises in northeast Minnesota, NECS also benefits from an informal business relation with Cooperative Network Services (CNS), a broadband engineering company that works with NESC and last-mile providers. When someone is trying to connect to a network asset, CNS might call NESC and ask how close the latter's fiber assets are, and whether they can be extended to meet the demand. These *"structured or even loose network structure, partnerships, and loose networks of colleagues allow for opportunities to meet unserved and underserved areas simply because of the collegial relationships you have in the marketplace."* (Northeast Service Coop)

Partnerships between providers also help. Harmony Telephone is a collaboration between two broadband co-ops and an electric co-op, which allows them to leverage their shared expertise and resources. The collaboration in broadband not only enhances Internet service to customers, but also helps electric utilities better deploy state-of-the-art technology such as smart metering. At the same time, the Executive Director of NECS underscores the importance of establishing clearly divided roles in partnerships. NECS operates a middle mile network, and is not interested in competing with the last-mile Internet Service Providers leasing fiber from NECS: "*We were able to communicate, at the front end of our part of [the] project, to the providers of the last mile level, that we had no interest in eating their lunch. We wanted to be their partner*."

Overlapping state and federal authority hinders rural deployment.

While the case studies demonstrate the multiple positive aspects of Minnesota's broadband policy, a number of challenges remain, especially regarding the regulatory landscape. Overlapping state and federal authority in the funding process increases the difficulty in project development. Regulatory mismatch and vacuum, which refers to

differing requirements between federal and state programs and the lack of effective regulation can hamper broadband development.

Minnesota will not allow state funds to be used in areas where ISPs have been awarded federal funds. State grant applicants will need to remove those areas from their application. According to BevComm's CEO, state grant applicants need to map out areas that have been pre-awarded federal dollars, so as not to include them in the proposed service area. This creates significant difficulties for broadband project planning and development. Le Sueur County discovered how cumbersome this rule is when, in 2020, the Federal Communications Commission announced that a $1.3 billion award of Rural Digital Opportunity Fund (RDOF) funding to LTD, with $311 million going to build out fiber optic cables in Minnesota.[129] The issue is that rural communities are partitioned into census blocks, with only some of them qualifying as "unserved" and pre-awarded RDOF funding. When the Le Sueur and BevComm tried to apply for a state grant, they tried to be very particular about the project territory to avoid including federally funded areas. However, it was impossible to avoid all the areas due to practical constraints. The application was denied. BevComm CEO believes the overlap with federal funding areas cost the county the project:

> *When you looked at Le Sueur County, it looked like a checkerboard. Like one block would get funded, the one after wasn't. […] We essentially had to include these areas that had RDOF funding, because there was no way to do it. You couldn't zero down into it by census block.* (BevComm)

Local providers and communities, doubtful of LTD's ability to serve the claimed areas quickly and effectively, protested. The FCC revoked the RDOF award in 2022, concluding that LTD was not capable of building the fiber-optic cable networks it had promised.[130] However, it remained uncertain whether local service providers could obtain state and other federal funding in LTD's claimed service area as LTD appealed the revocation, and the result of the appeal is still pending. The debate finally appeared settled with the state's Public Utilities Commission (PUC) suspended LTD's certification in late 2023. The time it took to sort out the regulatory overlaps, however, delayed potential shovel-ready projects in

rural Minnesota. Paul Bunyan Communications pulled 5 out of 6 projects due to concerns with overlapping grant territory with RDOF awards, and rising costs have made these projects less financially viable over time.

Regulatory mismatch, evident in varying requirements for different state and federal funding programs, also creates difficulties for local broadband projects and providers with limited capacity. One of the biggest challenges faced by rural providers is the various state and federal programs are not aligned in terms of requirements and timeline. Some policies like historical preservation processes along well-traveled corridors are well-meaning, but generate costly planning and project delays. According to the COO of Harmony Telephone, different rules across funding opportunities have been difficult to navigate, and meeting grant requirements when managing different funding sources can be a significant effort for small companies.

Another area of regulatory overlap is broadband mapping. Broadband availability maps are used by funding programs to determine which areas are eligible for funding, and by providers to challenge grant applications from competitors. However, the state and federal agencies must coordinate when developing maps that determine funding availability for different programs. The COO of Harmony Telephone notes that a self-funded project is not recorded anywhere until the next mapping cycle, whereas a USDA-funded project appears on maps as soon as the project is awarded. There are also uncertainties over how to reflect under-construction projects on maps.

Need for effective regulatory mechanisms to hold providers accountable.

Providers can claim that an area is already served or will be within the timeframe of the competing grant application. If the provider defaults on its promise to build in these areas, there is no effective mechanism at any level to ensure that providers are held accountable. While the state does prevent them from participating in future challenge processes, BevComm's CEO explained how this harmed counties nonetheless:

> *If a provider does challenge and [says,] "No, I'm going to be providing service to this area without grant funding." There really isn't any sort of mechanism to ensure that they ever do. So, in theory, a provider can say, "No, I'm going to do it just to prevent a competitor from coming into that area, and never actually build it." And there's no penalties for it.* (BevComm)

Neither smaller counties nor the state's broadband office have the capacity to monitor service providers to ensure broadband projects are completed. In Le Sueur County, addressing these issues with providers will require coordination between federal officials, the state's Attorney General and the state's broadband office. All levels of governments also struggle to keep accurate records of broadband speeds and availability as inaccurate maps remain an issue for providers.

Other challenges

There are also certain regulatory vacuums that impact local broadband deployment. Both the Development Manager of Paul Bunyan and the Executive Director at NESC spoke about encountering permitting difficulties when crossing railroads and expressed desire for a more efficient and easier to navigate permitting process. Despite state legislation addressing the issue, the Executive Director recalls it may take upwards of a year to gain permission around railroads, and Paul Bunyan had been forced to hire consulting firms to deal with railroads, or worse, to skip serving homes on the other side of the track.

Conclusion and Implications for State Policy

Given that local governments and providers are the main actors through which broadband projects are being realized, future policies may consider focusing on how to enhance local capacity and reduce burden placed on local actors. The case studies demonstrate that local advocates, local governments, and state broadband programs have an important role in facilitating early project planning, and strengthening channels of communication and data sharing between advocates, government agencies, and service

providers to generate more viable projects. Addressing the fractured broadband regulatory landscape may help reduce the burden on local governments and providers. This includes reducing the requirements associated with grants, clarifying and enhancing regulatory authority, and aligning the rules of different broadband programs. This would require coordinated efforts between state and federal agencies.

Despite the generous policy support, there are some areas that remain objectively hard to serve due to geography or rising costs. Greater financial and technical resources will be required to truly bridge the broadband gap in these locations. Policymakers should remain vigilant of uneven development when developing future policy. While some county governments have the ability to subsidize construction costs to ensure projects can commence, this may not be the case for municipalities that are more financially challenged and could lead to continued uneven broadband availability. Connecting the remaining locations as quickly and equitably as possible will require the continued cooperation between local actors (providers, advocates and local government leaders), the state and federal broadband agencies.

Maine – The Importance of Flexible Grant Rules

By Natassia Bravo and Elizabeth Redmond

Maine's former broadband authority, ConnectMaine, was one of the state's smallest programs[131] and operated for fifteen years before receiving its first major contribution from the Legislature in 2021.[132] Due to its limited budget, ConnectMaine supported rural deployment in multiple ways, besides state grants. To assist small rural grantees struggling to connect rural communities, the program supported the development of an open-access, middle-mile fiber network – the Three Ring Binder.[133] To provide more choices to rural communities, ConnectMaine also supported Broadband Utility Districts. These are partnerships between municipalities that can issue bonds to finance broadband deployment.[134] Today, ConnectMaine has been integrated into the Maine Connectivity Authority, which was established in part to manage incoming federal funds in 2021.[135]

We profile both traditional and innovative approaches to rural fiber broadband deployment in Maine. Our case studies include: (1) The Peninsula Utility for Broadband (PUB), a coalition of then seven coastal towns that became part of a larger federal grant application submitted by ConnectMaine; (2) The Town of Lincolnville, where residents struggle with the costs of connecting to incumbent's fiber network, and (3) Downeast Broadband Utility, an open access fiber network that is owned by Maine's first broadband utility district. These cases showcase how Maine communities are leveraging broadband advocacy and state support to bring fiber into their communities, and how they navigate regulatory and financial constraints.

The analysis below is based on expert interviews with key actors involved in these state-funded broadband initiatives, conducted by the research team in 2023 and in 2024. We interviewed a town official, one broadband coalition organizer, one industry representative, one former broadband committee chair, and the leader of Maine's first broadband utility district.

Table 4. Maine case studies

Location(s)	Interview with	Key actors	Key features
Hancock County, ME	**Jim Fisher** *Town Manager of Deer Isle* **Butler Smythe** *Organizer of the Peninsula Utility for Broadband (PUB), a broadband coalition* **Sarah Davis** *Vice President for Market Development, Consolidated Communications*	• PUB, the coalition that brought ConnectMaine's attention to the area • ConnectMaine, who applied for the NTIA grant • Consolidated Communications Inc. (CCI), network owner and ISP • The National Telecommunications and Information Administration (NTIA), who awarded funding to ConnectMaine	• A fiber network, owned by CCI • State program and CCI applied for an NTIA grant and included PUB member communities in the service area, including Blue Hill and Deer Isle • CCI had also been awarded RDOF funds to deploy fiber in some sections of the service area
Waldo County, ME	**Josh Gerritsen** *Former Chair of the Lincolnville Broadband Committee*	• Lincolnville Broadband Committee • Lincolnville Telephone Company, the incumbent	• Fiber is available in the town, but residents cannot afford to get it to their homes • The Committee aimed to build a publicly-owned network that reached every home • Town is not eligible for state or federal funding because there is fiber • No solution to their issues yet
Washington County, ME	**Dan Sullivan** *President of the Downeast Broadband Utility (DBU), and broadband advocate*	• City of Calais and town of Baileyville, who took out loans to start the project • Pioneer Broadband, the ISP leasing fiber from DBU • Maine Connectivity Authority, who awarded funding to four communities that later joined DBU • Maine Community Foundation, who awarded funding to one community that later joined DBU	• An open access fiber network, owned by Maine's first broadband utility district • Currently, only one provider leases fiber from DBU • Originally an interlocal agreement between two communities. Today, all members share the costs of financing the network's expansion

Town of Lincolnville

The Town of Lincolnville –located in the Mid Coast Region– is a small town in Waldo County with approximately 2,300 residents.[136] Lincolnville is solely serviced by the Lincolnville Telephone Company, which operates Lincolnville Communications, Inc. (LCI) and Tidewater Telecom in the town. Due to the company's natural monopoly, the cost of service in Lincolnville was among the highest in the nation, and the company required residents to enter into three-year-long contracts, with no option to exclude unnecessary services such as phone lines. While the town boasts a robust fiber network, LCI only offered asymmetrical service (50/10 Mbps. and 100/20 Mbps download/upload speeds). They also had some of the highest subscription fees in the country for relatively low-speed fiber. In 2022, LCI charged $64.95 for Internet service with download/upload speeds of 50/10 Mbps, while Downeast Broadband Utility (below) offers 1 Gbps (1000/1000 Mbps) for $67. In 2019, the incumbent approached Lincolnville with plans to expand their fiber network. The plan did not meet the town's expectations, and Lincolnville declined to support the project.

In 2021, Lincolnville joined the Mid-Coast Internet Coalition,[137] a group of several municipalities that sought to establish a publicly-owned, open-access fiber network.[138] While some of coalition's members moved forward with plans to establish regional utility district, Lincolnville opted against it. The project prioritized unserved locations in order to secure public broadband funding. LCI had already deployed fiber in Lincolnville, and thus the town did not qualify as "unserved". The town ran into the same issue when it considered building their own network: A feasibility study concluded that Lincolnville was unlikely to receive federal or state funding, or to successfully defend "overbuilding" LCI's existing fiber with a large municipal bond. Lincolnville's public broadband efforts were stalled. In the end, while prices remain high, LCI has begun to offer symmetrical fiber, and has dropped the three-year contracts and phone line requirements.

Peninsula Utility for Broadband

The Peninsula Utility for Broadband (PUB) is a community coalition and advocacy group that currently supports the towns located on the Blue Hill Peninsula as well as Deer Island and Stonington, in Hancock County. The original coalition was comprised of seven towns: Blue Hill, Brooksville, Brooklin, Deer Isle, Penobscot, Sedgwick and Stonington. It was the hope that, as part of a regional coalition, the towns could better access state, federal, and/or private funding. Towns in the coalition have historically relied on a patchwork of DSL, satellite, dial-up, and cable internet, which was slow and outdated; DSL, for instance, operated at a speed of 3/0.7 Megabits per second (Mbps), which fell well short of the federal broadband requirement of 25/3 Mbps.

In order to bolster broadband accessibility, PUB began to explore a wide range of options to bring affordable fiber to their constituents. In 2021, four of the towns (Blue Hill, Brooksville, Deer Isle and Penobscot, working through their PUB representatives and committees, developed and submitted a Request for Proposals (RFP) to nine ISPs. Notably, PUB did not insist on a public ownership model, and their RFP was not limited by a pre-supposed ownership model that would have restricted ISP participation. The coalition decided to accept the proposal from Consolidated Communications Inc. (CCI), who had concurrently partnered with ConnectMaine to apply for a large National Telecommunications and Information Administration (NTIA) grant which included all seven of the original PUB towns, as well as Castine; the grant was awarded in January, 2022. Through the NTIA award, CCI/Fidium Fiber has laid fiber across the Blue Hill Peninsula, Deer Isle, and Stonington. Installation is free for subscribers, with fees starting at $25/mo. for 100/100 Mbps.

Downeast Broadband Utility

Maine's first, and only operating, broadband utility district. Downeast Broadband Utility (DBU) currently comprises six communities across Washington County, all of whom share the costs of financing the network's expansion: Calais, Baileyville, Cooper, the Passamaquoddy Indian Township Reservation, Alexander, and Princeton. The project was

spearheaded by Calais and Baileyville, as an attempt to bolster economic development, and in response to widespread frustration over outdated technology with low reliability and high costs. At first, the towns approached their incumbent, Spectrum, but the project was unable to secure private interest from ISPs due to the low-density nature of the area. Instead, DBU moved forward with a public buildout of an open-access dark fiber network, where the towns would own the infrastructure and different ISPs would be allowed to operate service. The project received near unanimous support from town and city councils, elected officials, businesses, schools and other public organizations.

DBU connects to the Three Ring Binder to gain access to the broader Internet. It also provides middle mile access to several small towns that are too far from the nearest point of connection to the Three Ring Binder. To finance the project, Calais and Baileyville borrowed from the local banks using a line of credit. Alexander, Cooper and Princeton received state funding, which helped with the costs of expanding the network into their communities. Finally, the Passamaquoddy Indian Township Reservation received grants from ConnectMaine and the Maine Community Foundation, a nonprofit.[139] Today, DBU offers a minimum service of 1 Gigabit Internet service for $67/mo. The funds raised through subscription fees go towards collectively paying down the towns' loans.

Key findings

We identified four major findings across our interviews. First, regional coalitions allow under-resourced rural communities to access a wider range of funding and financing opportunities, such as state funding and cost sharing. They can explore different models of network ownership – from a traditional partnership with a large Internet Service Provider, to an interlocal agreement where communities share the costs of deployment. Second, more nuanced and flexible grant eligibility requirements are needed so rural communities struggling with unaffordable fiber access can explore other alternatives. Third, federal funding rules enable ISPs to claim portions of communities, which makes them ineligible for state funding. Finally, to address state policies that hinder fiber deployment, rural communities need broadband advocates in policymaking.

Regional coalitions act as a strategic equalizer for rural communities.

"*Our small towns don't do very well on [their] own*" noted one interviewee. When demand is an issue, communities are stronger by working together to pique the interest of providers and increase their chances to receive state funding: "*For any Internet company, it's much more attractive to go into an area with a population of ten thousand, than a population of seven hundred. Some of our towns are that small. […] They don't want to go in, and find they've got to do this sort of leapfrog installation."* (Deer Isle, ME)

The members of the Peninsula Utility for Broadband (PUB) coalition banded together to aggregate demand and together explore solutions to their connectivity issues. When the Town of Deer Isle received a $10,000 grant from the Maine Community Foundation, the Town Manager opted to conduct a regional study of Internet service options. A sub-group of four towns in the coalition received funding from their select boards to put together an RFP. This process shed light on a critical disagreement within the coalition, as the two towns were set on a public ownership model rather than an ownership-neutral RFP; as a result, the two towns stepped back from the coalition. This decision came at a critical time, as the sudden drop in potential subscribers was feared to make the project less attractive for providers. However, the remaining towns moved forward with the RFP and received six proposals, eventually accepting one from CCI.

CCI had already deployed fiber in nearby Stonington. CCI had also received funding through the FCC's RDOF program to build portions of the Blue Hill Peninsula. PUB's broadband efforts, largely volunteer driven, eventually paid off: PUB was included in ConnectMaine's successful NTIA grant application. The state program had engaged CCI, to identify areas that could be part of the application, and PUB had established a relationship with CCI through their Request for Proposals. "*We were able to participate in the NTIA grant because we worked together. […] By organizing and working together, I think we were big enough to get some attention. We probably made more noise than most people, and that helped*." (Deer Isle, ME)

All seven original PUB members had been included in the grant application, and the two towns that left eventually returned to the coalition. They were set to receive American Rescue Plan Act (ARPA) funds from the county, but the offer was withdrawn in light of the NTIA grant. The county decided to prioritize the towns that had no alternative options.

Early on, PUB towns considered following the steps of the Downeast Broadband Utility (DBU) to establish a broadband utility district. However, PUB members were not set on public ownership, and favored an ISP partner that could bear most of the costs. In contrast, DBU was exclusively financed with bank loans initially taken by the communities of Calais and Baileyville. The project was able to benefit from state funding as it expanded: The towns of Alexander, Cooper and Princeton, and the Passamaquoddy Indian Township Reservation, received state grants to join DBU. State funding cannot be used repay Calais and Baileyville's loan obligations, but it can help offset the costs of expanding the network into the new member's territories.

Nuanced and flexible state grant rules are needed to prevent corporate capture.

Incumbent capture can effectively halt local broadband efforts, especially when there is existing fiber infrastructure in place. In the case of Lincolnville, the inability to compete with their incumbent, Lincolnville Telephone Company (LCI), stemmed from two major issues. First, the presence of a robust initial fiber infrastructure virtually disqualified the town from state broadband funding. Second, local governments were reluctant to allocate taxpayer money or secure large loans for broadband projects.

LCI's monopoly hold on Lincolnville forced customers into long contracts and costly subscription fees, for relatively low service speeds. In particular, homes with long driveways struggled with the high cost of getting physically connected to LCI's network. In 2019, LCI proposed a plan to expand their fiber network across the entirety of Lincolnville. They offered to expedite the process if the town provided a local match which would have given LCI a better chance at state funding. However, LCI only meant to build fiber along all the

major roads, and not to connect every home. In addition, there was no chance of co-ownership of the network, which the Lincolnville Broadband Committee considered an imperative if public funds were used. The Committee declined to support the project, and sent a letter to inform ConnectMaine of their refusal. Since ConnectMaine requires grantees to provide evidence of community support,[140] it is unlikely that LCI's plans moved forward.

Paradoxically, the extensive fiber infrastructure in Lincolnville became a barrier when the town decided to explore other options. It rendered the town virtually ineligible for state funding, as the town was not considered "unserved." The town decided against joining efforts by neighboring towns Camden and Rockport to establish a regional utility district, the Mid-Coast Internet Development Corporation.[141] The corporation emphasized targeting towns that best met the state's definition of under- and unserved; focusing on these areas was the most economically viable strategy given the higher likelihood of securing state and federal funding. Lincolnville, having only a minor fraction of its area qualifying for state funding, would be deemed a lower priority.

The Committee then proceeded with a feasibility study to evaluate the potential for a dedicated network for the town. The study concluded that it was unlikely Lincolnville would receive any state or federal funding and that it would be difficult to defend overbuilding LCI's existing fiber network with a large municipal bond, halting their broadband effort.

When asked what rural communities could learn from Lincolnville, the former Chair of the Lincolnville Broadband Committee, explained:

> *If your town doesn't have much fiber deployment, that is the opportunity to potentially build out your own system. I mean, it's not too late at that point, you know, in terms of getting a low interest loan from a bank or from the state. Because once you have that incumbent with fiber up there, they're going to say, Well, there's an incumbent. How can you justify this huge loan? How are you going to get the take rate that's going to pay it back?*

Local efforts to get fiber must be timely. Otherwise, incumbents can expand their fiber networks without trying to reach every home or deploy other technologies. If the service available in the area meets the state's current broadband definition, then the area is unlikely to get state funding. These policies can contribute to corporate capture. One of the major challenges faced by Lincolnville is the need for "*more nuanced and flexible state and federal rules that somehow recognize […] that fiber availability does not equal served. It pretty much allows incumbents to plant a flag.*" Since fiber is available in Lincolnville, the incumbent could challenge any grant application from a competitor.

The extent of Lincolnville's existing fiber infrastructure set it apart from other towns in the study, several of which faced issues with their incumbent providers yet managed to secure state funds. Spectrum (Charter Communications) had challenged ConnectMaine's NTIA grant application, claiming to serve a significant portion of the Blue Hill Peninsula and Deer Isle. This claim was quickly disputed by the PUB organizer for Blue Hill and the Town Manager of Deer Isle who, through separate efforts, were able to produce a realistic coverage map that countered the challenge; they were able to prove that Spectrum's coverage in the area was overstated. Additionally, the PUB organizer argued that if Spectrum's challenge was accepted, at least two PUB towns were likely to get an extension of their copper network as the company's response to the RFP indicated that they were not committed to a unified fiber network for the area.

The town of Surry, in the Blue Hill Peninsula, faced a similar challenge. The town was not part of ConnectMaine's NTIA grant. An ISP already provided fiber-optic Internet service in a small portion of Surry, but the infrastructure was older, the speeds were lower, and the monthly costs are high (over $100) for a 200/200 Mbps service. In contrast, CCI/Fidium offers 1Gbps (1000/1000 Mbps) for $75 in the rest of the PUB towns.

Surry has its own broadband committee, and later joined the PUB coalition for support and assistance. In 2023, Fidium agreed to deploy fiber in the areas of Surry that did not yet have access to fiber optic service. Hancock County will provide a match of

$140,000 from their ARPA funds. The town will contribute with $35,000 from their own ARPA funds as well, and ninety percent of the project will be covered by Fidium.[142]

Federal funding allows ISPs to claim territories and makes them ineligible for state funding.

ConnectMaine's limited funds meant the program was unlikely to fund areas where another provider had received federal funding to deploy broadband infrastructure during the same timeframe proposed by the applicant. The only exception was satellite, which does not meet the state's broadband definition.[143] Without state funding, rural communities have few options to get fiber. When the Town of Charlotte sought to join the Downeast Broadband Utility, it applied for funding to the Maine Connectivity Authority (MCA). The majority of Charlotte's "last mile" connection was copper or DSL,[144] but their town was nonetheless disqualified from receiving MCA funding.[145] The MCA denied the application because portions of Charlotte had been pre-awarded federal funding from the Rural Digital Opportunity Fund (RDOF). RDOF is a competitive bidding process in which applicants are expected to provide broadband Internet service with download/upload speeds of at least 25/3 Mbps.[146]

CCI had been awarded RDOF funding in 2020 to build fiber in a portion of Charlotte. The portion accounted for 57% of the town's population,[147] and any application would need to remove it from their proposed service area. The issue here is the source of the funds that are managed by the state program. If the funds were originally awarded to the program by a federal agency, then both the state and the grantees need to comply with the agency's eligibility rules, which could be affected if the community has pre-awarded RDOF portions. "*They have basically hamstrung these little communities that can't get these federal funds that MCA is sitting on. And that's not just Charlotte. That is hundreds of communities all across the state of Maine.*" (Downeast Broadband Utility)

If ineligible for state or federal funding, Maine rural communities are left with few options. Part of the issue is that state programs do not have enough discretion on how to

distribute the federal funds flowing through them, according to the President of Downeast Broadband Utility. "*When all these broadband dollars started, the conversation to the states was […] We're going to allocate this money to the states, and let the states decide how to better use these dollars.*" He later adds: "*Let the state handle this money. They know*."

Peninsula Utility for Broadband towns also had RDOF portions, leaving the RDOF winner, CCI, as the only viable choice. In fact, the organizer of the Peninsula Utility for Broadband (PUB) coalition partially attributes the inclusion of PUB communities in ConnectMaine's grant application to the fact that CCI had also won RDOF funding to build in portions of the region. The application was successful; CCI just had to make sure not to use RDOF and BIP funds in the same area.

As the winning bidder of their Request for Proposals, CCI had been PUB's preferred choice. PUB towns were not set on owning the network, their preference was an ISP willing to bear all of the risk. CCI also had the money to build in areas where public funding could not be used, because they overlapped with the incumbent's service area. According to the Town Manager of Deer Isle, this path was the better choice for the town, given their low population density and the general opposition against financing projects via bonds:

> *I have a very conservative select board. They didn't want to have to go to the taxpayers and raise hundreds of thousands of dollars in order to get infrastructure installed, and then try to pay it back with revenue bonds. As it is, I don't think we could have provided the quality service we're getting for thirty-five dollars a month. And, even if that rises over time, I don't think we could have competed.*

Rural communities need broadband advocates in state policymaking.

Early on, ConnectMaine had been primarily funding DSL and fixed wireless networks. Broadband advocates pushed for the state's minimum download/upload speeds required to be raised from 3/1 Mbps to 10/10 Mbps. This ensured state funds would prioritize technologies that could provide symmetrical speeds, such as fiber, over those that typically offered asymmetrical speeds, such as DSL and fixed wireless.

> *It took a lot of meetings at the state level, you know. […] All these kinds of people that are legislators, that are trying to understand a thousand subjects. […] They rely on the people in the room that understand it. And by being in the room is when you can actually affect change. A lot of times, in broadband especially, the only people in the room have been incumbents.* (Downeast Broadband Utility)

Higher upload speeds enable content creation, and broadband advocates play a key role in bringing the state's attention to these needs. Without them, state policymakers will primarily rely on providers to design broadband policy, and their interests may not be aligned with the interests of the communities.

Conclusion and Implications for state policy

Rural communities in Maine are engaging in both traditional and innovative partnerships to fiber deployment, and leveraging broadband advocacy, regional coalitions and frequent interaction with the state's broadband office. However, flexible broadband funding rules are needed so rural communities are still able to explore a wide range of network ownership and operation alternatives. Because of their low population density and challenging geography, these communities already have little leverage with ISPs, and grant eligibility requirements can aggravate these issues. Some rural communities do not qualify for broadband grants because of pre-existing federal awards of fiber, leaving them without bargaining power when negotiation with ISPs.

The constraints imposed by federal funding on state programs have implications for BEAD funds. While these funds will flow through state broadband grants, state programs will need to follow federal guidelines. For example, areas that have been pre-awarded RDOF funds will generally not be eligible for BEAD funds. [148] State and federal funding rules need to be aligned, to avoid the corporate capture and fragmentation of rural communities in grant applications. Finally, local advocates are instrumental in bringing the state's attention to these issues, and pushing for policy change that protects the interests of rural communities.

Discussion

The most significant challenges for rural broadband projects across the three states included: low population density; remoteness; vast, mountainous or rocky terrains; fiber cuts that cause service outages; access to slow and obsolete technologies like DSL, disinterest from incumbents to upgrade their services, unaffordable Internet service and unserved homes in "served" communities. Many of the communities featured in this report had Internet access, but not to fiber broadband. This report shows the steps local actors took to bring fiber into rural communities, the partnerships that made these projects possible, how public broadband funding was leveraged, and how they navigated state and federal policies.

Each of the three states in this study has a unique approach to close the digital divide. States will design and implement policies that will help them achieve their own rural connectivity goals. Some of these policies – eligibility requirements and challenge processes – are meant to address specific state concerns, and to make the distribution of funds more efficient. However, where the interests of communities and ISPs are in conflict, these policies tend to favor the latter.

Theme 1: A Regional Mindset Eases the Path Towards State Funding and Better Connectivity.

When local capacity is an issue, rural partnerships are key to aggregate demand, address cost barriers, pique the interest of providers, and increase their chances to access state funding. The case studies show how statewide efforts to address rural connectivity issues, like slow and unreliable Internet service, benefit from collaborative efforts between local governments, broadband advocates, local providers, and electric utilities. Coalitions facilitate interaction between these different actors, open up opportunities for collaboration and increase their chances to access state funding. State broadband programs and rural coalitions benefit from working closely, as well. In Maine, rural coalitions helped bring the

state's attention to areas in need of funding; in turn, states work with coalitions to ensure that projects are consistent with grant requirements.

These coalitions often include broadband advocates. In Maine and Minnesota, they were instrumental in spearheading the projects included in our research. They procure state support for local projects; connect local leaders, providers and state broadband offices; lead efforts to assess local connectivity needs; and use their technical knowledge to push for policy change and higher service standards. Rural communities need broadband advocates in state policymaking: They bring the state's attention to issues in rural broadband deployment, and help tailor broadband policy that prioritizes the interests of rural communities.

Collaborative middle mile infrastructure initiatives, like THOR in Colorado, ensure that several communities will have access to redundant fiber loops and will not lose Internet service if one of the lines is damaged. In turn, these initiatives are because state programs support individual middle-mile networks, like Archuleta and Rio Blanco in Colorado, or support projects that lease out excess middle mile capacity to small rural towns, like Downeast Broadband Utility in Maine. To amplify the benefits of middle mile investment, a regional approach is needed.

By partnering with other communities, those with limited fiscal capacity can increase their chances to access state funding. States require grantees to cover a percentage of the project's cost, and higher matches can make applications more attractive to state grant programs. Prohibitive matching requirements can become a barrier for projects in remote, low-density and high-poverty areas. While ARPA funds in Colorado and low-interest loans in Minnesota have provided some relief to rural communities with limited resources, others are exploring alternative solutions to the cost barrier. In Maine, we observed both traditional and innovative approaches. PUB communities banded together and worked closely with traditional Internet Service Providers, who had the resources to provide a substantial match and bear all the risk. In contrast, DUB communities partnered to share the costs of financing the network expansion and keep ownership of the network.

State programs play an important role in allowing communities to explore both traditional and innovative partnerships, as well as different ownership and operation scenarios. Not all communities will have the same choices. Colorado and Minnesota are supporting local provider alternatives like telephone cooperatives and electric utilities, and allowing ARPA funds to be used for matches. Maine is engaging rural coalitions and providers to go after federal funding, and facilitating the expansion of innovative models like broadband utility districts. Minnesota's strategy is to engage local providers to increase accountability, given these provider's long-established relationships with rural communities.

Theme 2: Regulatory Barriers Block the Path to State Funding and Hinder Accountability.

Across the three states, rural communities face three key regulatory challenges – the need for flexible and nuanced state grant rules, overlap between federal and state authority, and a lack of effective mechanisms to hold providers accountable during challenge processes. Some of these policies – eligibility requirements and challenge processes – are designed to ensure that funds are actually allocated to "unserved" communities. They can be weaponized by providers to prevent communities from exploring alternative connectivity options, all while not meeting their needs. "Neutral" regulations are not always neutral, and where the interests of communities and ISPs are in conflict, the latter tend to be favored.

The first issue is eligibility requirements. Nuanced and flexible state grant rules are needed to achieve universal service, and to prevent providers from "capturing" communities. States are looking to prioritize areas without access to fiber. However, many rural communities that already have fiber continue to struggle with access, as seen in Colorado and Maine. Rural broadband projects like Rio Blanco, CO, continue to rely on state aid to reach low-income homes that cannot afford the costs of connecting to the county's fiber network. Similarly, in Lincolnville, ME, the incumbent had already deployed fiber, but residents could not afford to get their homes connected. Both locations meet their respective

state's definition of "served", and do not qualify for state funding. In sum, fiber availability does not equal access.

The second issue is overlaps between federal and state authority. Eligibility for state funding is affected if an ISP has already been awarded federal funding to build in part of the community. Minnesota does not fund areas where there is federal funding available, forcing applicants to exclude homes from their proposed service areas. In contrast, the issue in Maine was the source of the funds. If the source of these funds are federal agencies, then the state's hands are tied. The funding has its own rules, and one of them is that they cannot be combined with funds from other sources. These restrictions have led to applications getting rejected in both Minnesota and Maine, because portions of the towns that applied had been pre-awarded federal funding. Without state funding, towns lack leverage and rely completely on a provider's "good" behavior.

Finally, rural communities need effective regulatory mechanisms to hold providers accountable. Providers can weaponize challenge processes to deter other grant applications. They claim that they already provide service in the area, or will be doing so shortly. There is no way to hold them accountable if they default on their commitments. Minnesota prevents them from participating in a future challenge process, but in the meantime, communities miss out on funding opportunities. When local actors are proactive in responding to challenge processes, they can be successful, as seen in Maine. However, challenge processes can discourage applicants, and the issue cannot be addressed at the local level. Regulatory mechanisms at the state and federal level are necessary to protect rural communities from corporate capture.

Conclusion and Implications for Policy

These case studies illustrate the many ways in which state policy matters in rural deployment. Rural communities are addressing rural connectivity challenges with a regional mindset. They are banding together to overcome capacity constraints, explore both traditional and innovative partnerships and ownership models, and ease the path towards state funding. Rural broadband deployment is a collective effort between local governments, broadband advocates, local ISPs, and states.

State policy can expand or restrict the choices available to rural communities. We show how state broadband programs support different approaches to rural connectivity, including public-private partnerships, publicly-owned broadband networks, and electric cooperatives. However, some state policies can hinder local broadband efforts, lock communities out of state funding and favor private interests, including strict eligibility requirements, authority overlaps between federal and state funding programs, and a lack of regulatory mechanisms that hold providers accountable.

These results have implications for the distribution of BEAD funds. Community input is needed in the design of broadband policy, including grant eligibility criteria and requirements. Without meaningful local involvement in the decision-making process, funds may go to applicants that already have significant resources and own a substantial amount of network infrastructure. States can continue to support local broadband efforts by leveraging local knowledge and resources in state policy design, as well as strengthening local capacity.

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