

# Regional Technology Plan

## Piscataquis County

Submitted by:

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# Axiom

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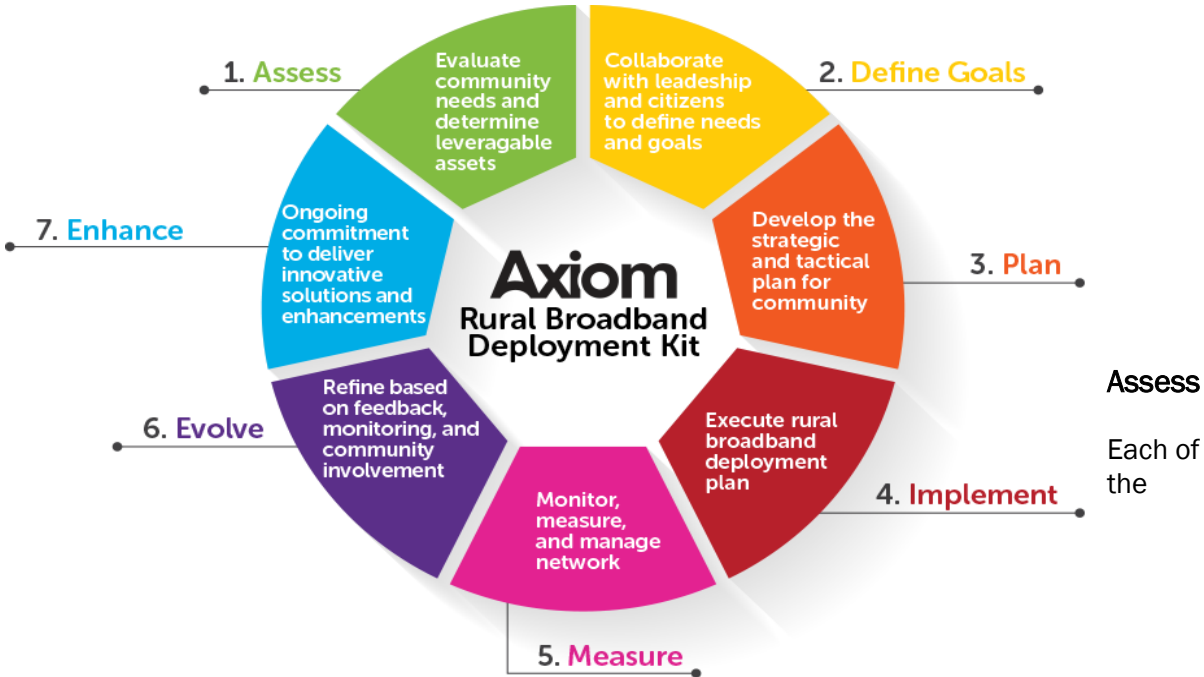
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## Background & Structure of Report

Axiom was hired to work with the Piscataquis County Broadband Committee, a committee formed by the Piscataquis County Economic Development Corporation to address Broadband connectivity needs in the county. Because Piscataquis is geographically large and relatively remote, challenges to this plan really revolved around what was achievable relative to cost considerations. That said, most of the communities we talked to saw Broadband connectivity as critical to their future growth and ability to attract new economic opportunities or families into the region.

In addition to the work on connectivity, a Digital Inclusion Plan was developed backed by a significant amount of data collected in the countywide surveys that received over 400 responses from Piscataquis County residents and businesses.

Axiom used a process that incorporated the first three steps of the Axiom Rural Broadband Deployment Kit to help communities and the region be ready for Step 4, Implementation.



communities in the County was mapped for existing coverage, giving the PCEDC Broadband Committee and each town the ability to understand what their current Broadband service looks like, who provides that service and if that service is ubiquitous, or if there are gaps in service that need attention.

### Define Goals

For those communities that we spoke with, we have developed plans that meet the goals of our discussions. Those goals are different for each community, however, given the cost of extending a fiber trunk throughout the county, most of the communities that are a distance away from fiber infrastructure will receive a wireless plan based on proximity to wireless assets (tower locations). Axiom and the Committee were also interested in creating a high capacity fiber connector from the

Three Ring Binder up through Greenville, giving the PCEDC a project that might be funded with federal grant money and open up the communities along the route to a more affordable fiber solution.

## Plan

The Plan for Piscataquis County includes:

- Fixed wireless solutions to every community where coverage can be obtained through an existing tower structure, or a proposed tower build
- Fiber build plans to those communities that have requested this type of project
- An expansion of middle mile fiber from Dover Foxcroft to Greenville
- A Digital Inclusion plan that includes
  - The four components: Affordable Computers, Affordable Internet, Digital Literacy training and Public Computer Access
  - Workforce Investment Strategies
  - Employees Initiative Program

## Implement

Axiom stands ready to assist any community or the PCEDC Broadband Committee to help promote and implement any of the recommendations contained in this report. Should any community request a meeting to discuss this report or next steps, Axiom would be pleased to come to the county at any time after this report is completed. The goal of this report is to help the county and individual communities move forward with achievable projects. Axiom will stand with you well after this report is submitted to support any efforts toward implementation. Please consider Axiom a resource for any questions, issues or opportunities that may arise from this report.

## County Information

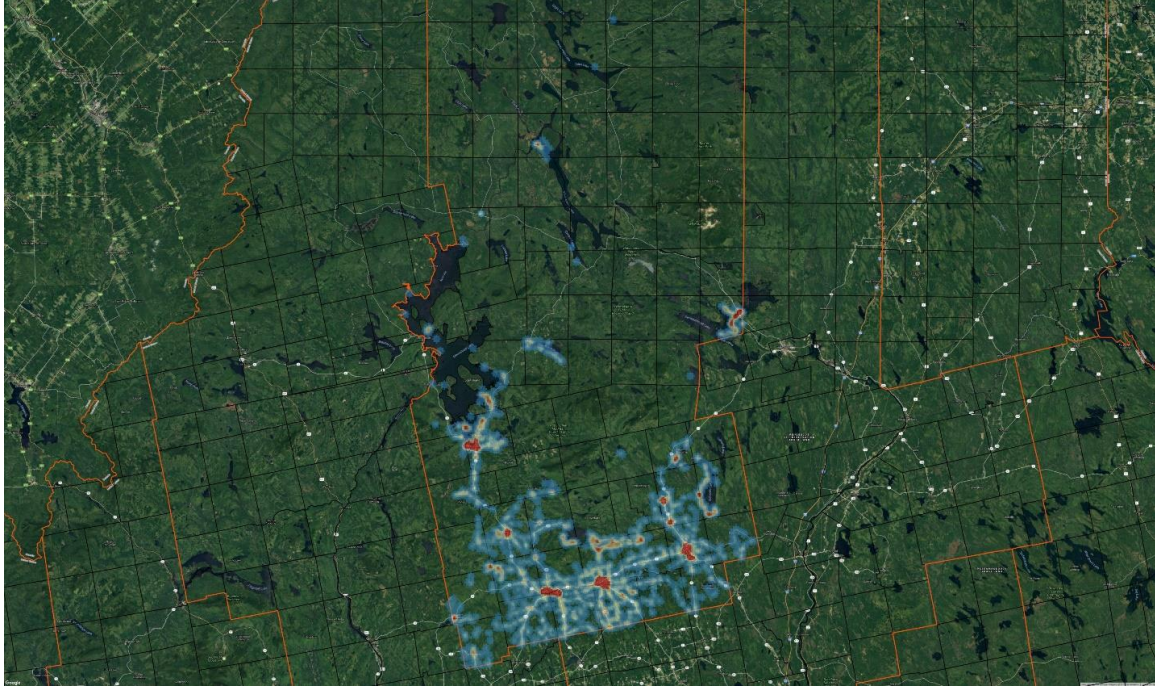
This section will provide detailed information on current broadband providers and their coverage areas for each of the municipalities in Piscataquis County. A description of the various broadband technologies used and what types of service each technology can offer is also included to help community members understand the benefits and limitations of how citizens are being served.

While the communities of Piscataquis share many similarities, population density, the type of technology being utilized and proximity to the assets that power the technology all can affect the type of service that a particular community or area receives and the number of providers that offer their service. Many communities would like to attract another provider to help induce competition and potentially bring pricing down as more providers fight over a finite number of potential subscribers. In reality, Piscataquis County is so large, and sparsely populated that inducing other providers without some type of public subsidy to build out projects will be difficult to achieve.

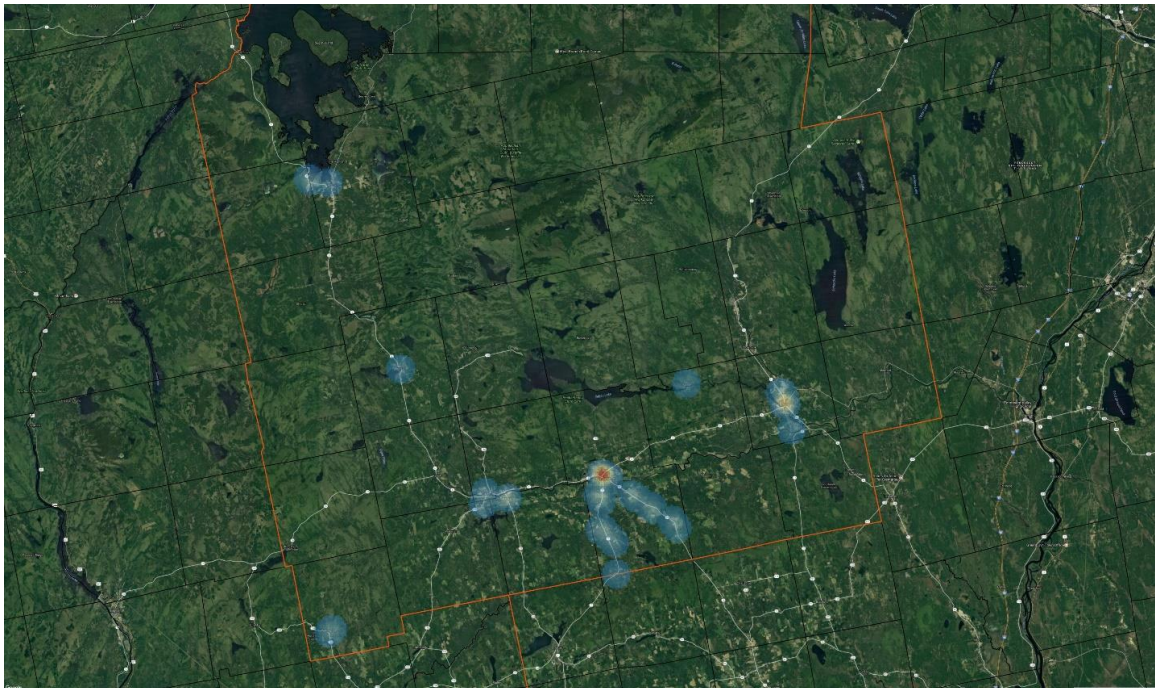
Below is a chart of the number of people and homes in Piscataquis based on the 2010 census.

Municipality	Population	Homes
Abbot	714	311
Atkinson	326	135
Beaver Cove	122	61
Bowerbank	116	63
Brownville	1250	527
Greenville	1646	820
Dover-Foxcroft	4213	1773
Lake View Plantation	43	25
Kingsbury Plantation	9	6
Guilford	1531	652
Milo	2340	1034
Medford	231	88
Monson	686	308
Parkman	843	353
Sebec	630	273
Sangerville	1343	612
Shirley	233	116
Wellington	260	124
Willimantic	150	69

As a basis for our work, we put together some heat maps that will help the communities and the county understand more clearly the distribution of structures throughout the county and whether they were classified as a residential or business. The images below show a heat map for each category with a “hotter” color, orange and red, indicating a larger number of these structure and “cooler” colors, green and blue, indicating lesser numbers.



Residential Heat Map  
Red= Most density of residential homes  
Blue= Less Density



Business Heat Map  
Red= Most Density of businesses  
Blue= Less density

## Internet Providers in Piscataquis County

Piscataquis County has a number of providers that serve the communities. Each of these providers offers different levels of service, reliability and pricing as well as a variety of technologies to deliver service to the home.

### Spectrum:

Spectrum offers their services in several municipalities within Piscataquis County. They can offer broadband services to these areas using a combination of fiber and coaxial cable to provide packages of up to 100 Mbps to their subscribers and up to 300 Mbps using fiber-to-the-premise (FTTP) hardware. According to Spectrum, this service is available everywhere they can offer their TV or phone service.

Subscribers will not always get their maximum speed offerings since bandwidth is shared with other subscribers who are connected onto the same line and “node”, which is a distribution point that is fiber fed.

Spectrum, like many cable TV operators, has exclusive rights to offer their television service to a specific town or territory in the form of a franchise agreement. These agreements typically provide a certain percentage of the revenue collected from their residents back to the municipality while the cable operator will be required to reach a specific threshold by some formula, usually a certain number of structures per mile.

In many cases these franchise agreements have been ignored or forgotten by the municipality and most have expired. This provides a point of negotiation for the municipality to review and update the agreement before renewing it.

Spectrum serves:

Brownville  
Dover Foxcroft  
Milo

### FairPoint Communications (recently acquired by Consolidated Communications)

FairPoint provides telephone services to the majority of the County and as such is the provider of last resort; a term used for a negotiated agreement with the State of Maine to provide phone service anywhere someone wants a phone line. They primarily offer DSL service to their residential subscribers with some fiber service available to businesses that reside along their fiber paths.

FairPoint has performed a significant series of upgrades to their network in Maine over the last several years due to a grant from the second round of the Connect America Fund, colloquially called CAF II. This grant has allowed FairPoint to target approved areas based on census block data.

These upgrades have primarily consisted of improving the hardware in their central office and remote terminals with the ability to offer bonded DSL service out of these locations. These upgrades also included running fiber cable to each of their remote terminals allowing an increase in the bandwidth capacity that can be served out of these remote locations. When these upgrades have been completed they will be able to offer up to a maximum of 25 Mbps connection based off the distance the subscriber location is from the distribution point.



Fairpoint is in the midst of a 6-year CAF plan to upgrade 35,000 homes in Maine to the 10/1Mbps standard that was set by the federal government to be eligible for funding. As part of the planning document we have included maps of FairPoint service and additional maps of CAF II eligible areas to help communities who have not yet received an upgrade understand the areas in their community that are eligible.

FairPoint has recently been acquired by Consolidated Communications, it is currently unknown what they will be bringing to the table for Maine, but they have agreed to pledge \$52 million to conduct network upgrades in Maine as part of an agreement with the state's public advocate.

FairPoint coverage area includes almost every community in Piscataquis.

### **Other Providers:**

Other providers that serve the county include North County Broadband, Premium Choice Broadband, MaineStream Internet, ProTech Solutions and Moosehead Cable TV. Recently, both Moosehead Cable and MaineStream Internet have been acquired by Premium Choice. Axiom was not able to obtain detailed mapping and information of coverage areas for these providers, but have talked with them and have a general understanding of service footprint.

#### **North County Broadband**

Fiber or DSL to the home of up to 8Mbps of service

Abbott

Willimantic

#### **Premium Choice Broadband**

Premium Choice is a broadband provider that offers a fixed wireless solution over a good portion of the county. The coverage map for Premium Choice is located in the **Other Provider** section of the report. They have approximately 1000 wireless subscribers in Piscataquis County.

#### **ProTech Solutions**

ProTech Solutions is a small fixed wireless company that provides up to 50Mbps service to discrete areas around:

Schoodic Lake region

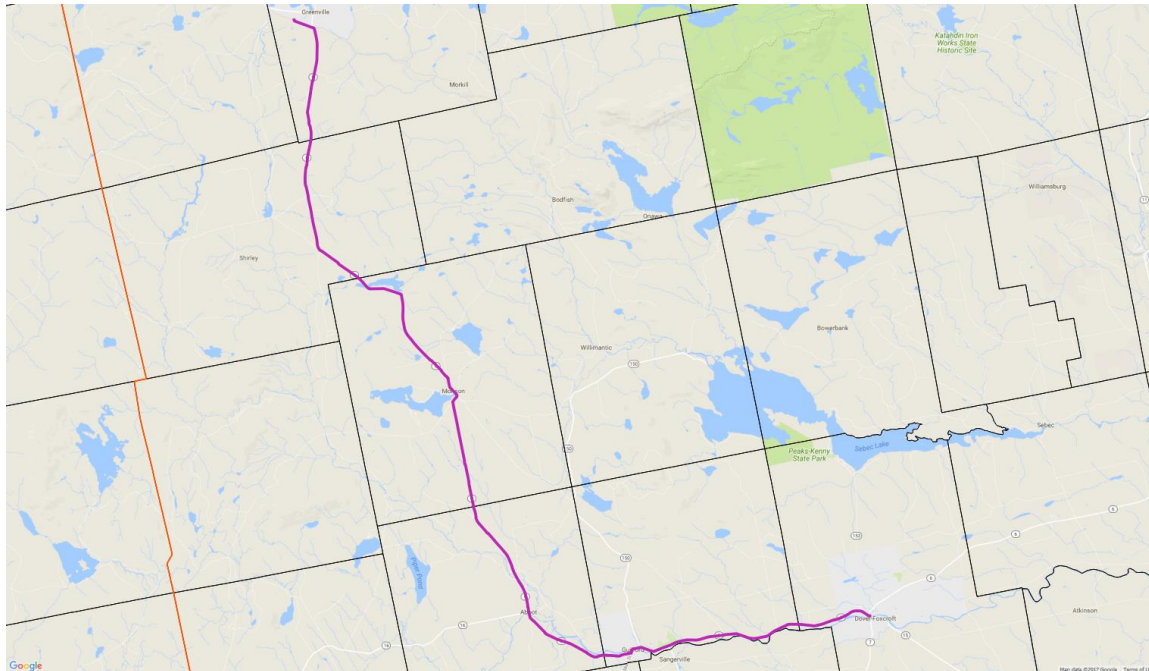
Sebec Lake region

### **Fiber Build from Dover-Foxcroft to Greenville**

In our meetings with the PCEDC Broadband Committee, there was discussion about the concern that the Three Ring Binder only hugged the very bottom of Piscataquis County and that the majority of the County would have a more difficult time getting open access fiber to their community because of their lack of density and distance from this asset. Axiom agreed that extending the Three Ring Binder into Piscataquis would begin to open up additional possibilities for better connectivity over time. Fiber-Optic trunks, such as the one proposed here have the potential to carry almost unlimited amounts of internet service, giving communities along its route the ability to tap in to service speeds and reliability almost unheard of in Piscataquis.

This type of asset could be leased to internet service providers to off ramp service to communities along its route. Or the fiber could be “dark” and individual strands of fiber could be offered to businesses or organizations that would light it up for their own use. Either model keeps the county out of being the service provider, while still assisting the county residents and businesses with the opportunity to obtain vastly increased speeds and reliability.

The map below indicates a potential pathway for a new fiber trunk that would begin at the Three Ring Binder in Dover-Foxcroft and extend through Sangerville, Guilford, Monson, Shirley and finally terminating in Greenville.



County Fiber Route

Cost:

Fiber Route Cost	Estimated
Fiber Materials	\$595,000
Fiber Labor	\$565,000
<b>Total</b>	<b>\$1,160,000</b>

This is a project that could be eligible for federal funding, please see Appendices for possible sources.

The benefits of this type of investment are significant:

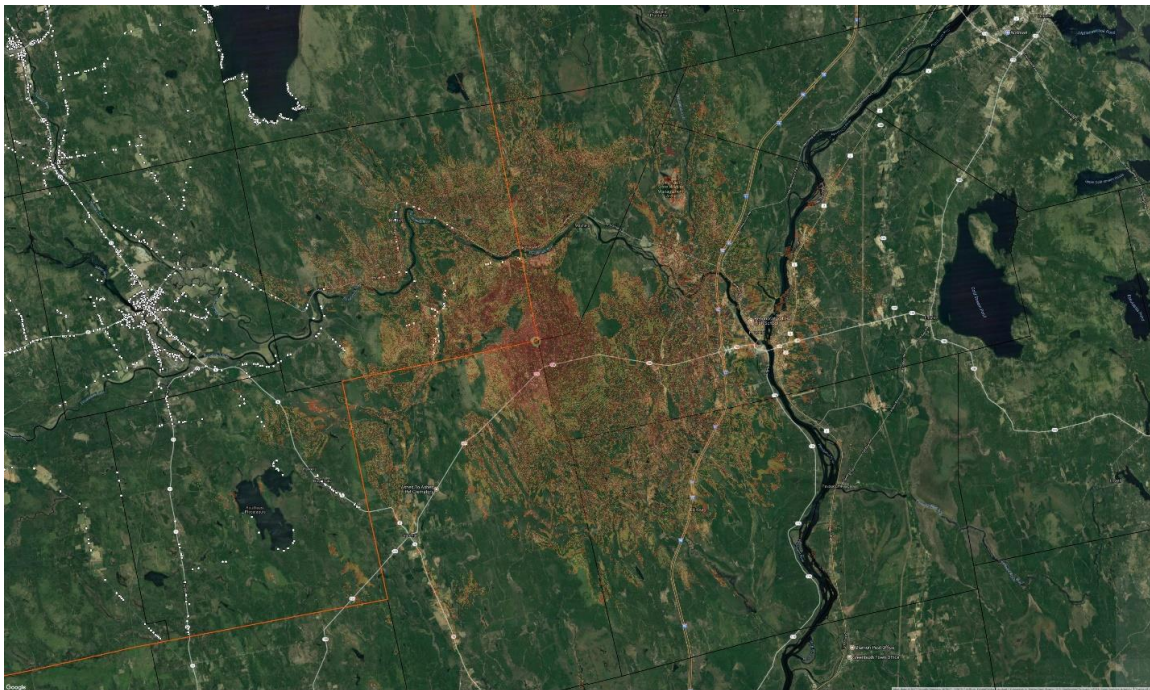
- ✓ Produces the conditions for communities along the route to build out world-class 21<sup>st</sup> Century broadband connectivity speeds and reliability
- ✓ Allows the county to take control of its own destiny and not be left behind
- ✓ Brings high capacity service closer to even more remote parts of the county and can be extended to these difficult to reach parts of the county in time

- ✓ Is a small investment for an asset that would be expected to last 20-30 years without major upgrades

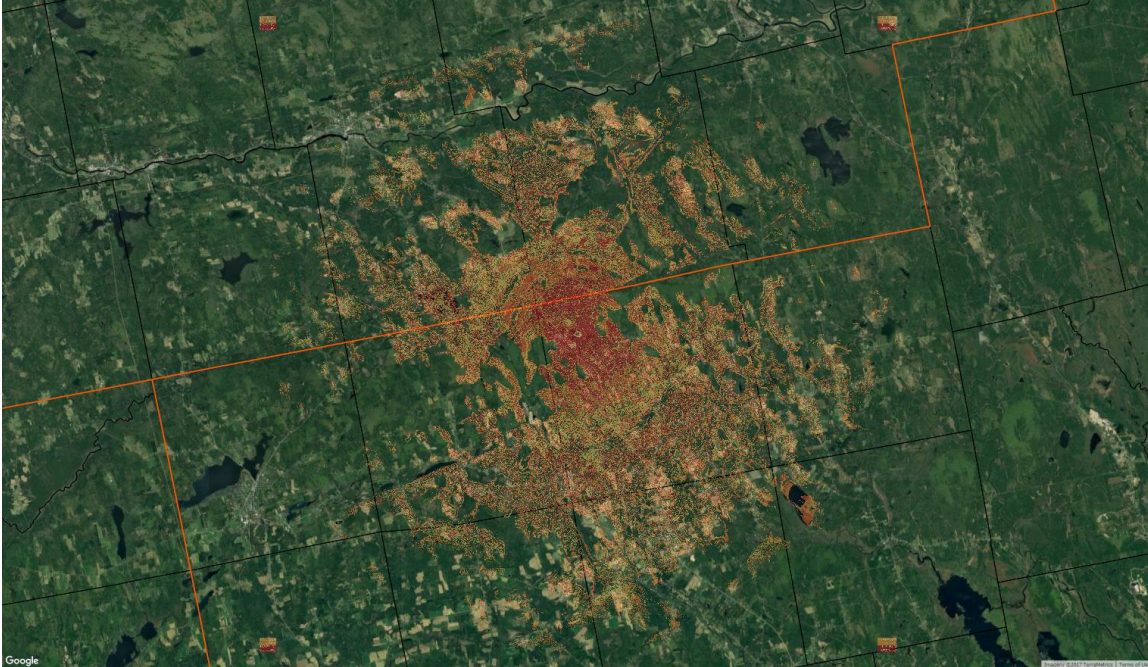
We can think of no other investment the county could make to support its citizens now and in the future, promote economic activity, attract families and raise home values for the comparable price of 3-5 miles of a road rebuild.

### Fixed Wireless to serve rural southern Piscataquis County

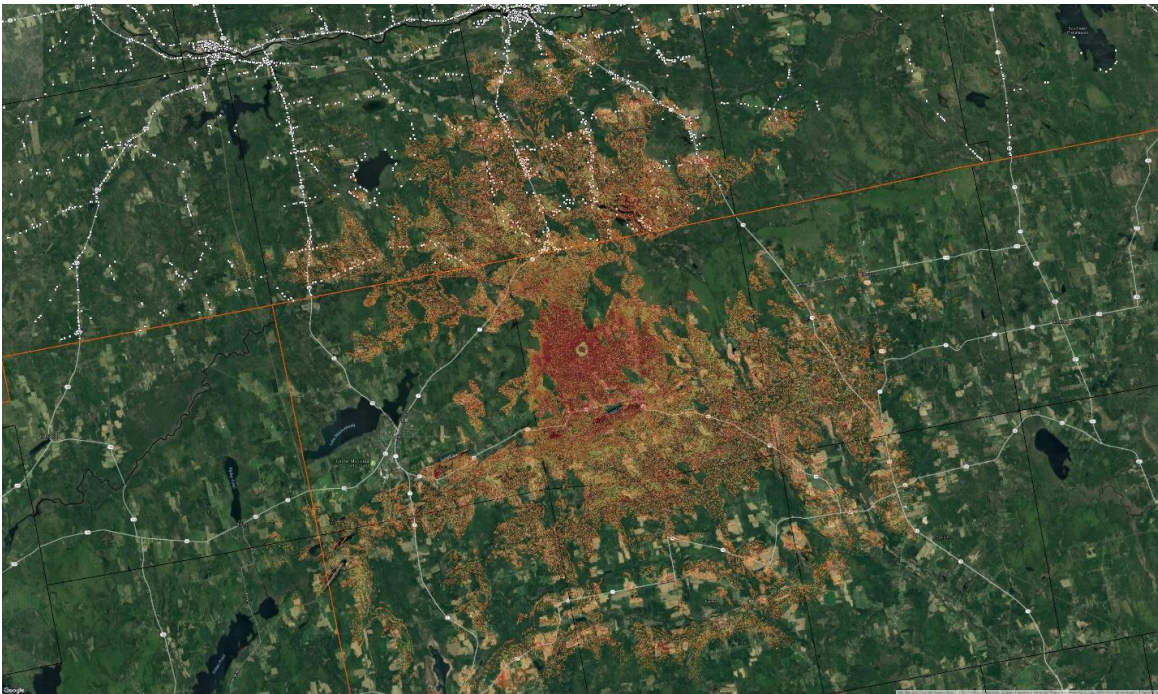
There are a series of towers that are just over the county line that could be used to serve the most southern parts of Piscataquis County. Three towers in Lagrange, Charleston and Garland together serve a swath of Piscataquis extending from Route 11 across Atkinson, Dover Foxcroft Sangerville and Guilford and finally covering the area around Parkman.



Lagrange Tower Coverage Map



Charleston Tower Coverage Map



Garland Tower Coverage Map

These are maps that utilize equipment technology that uses 3.6GHz to broadcast service to homes. This frequency has properties that allow it to penetrate some foliage and tree cover, giving it a better opportunity to get people hooked up in more difficult locations. There is a possibility to overlay 5GHz

and TV White Space wireless technology that also each have properties that can provide different coverage opportunities. Each of these technologies have different price points and deployment scenarios. Below is pricing for the 3.6GHz equipment deployment to serve 100 customers off of a single tower.

3.6GHz Fixed Wireless cost	100 Customers
Hardware/Materials (on tower)	\$45,000
Engineering/Labor (tower)	\$16,000
Subscriber home equipment (\$350/subscriber)	\$35,000
Subscriber installation cost (\$400/subscriber)	\$40,000
Backhaul (estimate)	\$15,000
<b>TOTAL</b>	<b>\$151,000/ per tower</b>

### Community HotSpots

Community HotSpots are open access networks that allow citizens in your downtown or other public spaces access to the internet. This is a simple, inexpensive way to help your community to get better connected. Over the past year, Axiom has installed HotSpots across the state including:

Machias  
 Greenville  
 Eastport  
 Biddeford  
 South Portland  
 Rockland  
 Pemaquid Campground  
 Millinocket  
 Chebeague Island Ferry

Many community leaders initially question this type of investment, given that most people can use their smart phone to access the information they need. Community HotSpots offer several advantages to traditional cellular networks.

- ✓ Faster Downloads than cellular making surfing the web easier and more efficient
- ✓ Community HotSpots allow you to use multiple devices (laptops and tablets can hook up easily)
- ✓ Customized, branded landing page- allows community to advertise amenities
  - Public Venues including Parks, Trails and Public Restrooms
  - Restaurant offerings
  - Other businesses, such as the local pharmacy
  - Tourism related attractions, such as a boat launch or parks
- ✓ Local sponsorship opportunities to cover the cost

These Community HotSpots have been wildly successful. In looking at the latest usage in a couple of comparable communities, Greenville had 800 unique users in October and over 2000 unique users over the Summer months off of their one Community HotSpot in the downtown, they received a grant to install 2 other Hotspots due to how successful the first one was. Millinocket in September had

over 900 unique users and they do not even have signage in the downtown advertising the HotSpot, and this system has only been operational since July.

Each community has used a different model to pay for their Community HotSpot, several have been paid for by a local sponsor, Bangor Savings Bank, a couple have been paid for by the local economic development commission, and a couple have been paid for directly by the town.

Community HotSpots have been used to cover a public park, a marina/boat launch area but most have focused their deployment around their downtown. Any location where people are outside or in an area where there is foot traffic or a gathering space are good candidates for installation.

#### Requirements:

HotSpots need three things to operate. First, they must be in a location where they can get an internet connection to broadcast. Second, they need electrical power. And third, they need good line of sight to the area they are trying to cover. This often means broadcasting from height; the top of a building or nearby municipal owned utility pole is often used in the downtown.

#### Cost:

Generally, the cost is \$3000/per install which covers all maintenance, technical support and monthly usage reports for the first year. \$1000/year starting in year two that covers all of the support, maintenance and reporting.

Additional costs that are not included are the monthly cost of the internet, generally between \$50-\$100 a month and the cost of electricity, generally well under \$10/month. Many of the locations that were used were powered by the local municipal facility or cooperating entities.

#### Interest:

For those communities that have interest, Axiom would meet with them and complete an engineering study of location and coverage and discuss in detail the options of the service.

- ✓ Customizing a landing page
- ✓ Branding
- ✓ Signage
- ✓ Usage protocols
  - Amount of time someone can use the service
  - Restrictions on bandwidth use
  - Potentially setting up a two tiered system that can generate revenue
- ✓ Sponsorship models and opportunities

The bottom line is that Community HotSpots are a low cost entry, low risk opportunity to get internet coverage in key areas of the community. In all of the communities we have installed these HotSpots, people are continually amazed at how much people (visitors and locals) use this amenity.

## Community Planning

This section was developed to help individual communities assess, plan and ultimately implement solutions that help them get better broadband coverage with increased speeds and reliability at an affordable price. From Axiom's time in Piscataquis County it became clear that:

- A fiber optic backbone that connected more of the northern county was essential to bringing better speeds and service to more remote areas
- Distance from existing infrastructure was going to add costs to projects in Piscataquis
- Most communities were interested in an economical solution that could be implemented, not complicated plans that might never be built
- The uneven nature of service throughout the county creates a have vs. have not situation that was not in the spirit of a rural Maine county that must stick together to bring connectivity solutions that allow Piscataquis County residents to build their own economy

The structure of this section of the report will be by town, alphabetically. Each town is broken down by current service provider(s) coverage area, a potential wireless solution to help expand service offerings and the cost and number of homes such a service expansion might cover.

Also included will be the number of households based on the 2010 census data, from this an estimate will be derived based on the radiation coverage map to determine the number of potential households that could be served from each tower. Finally, some estimated costs are included to provide a generalized idea of what renting space on a tower to provide service entails.

Some of the communities detailed below will have areas that have nearby towers that could be used to service a wireless signal to them. These maps have been generated with radio propagation software that provides a visible representation of what type of coverage could be expected from a tower location using a 3.6 GHz frequency at a height of 100 ft. AGL. The use of the 3.6 GHz frequency provides a signal that can both reach a fair distance and retain enough power to penetrate light foliage, all while being able to maintain a sufficient throughput to match today's broadband needs. In many instances, multiple towers are present within municipal boundaries but for this report, the tower that generates the best possible projection is used.

The towers used for this propagation are FCC registered and therefore have location coordinates recorded. There is a possibility that other towers could be present in the same areas that are not registered towers but as these maps are strictly here to provide an idea of the type of coverage, the variances should be minimal. If a town would like a specific tower located in or near their community mapped, Axiom would be pleased to map these and add them to this report.

Key describing what is included in each line:

### **Hardware/Materials:**

This includes the equipment and hardware that is installed onto the tower as well as at the base of the tower.

### **Engineering/Labor:**

This covers the structural engineering costs as well as the labor to install the above hardware onto the tower.

***Equipment/Materials:***

This refers to the cost of the equipment and any mounting hardware necessary to install service to the end use, estimated at \$350/household.

***Installation Labor:***

This deals with the actual labor cost to install each end user; this is estimated at \$400/household.

***Transport/Uplink:***

Depending on whether the tower will be fed by a fiber connection or a high capacity wireless link, this section will cover whichever is chosen and will be listed after in parenthesis.

***Bandwidth:***

The cost of the bulk internet bandwidth used to serve individual customers. This cost is typically covered by the operational budget of the provider.

All costs are estimates.

**As a commitment beyond the final report, if any community has additional questions about our cost analysis, Axiom is ready to meet or discuss our assessment with any community or the Broadband Committee.**

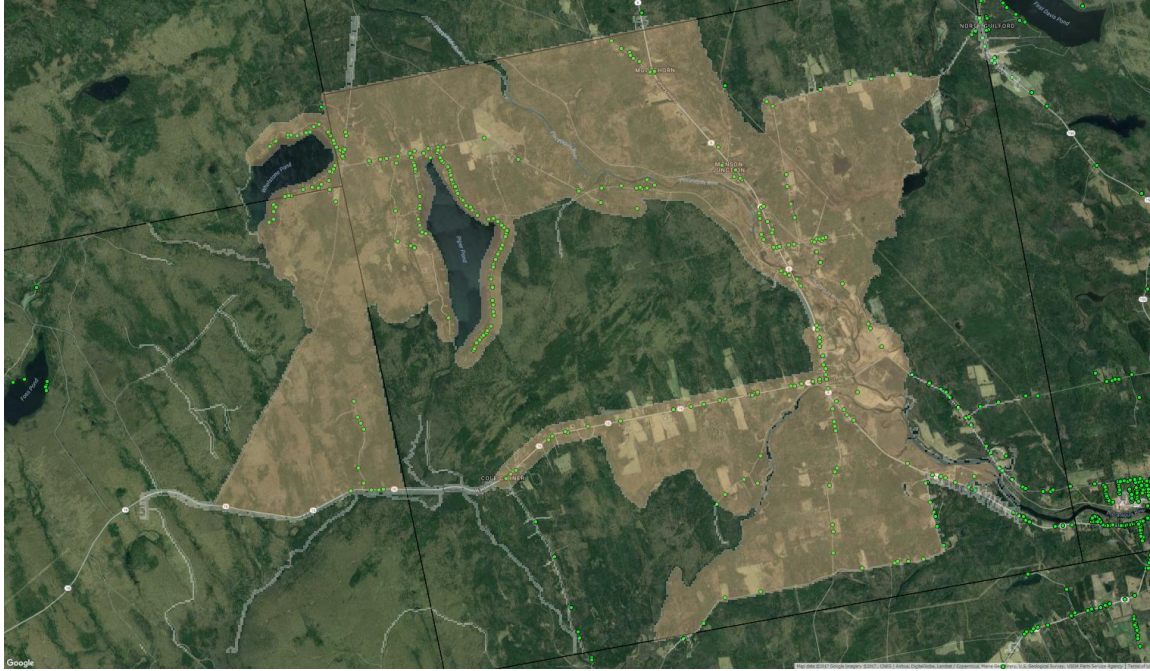


## Abbot

Population (2010 census): 714

Homes: 311 homes

Provider(s): North County Broadband, FairPoint Communications



Abbot North County Broadband Coverage Area

Abbot is in an interesting position. They are one of only a handful of communities across the state that actually have the potential of Fiber to the Home (FTTH) solution currently available through one of their current providers, North County Broadband. In addition, it appears that North County Broadband covers 95% of the community now. We suspect that fiber is not available everywhere, but were unable to obtain a clear sense of the coverage area of DSL vs. fiber.

The issue with North County Broadband service is that current bandwidth offerings do not meet the federal (25/3Mbps) or state (10/10Mbps) standards. However, because Abbot has the potential to leverage fiber, meeting either of these standards is achievable, most likely with higher demand for more speed tier offerings or an upgrade in equipment.

Our recommendation to Abbot is to work closely with North County Broadband to enhance service offerings and help citizens obtain better speeds. To incentivize North County Broadband, the town might help subsidize the upgraded equipment necessary to improve service offerings.

There are also a couple of pockets of unserved areas that might benefit from North County Broadband expansion. We suspect that the economics and return on investment do not make these expansions achievable without some type of subsidy to the provider. In these cases, we recommend that the community work with North County to apply for a ConnectME infrastructure grant, most likely available around March-April of 2018.

In addition to North County Broadband, FairPoint also serves Abbot and over the past year has used federal dollars from a Connect America Fund grant to upgrade service across its network in the community. Upgrades now mean FairPoint customers can receive service of 10Mbps- 25Mbps, depending on where you are located.

**Recommendations:**

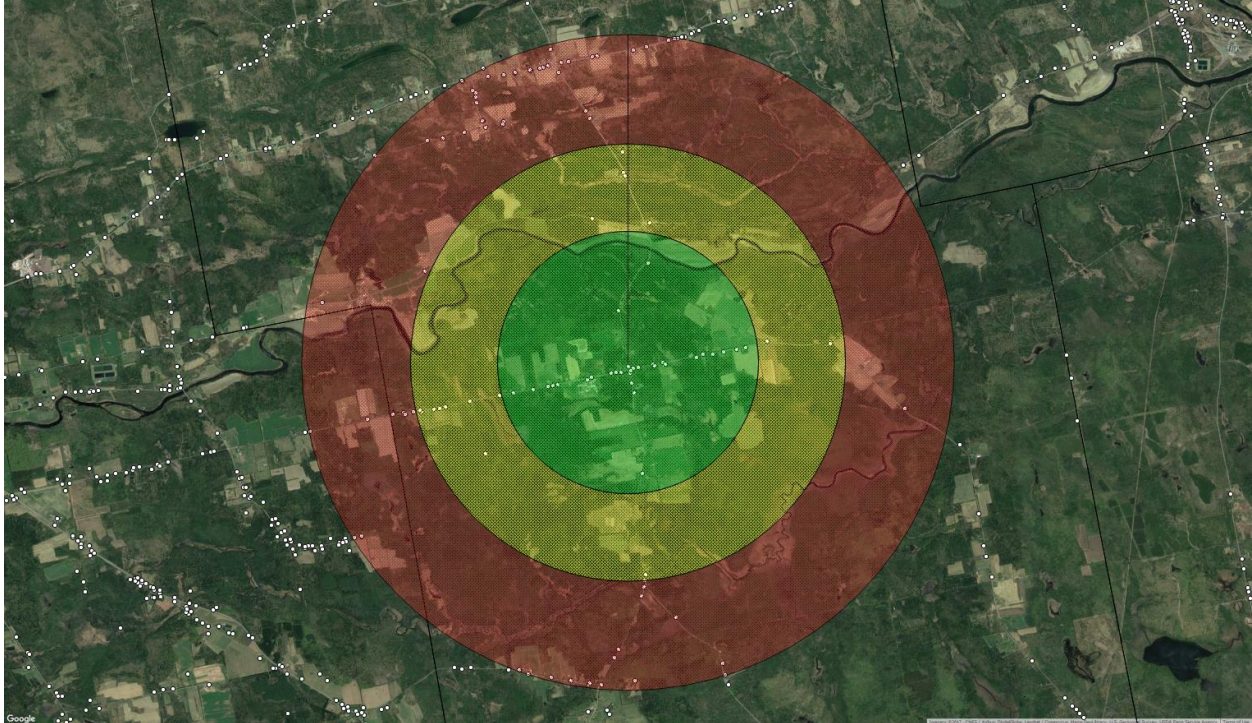
- ✓ Work with North County to expand fiber-fed service to individual homes and businesses
- ✓ Look to partner with either of the providers to serve the unserved areas of the community (unserved is defined as those homes unable to obtain service greater than 1.5Mbps)
  - Apply for a ConnectME infrastructure grant

## Atkinson

Population (2010 census): 326

Homes: 135

Providers: FairPoint Communications, Maine Stream Internet



Atkinson FairPoint Coverage area

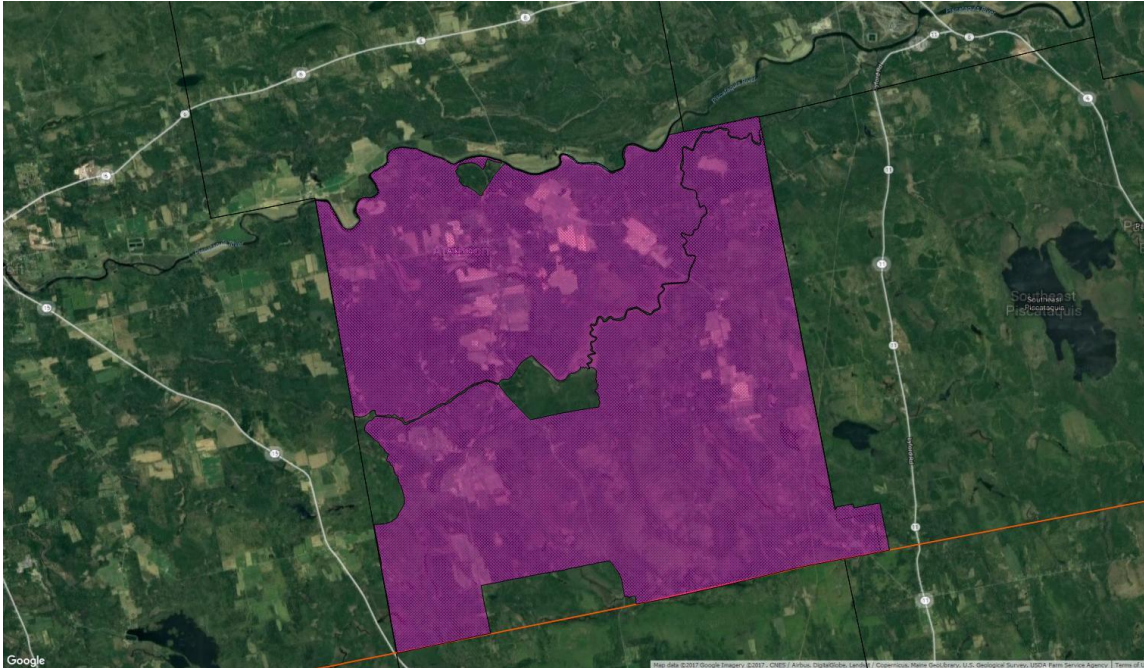
### Legend

#### DSL Coverage

- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

Like all DSL coverage maps, the further away you get from the location of the equipment, the speed and sometimes reliability suffer. The areas in the red ring might not be able to receive the 15Mbps bonded service that this represents, while many could possibly see much less. These circles are a representation of the areas of coverage, and should not be used to determine what an individual home may be able to receive for service.

Atkinson is also eligible for Connect America funds, commonly called CAF II, see map below for the areas eligible for this funding source. This funding was made available to carriers, in this case FairPoint, to upgrade or expand service to 36,000 homes in Maine. Currently FairPoint is in the 3<sup>rd</sup> year of a 6-year program to reach those 36,000 homes. Our understanding is that Atkinson is on the list to upgrade three Remote Terminals. FairPoint does not distribute equipment locations, considering this information confidential. Axiom was able to locate one of the three upgraded sites, and that is what is represented on the map above.



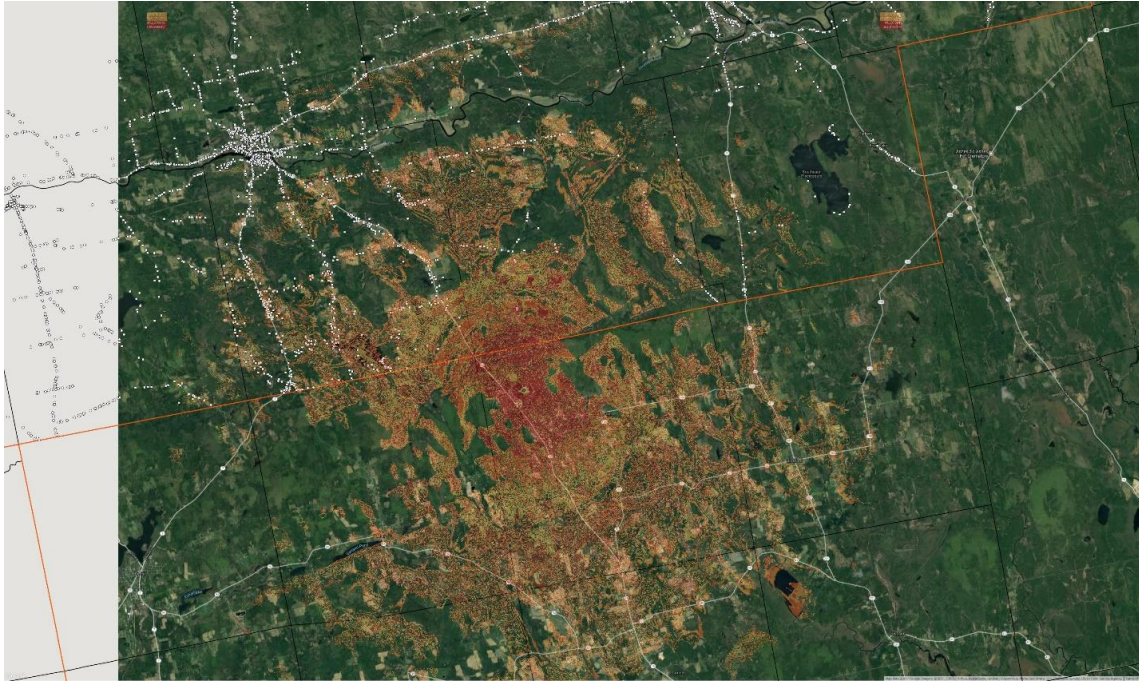
Atkinson CAF II Approved areas

In addition to FairPoint, Maine Stream Internet also serves parts of Atkinson with DSL that overlays and potentially extends the FairPoint service area with the same speeds and reliability available as FairPoint and potentially beyond FairPoint's coverage area. MaineStream Internet did not provide a service coverage map for this report.

In order to potentially improve service in Atkinson beyond the upgrades recently experienced with FairPoint, a tower in Charleston can serve a good portion of the community. Because of the low density of homes, it is likely that this type of investment would not be borne solely by an internet provider because the return on investment is not easily met. The cost of this project would fall to the community, either through municipal bonding or grant funding. Grant funding at the state will be available in 2018 through the ConnectME Authority for those areas that are unserved (the definition of unserved for the purpose of this grant is locations with service 1.5Mbps or less.

Potential Cost for equipment to serve 50 homes:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$17,500
Installation Labor	\$20,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$113,500</b>



Charleston Tower Propagation Map

With significant upgrades to the current FairPoint service footprint in Atkinson, which can bring bonded service levels of between 10-25Mbps, the question would be to understand the community residents' satisfaction with the new upgrades and to evaluate the need for additional upgrades that might come with the investment of a wireless solution as suggested above.

**Recommendations:**

- Understand needs of community for higher service levels
- Determine if sections of the community are eligible for ConnectME Infrastructure grant in 2018
- Work with PCEDC or Axiom to understand other funding options for expansion

## Beaver Cove

Population: 122

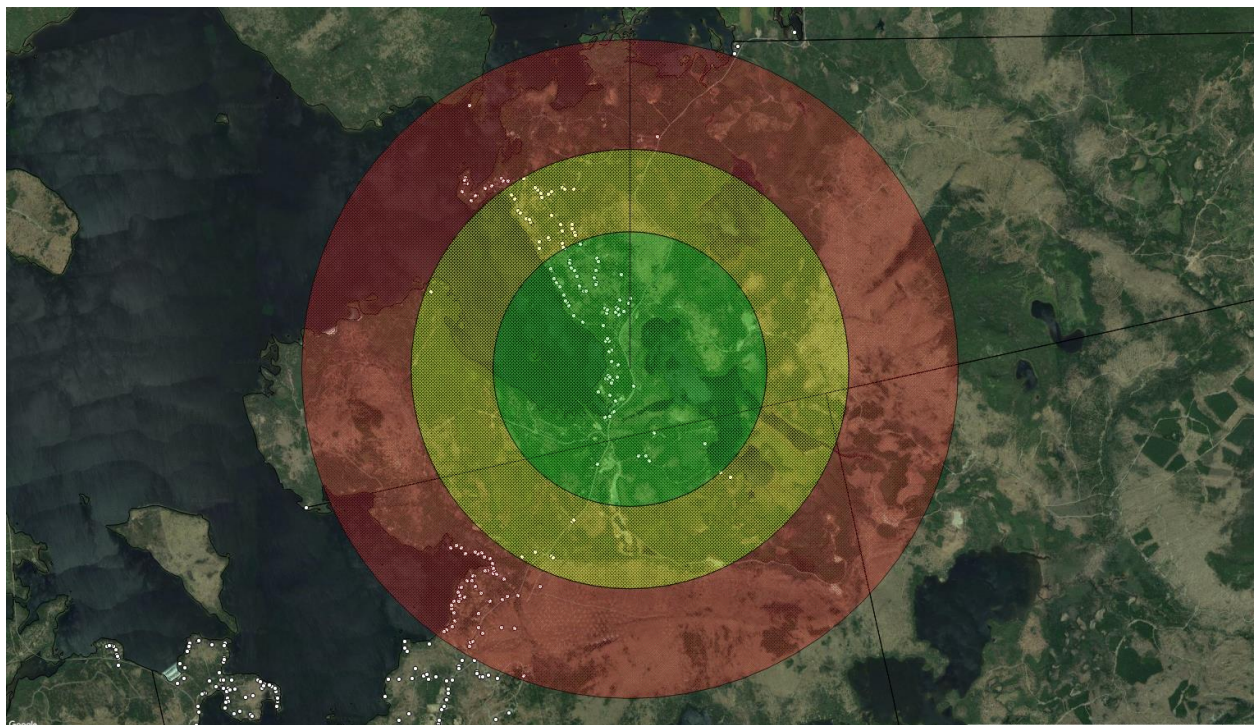
Homes: 61

Providers:

Service Providers: FairPoint Communications

A number of locations on the eastern side of Moosehead Lake were upgraded with the second round of Connect America Funds (Commonly called CAF II). In a meeting with FairPoint, their equipment in Beaver Cove, Lily Bay Twps. and the First Roach Pond area have been upgraded to allow between 10-25Mbps of bonded DSL service.

Because of the small number of homes in Beaver Cove, it is unlikely to expect another provider to come in to the community without a clear return on investment. To obtain better service than is being provided beyond the recent upgrades by FairPoint, an engineered solution to bring a wireless signal to the community by erecting a tower or procuring a high capacity wholesale purchase of bandwidth that could be distributed through the community are possibilities, but unlikely without a significant community or county investment.



FairPoint Beaver Cove Coverage Area

### Legend

#### DSL Coverage

- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

We have not spoken with anyone from Beaver Cove and have not engineered a solution, but if the community is interested, we are happy to provide additional support and add to the report as community interest is gauged.

**Recommendation:**

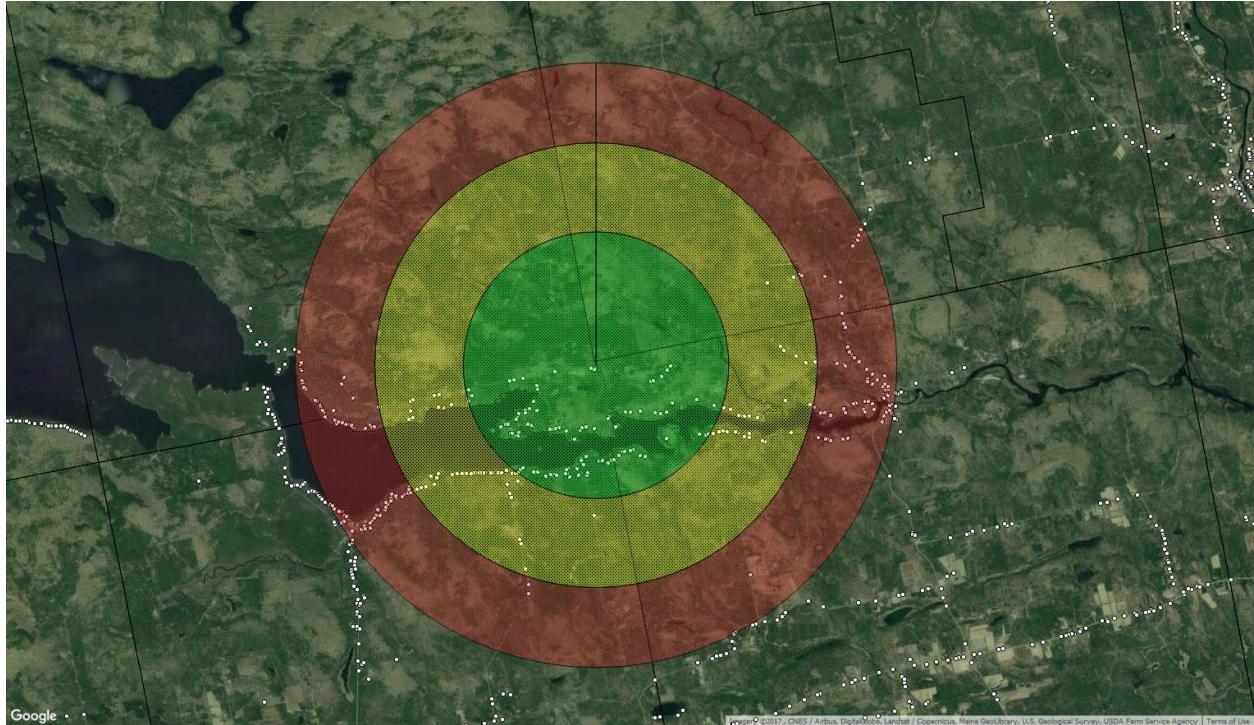
- If Beaver Cove has interest in enhanced Broadband solutions, please contact Axiom to discuss
- We do have FairPoint mapping for Lily Bay and First Roach Pond and can be included or provided as requested

## Bowerbank

Population: 116

Homes: 63

Providers: FairPoint Communications, Maine Stream Internet, Premium Choice and ProTech Solutions (around Sebec Lake)



Bowerbank FairPoint Coverage

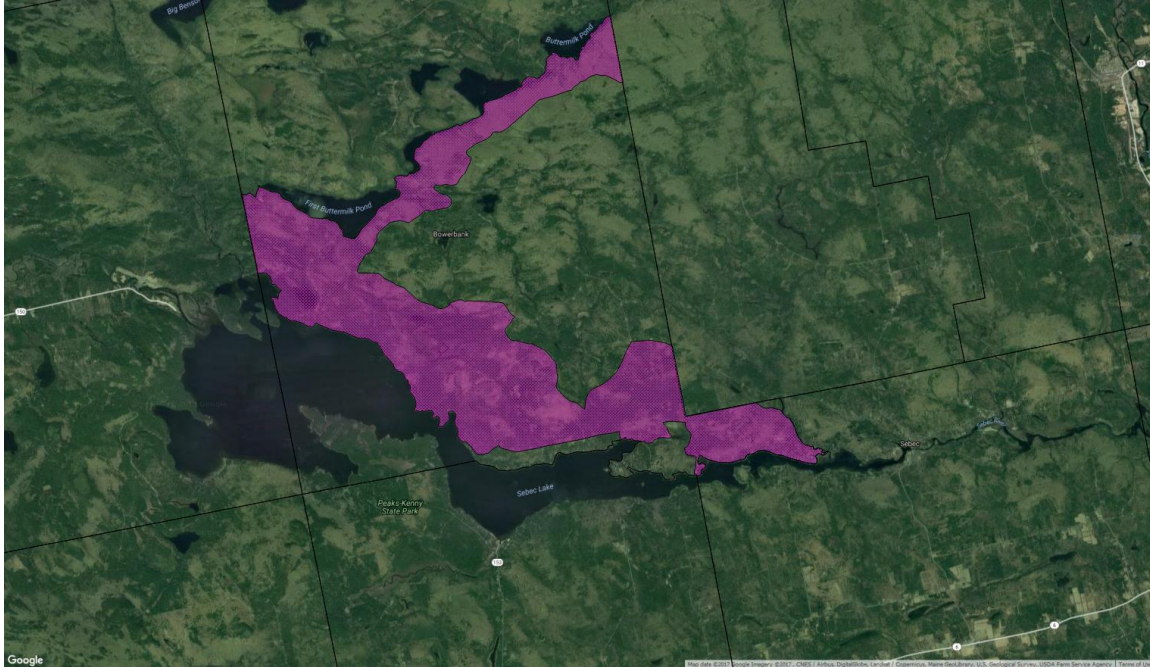
### Legend

#### DSL Coverage

- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

According to FairPoint Communications, they have upgraded their equipment in two remote terminals that allows for bonded speeds of between 10-25Mbps. Above is a visual representation of speeds as you move farther away from the equipment. Because FairPoint keeps its coverage area and equipment confidential, we were unable to locate a second Remote Terminal that services part of the community. We can confidently assume that some portion of the eligible areas in the map below were targeted for their upgrades.





Bowerbank CAF II Approved areas

One option to consider would be to work with North County Broadband, which is part of the Premium Choice service area. Their service is in neighboring Willimantic. Working with Premium Choice Broadband might be a good way for you to apply for ConnectME infrastructure grants. Eligible areas must have service that does not exceed 1.5Mbps. Premium Choice Broadband may also work with the community to look for other grant opportunities.

The North County Broadband service area in Willimantic:



Currently North Country Broadband service does not extend into Bowerbank, but because it comes right up to your community border, it might be an asset that could be extended, giving residents more choice and potentially greater speeds and reliability.

Another possible partner may be ProTech Solutions. ProTech Solutions is a locally owned internet provider that serves limited areas with service of up to 25Mbps. They are a company that would be interested in expanding service if there was a subsidy through the ConnectME Authority or a federal grant.

**Recommendations:**

- Contact ProTech Solutions to discuss possible partnership to expand service beyond Sebec Lake area
- Work with North Country Broadband to explore expansion opportunities to extend service into the community

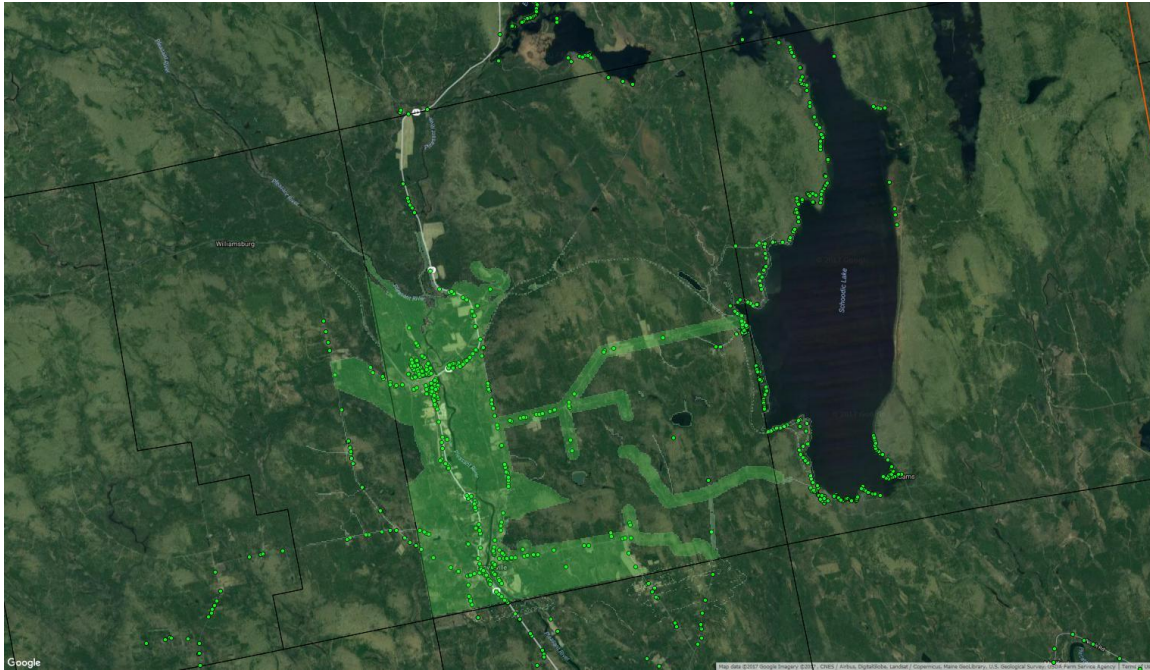
## Brownville

Population: 1250 (2010 census)

Homes: 527

Providers: Spectrum, FairPoint Communications and ProTech Solutions (around Schoodic Lake)

ProTech Solutions a small internet service provider based in Atkinson Mills and does serve Schoodic Lake residents with up to 25Mbps service for those homes that have line of site to ProTech Solution's equipment.



Brownville Spectrum Coverage Map

Spectrum offers their services in several municipalities within Piscataquis County, including Brownville. They can offer broadband services to these areas using a combination of fiber and coaxial cable to provide packages of up to 100 Mbps to their subscribers and up to 300 Mbps using fiber-to-the-premise (FTTP) hardware. According to Spectrum, this service is available everywhere they can offer their TV or phone service. Subscribers will not always get their maximum speed offerings since bandwidth is shared with other subscribers who are connected onto the same line and “node”.

Spectrum, like many cable TV operators, has exclusive rights to offer their television service to a specific town or territory in the form of a franchise agreement. These agreements typically provide a certain percentage of the revenue collected from their residents back to the municipality while the cable operator will be required to reach a specific threshold of coverage, usually a certain number of homes per mile (20-25 homes per mile typically).

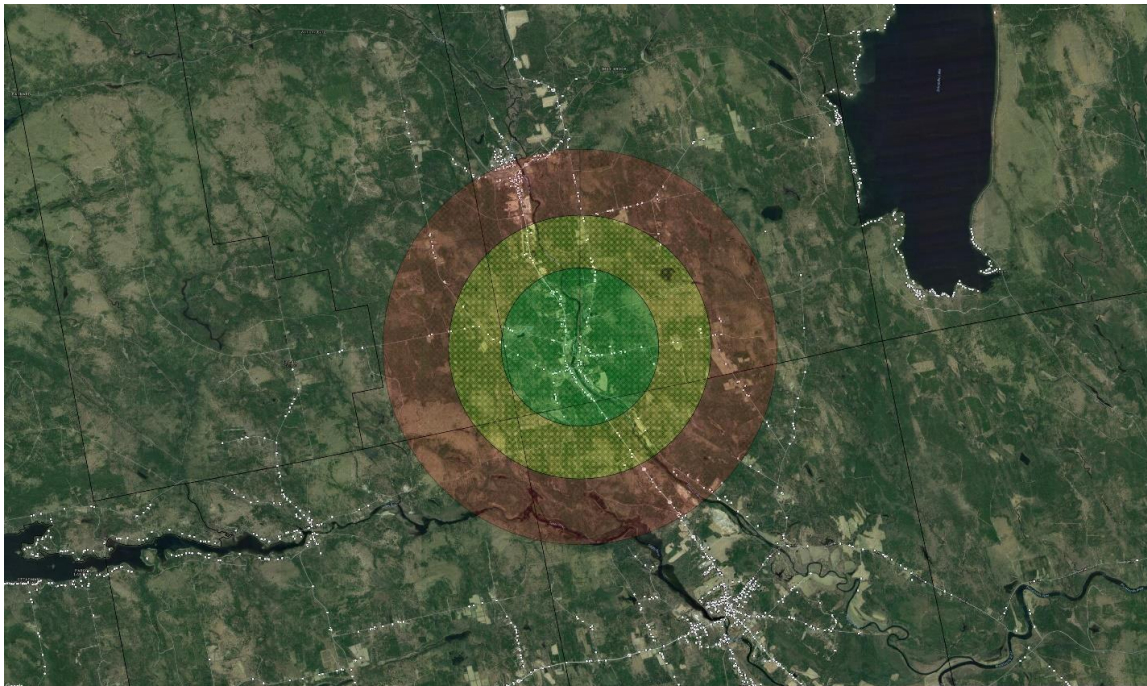
In many cases these franchise agreements have been ignored or forgotten by the municipality and most have expired. Since the acquisition of Time Warner, Spectrum has been working to update

these agreements. This provides a point of negotiation for the municipality to review and update the agreement before renewing it.

Axiom has been advising communities that have a Spectrum franchise agreement to consider working with them to expand service to unserved areas in lieu of franchise fees or to work together to apply for a state ConnectME grant, if the area being considered for coverage does not currently have service over 1.5Mbps.

Typically, Spectrum will not expand service on their own without at least 20-25 homes per mile. If Brownville would like to discuss how to approach Spectrum, Axiom would be pleased to work with the community on some suggested approaches.

Brownville also has FairPoint coverage that reaches some of the more rural parts of the community. Below is a general idea of the areas served. Please be aware that this map is generalized and specific location service offerings can vary based on a number of factors.



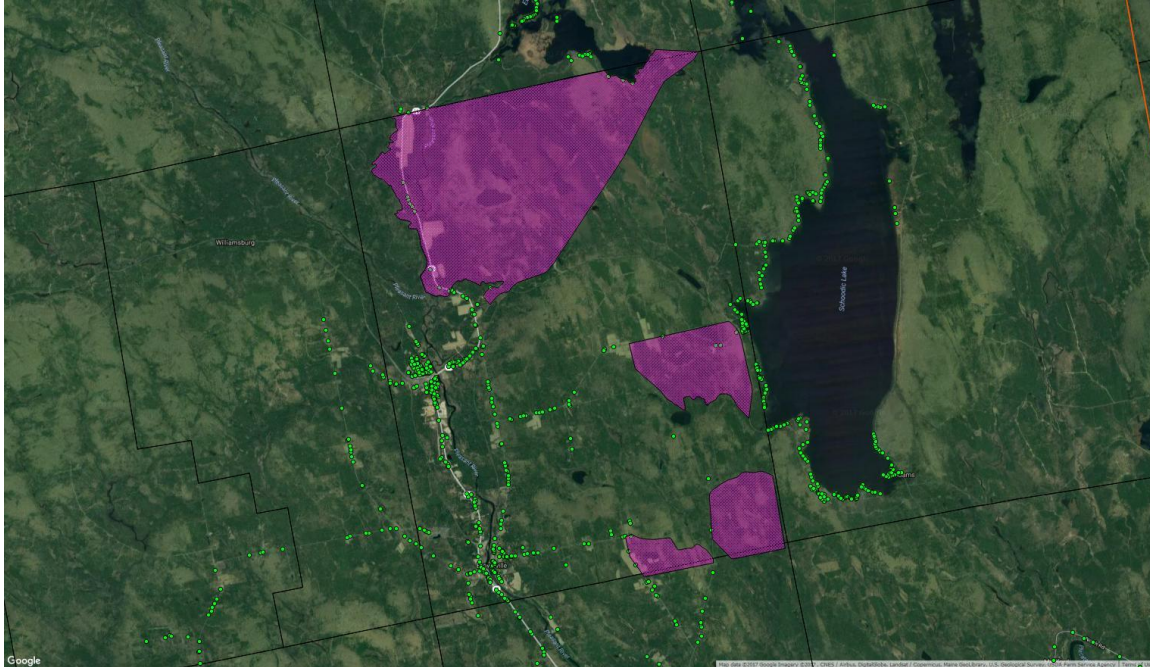
Brownville FairPoint Coverage Area

### Legend

#### DSL Coverage

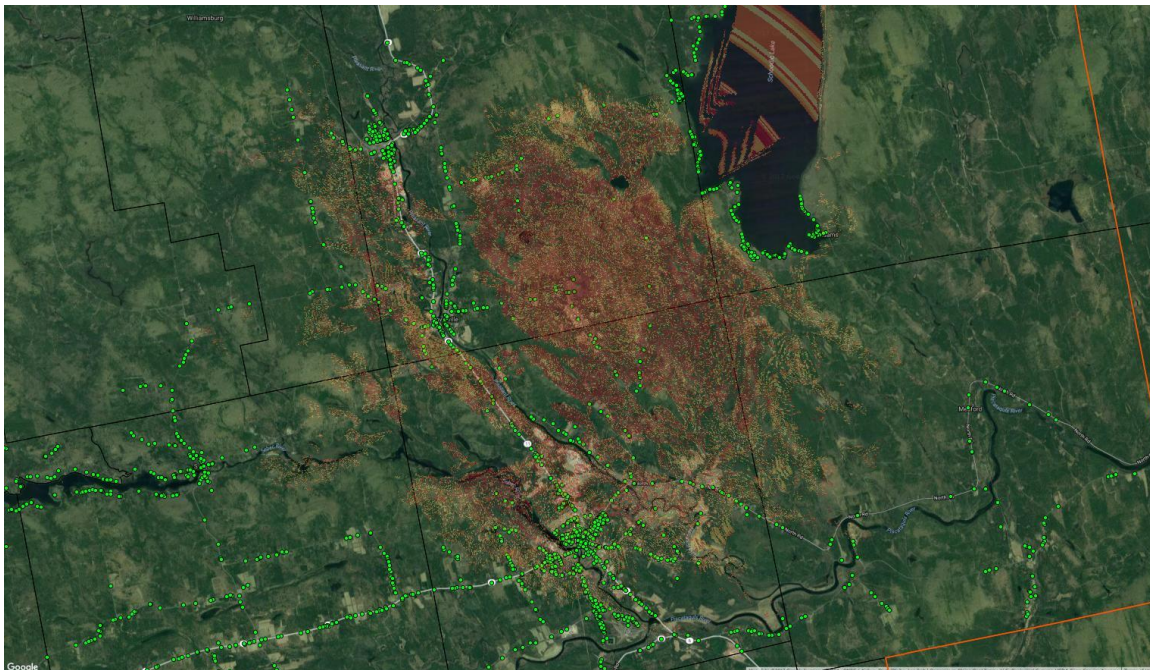
- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

There are pockets of Brownville that currently do not have coverage by the two major providers. However, Brownville does have areas that are eligible for Connect America Funds, commonly called CAF II. These are federal funds available to FairPoint to upgrade up to 36,000 homes in Maine.



Brownville CAF II Eligible Areas

As part of our planning process, we mapped the FCC registered towers to give the communities a good idea of coverage and cost of a new provider locating equipment on one of these towers. The map below shows the prospective coverage area from a tower located in Brownville.



Brownville Prospective Wireless Propagation

Estimated Expansion Costs for 100 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$35,000
Installation Labor	\$40,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$151,000</b>

Recommendations:

Brownville, unlike many communities in Piscataquis County, has many opportunities for expanded service. First, it can work with Spectrum, through a renewed Franchise Agreement, to expand Spectrum service to areas not currently being served by them. Second, it can work with FairPoint to invest CAF II funds into eligible areas of the community. Third, it could invest in a wireless solution that could cover unserved or underserved parts of the community.

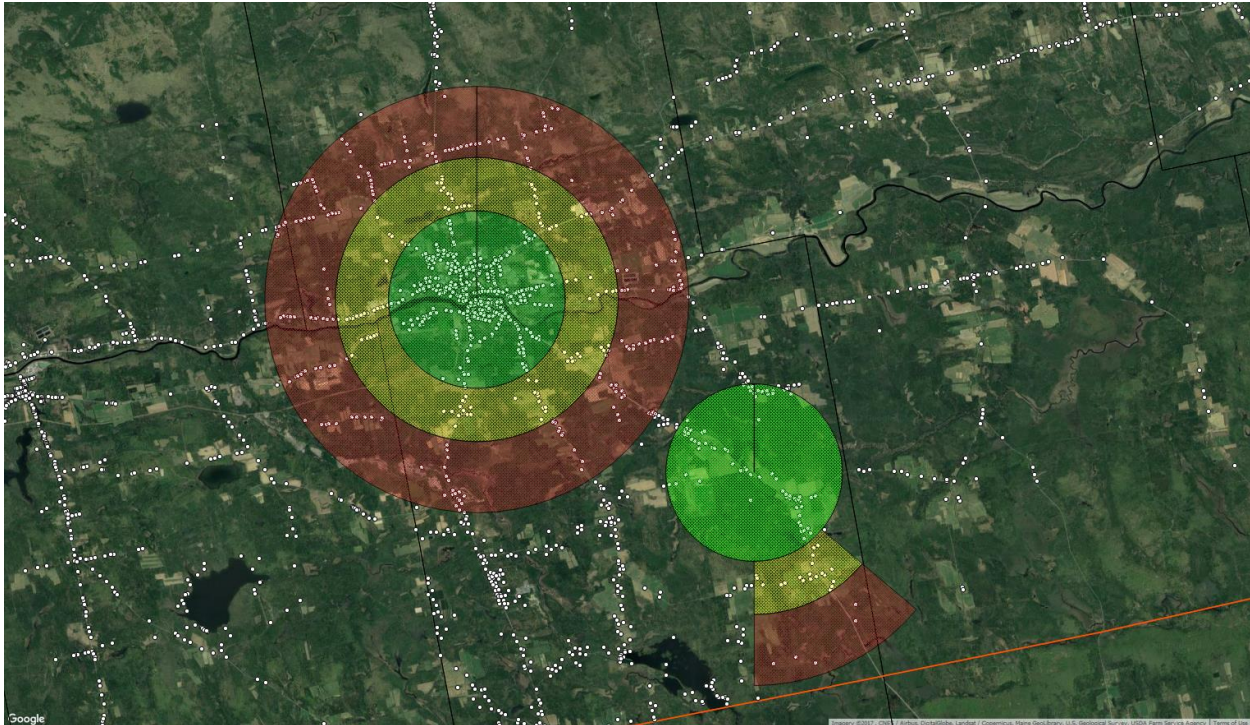
- Work with Spectrum to expand service
  - Use the Franchise Agreement renegotiation, in lieu of franchise fees
- Work with FairPoint to ensure that CAF II eligible areas are included in their planning efforts to expand and enhance service
- Work with an outside provider to deliver a competitive solution to underserved or unserved homes
  - Perhaps look for grant monies

## Dover Foxcroft

Population (2010 census): 4213

Homes: 1773

Providers: Spectrum, FairPoint Communications



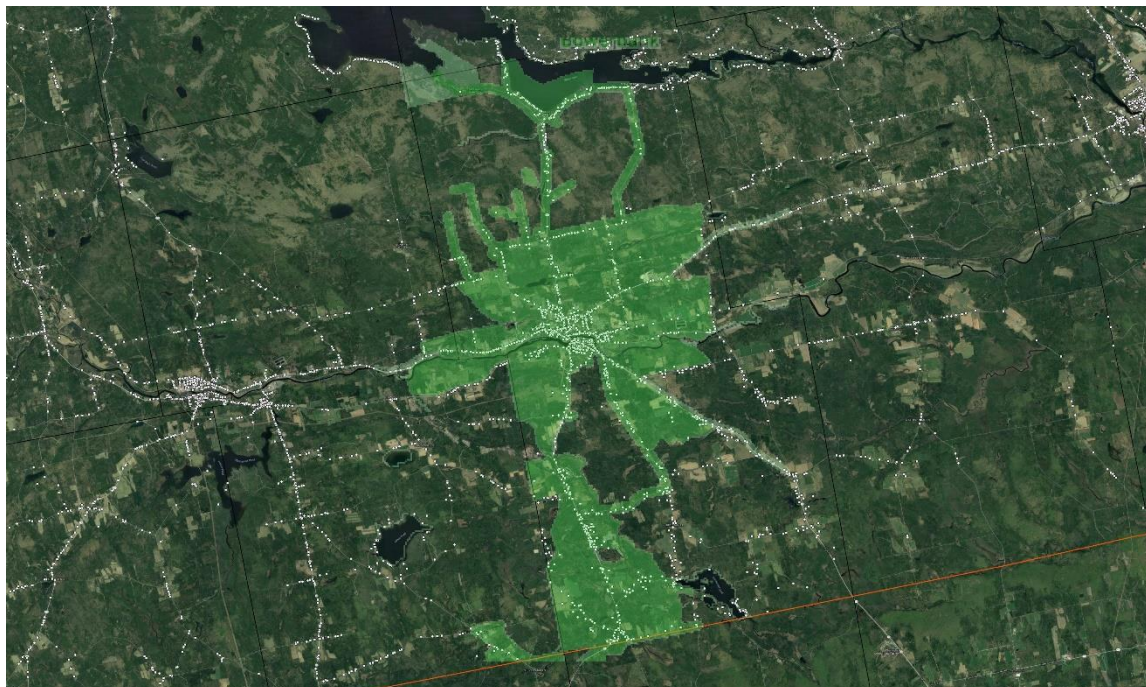
FairPoint Coverage area in Dover Foxcroft

### Legend

#### DSL Coverage

- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

FairPoint has made an effort to upgrade its current footprint to offer up to 25Mbps speeds in limited areas, typically 6000 feet from its equipment located in a Central Office or at a Remote Terminal. The above map shows the general areas where particular speeds can be obtained. This is a general estimation and individual homes, because of the quality of the copper lines, or a particular location, may not be able to achieve the maximum speeds indicated on the map.



Spectrum Coverage Map in Dover Foxcroft

Spectrum offers their services in several municipalities within Piscataquis County, including Dover Foxcroft. They can offer broadband services to these areas using a combination of fiber and coaxial cable to provide packages of up to 100 Mbps to their subscribers and up to 300 Mbps using fiber-to-the-premise (FTTP) hardware. According to Spectrum, this service is available everywhere they can offer their TV or phone service. Subscribers will not always get their maximum speed offerings since bandwidth is shared with other subscribers who are connected onto the same line and “node.

Spectrum, like many cable TV operators, has exclusive rights to offer their television service to a specific town or territory in the form of a franchise agreement. These agreement typically provide a certain percentage of the revenue collected from their residents back to the municipality while the cable operator will be required to reach a specific threshold of coverage, usually a certain number of structures per mile (20-25 homes per mile typically).

In many cases these franchise agreement have been ignored or forgotten by the municipality and most have expired. Since the acquisition of Time Warner, Spectrum has been working to update these agreements. This provides a point of negotiation for the municipality to review and update the agreement before renewing it.

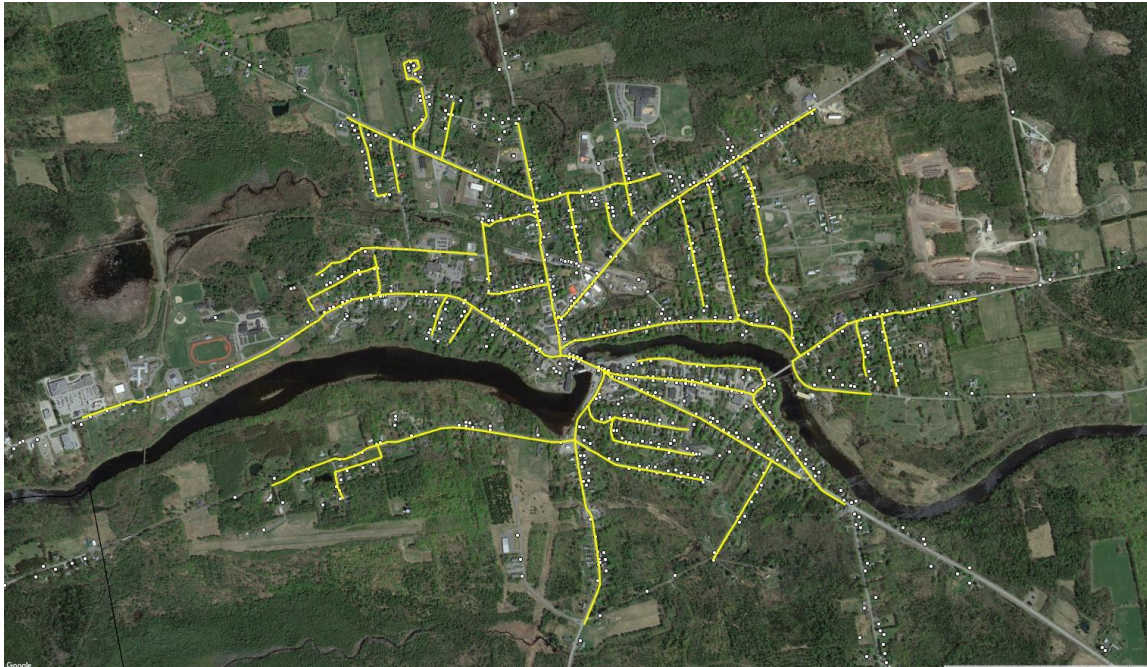
Axiom has been advising communities that have a Spectrum franchise agreement to consider working with Spectrum to expand service to unserved areas in lieu of franchise fees or to work together to apply for a state ConnectME grant, if the area being considered for coverage does not currently have service over 1.5Mbps.

Typically, Spectrum will not expand service on their own without at least 20-25 homes per mile. If Dover Foxcroft would like to discuss how to engage Spectrum, Axiom would be pleased to work with the community on some suggested approaches.



While having two providers in the community and a significant coverage area that provides service to the majority of the town, Dover Foxcroft was interested in a Fiber-to-the-Premise (FTTP) project to help better understand the costs of providing a level of service and reliability that would rival broadband solutions worldwide. This solution also has the benefit of almost unlimited upgrades as demand increases and has the potential be an infrastructure project that would last well over 20 years, with minimal upgrades.

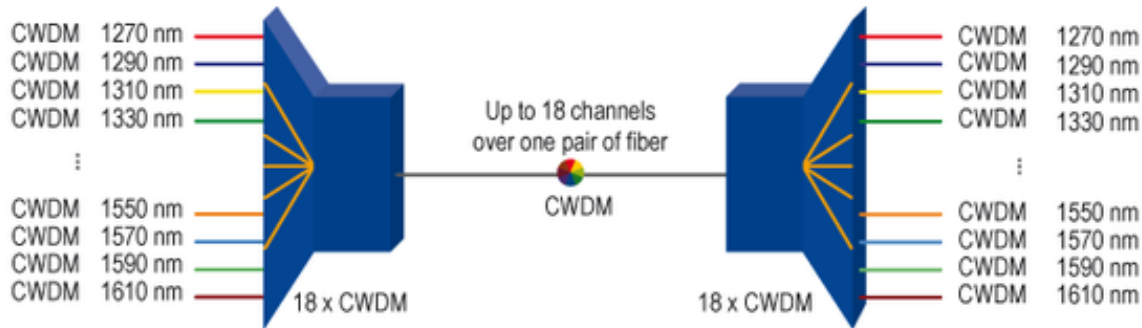
The following proposal has been designed to extend approximately 1 mile from the town center. This network design would allow connections of up to 1 Gigabyte (1000Mbps) or more to each subscriber using technology currently available.



Below is an estimated cost structure for the proposed fiber build. These costs are provided here to assist the municipality in determining budget and loan/bond requirements if they decide to proceed with a full FTTP build in the downtown. The numbers will also assist the committee in determining bid proposals from prospective vendors, flagging bids if they are significantly lower or higher than the provided numbers.

<b>Dover Foxcroft Cost Estimates</b>	
<b>Fiber materials</b>	\$225,000
<b>Fiber Labor</b>	\$365,000
<b>Licensing and Make Ready</b>	\$150,000
<b>Pole Replacement</b>	\$138,000
<b>Regen Cost/Installation</b>	\$240,000
<b>Customer Prem Hardware</b>	\$800,000
<b>TOTAL</b>	<b>\$1,918,000</b>

The estimate above assumes a fiber design implementing CWDM (Coarse Wavelength Division Multiplexing) technology. This system allows up to 18 connections over a single fiber strand by having each connection operate on a separate light wavelength.



CWDM is similar to a GPON (Gigabit Passive Optical Network) system in that multiple connections can operate over a single fiber strand, where it differs is that each CWDM connection, depending on the optics used, can carry up to 1 Gbps of data whereas GPON has to split its 2.5 Gbps connection over its 32 connections giving those on a CWDM system the opportunity to actually receive a Gig of service, or more.

Other benefits of a CWDM solution include:

- ✓ Size of the Trunk line (saves money)
- ✓ Scalability

Due to the reduced strand count needed the trunk line doesn't need to be as large, making it lighter, easier to maneuver, easier to splice, and more cost effective. If a single strand were required for each home, and 1000 homes needed to be reached you would be required to have at least 1000 strands available in the trunk line to accommodate, making the trunk very heavy, and cumbersome to work with on the utility pole. Using CWDM technology the trunk line could be reduced to a fraction of its size.

The other benefit of using this technology is its scalability; with inexpensive optics, up to 1 Gbps could be offered to each home and with higher quality optics, the total bandwidth can increase to 10 Gbps. When looking at future proofing a network, this design allows this to happen while still protecting your initial investment, without increasing the cost drastically.

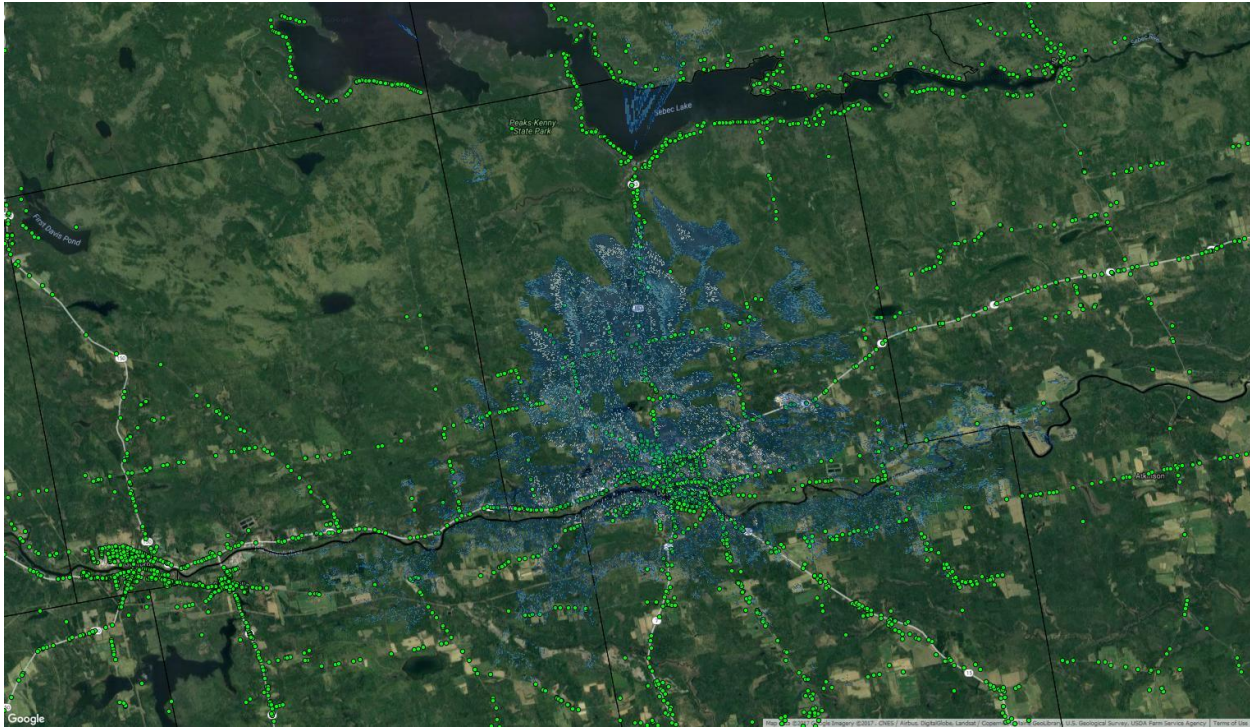
The FTTP design described above assumes that a certain percentage of the poles will need to be replaced primarily due to poles being over crowded with current provider cables. This occurs frequently on main roads through towns and can cause significant delays to the build process as a new utility pole will need to be installed then each vendor will need to move their cables over to the new pole.

It has been estimated that 10% of the poles would need to be replaced which comes to approximately 55 poles. This cost has been built into the above estimate.

There are several options for providing the requisite backhaul bandwidth to feed such a network. The first option is to obtain wholesale service through FairPoint Communications. They have an extensive fiber optic network throughout Maine and can offer a reasonable price when purchasing bulk bandwidth. The second option would be to attach to the Three Ring Binder (3RB) dark fiber that runs through Dover-Foxcroft and find a provider that also has a connection to the dark fiber that can provide the needed bandwidth. This option is more difficult to ascertain costs as it depends entirely on the individual providers that have attachments to the 3RB. However, Dover Foxcroft would be in the enviable position of having multiple options for backhaul, creating a competitive situation that should keep the cost of backhaul reasonable.

## Wireless Solution

As a stop-gap measure that would act as an alternative or supplement to current service this solution could support more rural parts of the community that may be currently underserved or unserved. It would provide service to potential customers across the community, but with FairPoint and Spectrum already serving the most lucrative parts of the community, this fixed wireless solution would be a reasonably costed solution for some of the most difficult areas to serve.



Dover Foxcroft Prospective Wireless Propagation

Estimated Costs for 100 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$35,000
Installation Labor	\$40,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$151,000</b>

### Recommendations:

- Work with Spectrum to renew franchise agreement and potentially expand service coverage area
- Work with PDEDC to locate federal or state funding for the FTTP project
- Create Broadband working group to determine the need for an alternative solution for those living outside of town center with less than optimal service now

## Greenville

Population: 1646

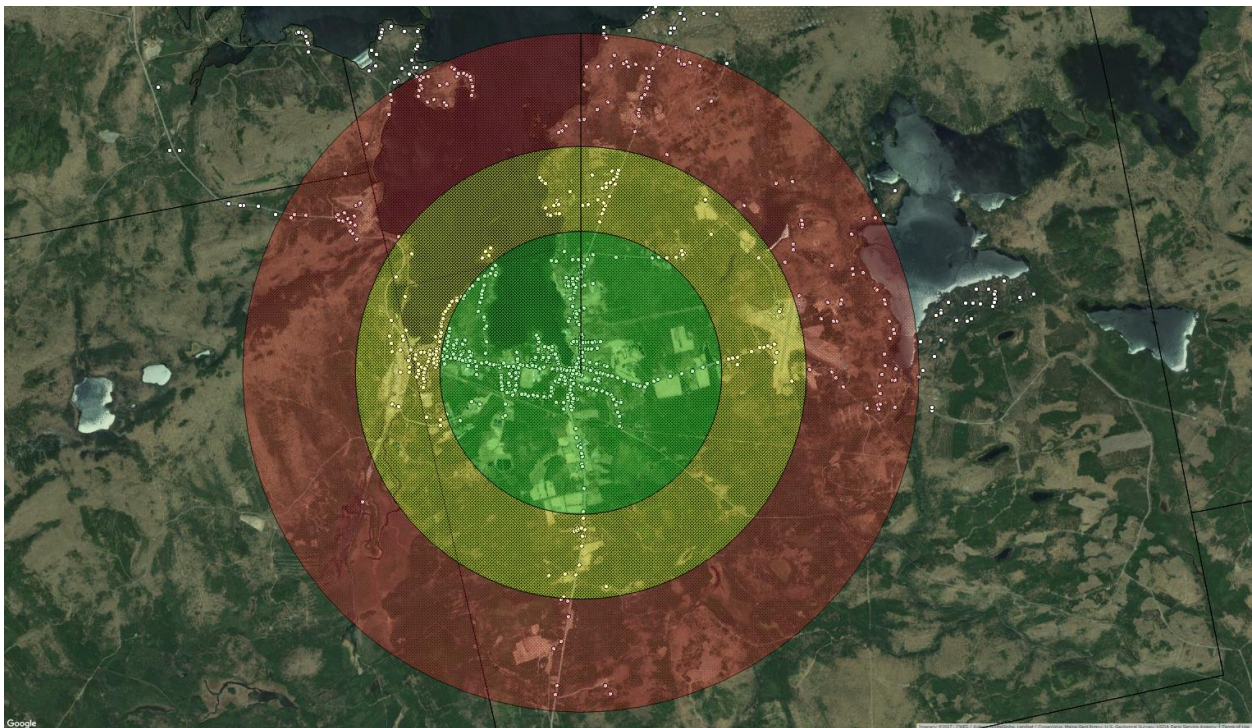
Homes: 820

Providers: Moosehead Cable (acquired by Premium Choice), FairPoint Communications

Service Levels: 1.5Mbps- 25Mbps

Greenville has had two successful projects over the past year or so. First, Shaw Library became the only library served by the Maine State Library Network to become a pilot project for a downtown Community HotSpot. That Community HotSpot has been wildly successful, with over 2000 unique users through the summer months. An expansion effort is under way, with grant funds recently awarded to expand HotSpots to two additional locations.

Second, FairPoint Communications' upgraded service in an area on the east side of the lower lake to help residents in that area now obtain speeds of up to 10/1Mbps. These are both positives. However, with the significant tourism attraction and second homeowners, town officials are looking to do more. Service in many parts of the community remain suspect, and Rockwood, an area on the west side of the lake, an area intended for major growth still has uneven or substandard service that needs to be corrected in order to reach the vision of the planners.

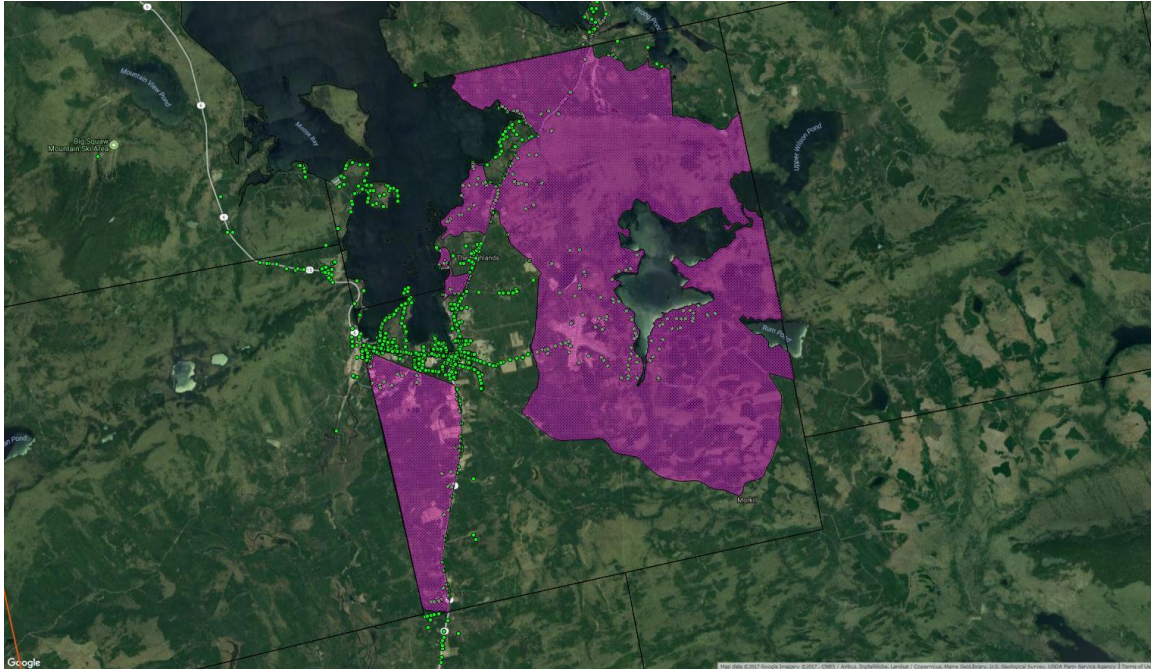


Greenville FairPoint Coverage Area

## Legend

### DSL Coverage

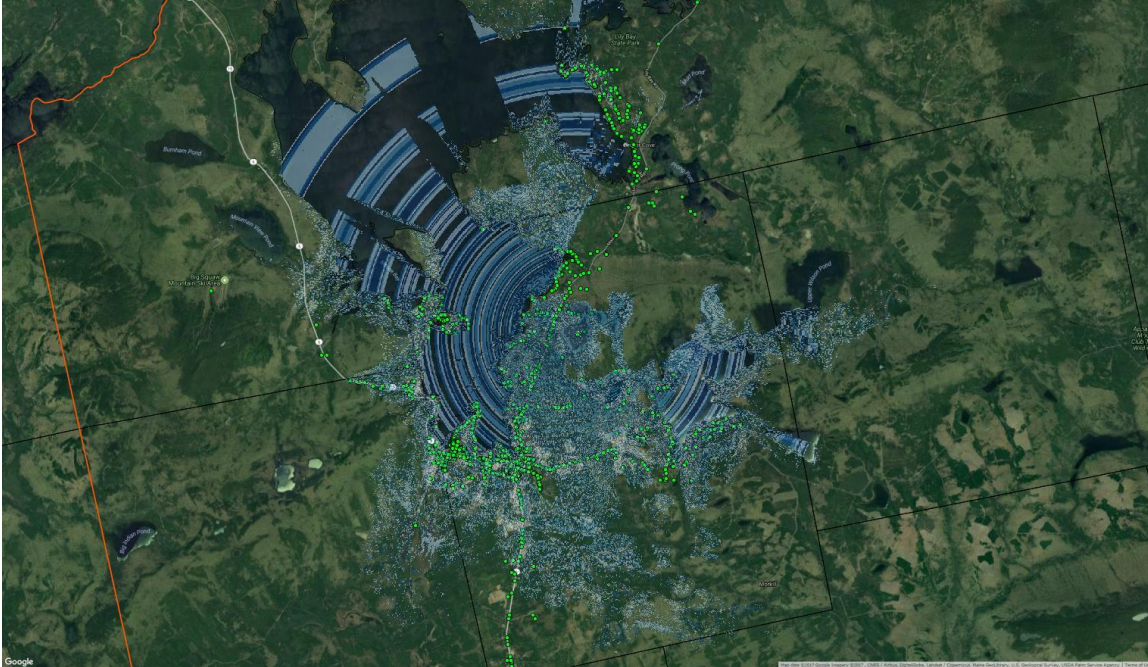
- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M



CAF II Eligible Areas in Greenville

FairPoint recently upgraded service in an area of Greenville on the eastern side of the lake. We are not sure if further upgrades will be coming, but assume that if others were coming, they would have been announced. On the other hand, FairPoint is in year three of a six year \$37 million dollar grant to serve 36,000 homes in Maine with a 10/1Mbps service level and it is not inconceivable that FPC might come back to Greenville as other projects are evaluated.

Moosehead Cable TV is a cable company that offers broadband services in Greenville and Guilford. They have stated that they have approximately 90% of Greenville and 60% of Guilford covered. We were not able to obtain a map of their coverage area, but because Premium Choice Broadband acquired them, the town does have the option of working with them to expand their cable and broadband offerings. Our understanding is they currently offer internet packages of up to 5Mbps. Premium Choice Broadband has successfully partnered with communities to apply for ConnectME (State of Maine) funds to expand broadband. If there are areas of the community that currently cannot receive speeds greater than 1.5Mbps, this would be an eligible area for ConnectME funds to be used.



### Greenville Prospective Wireless Propagation

As one suggested path forward, Axiom put together a plan for an additional wireless solution for Greenville using an existing FCC registered tower in the area. The map above is a good representation of the coverage area of such a solution.

Estimated Expansion Costs for 100 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$35,000
Installation Labor	\$40,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$151,000</b>

### Greenville Recommendations:

Greenville has seen some success recently in expanding internet service and would like to continue those accomplishments with additional projects. While working with FairPoint remains a possibility, more likely that working with another provider to pinpoint and address areas not being served properly, stunting growth and tourism opportunities seems like a more urgent opportunity.

- Work with FairPoint to ensure additional CAF II eligible areas are included in their planning efforts to expand and enhance service
- Work with an outside provider to deliver a competitive solution to underserved or unserved homes
  - Perhaps look for grant monies

- We are also recommending an expansion of the 3 Ring Binder that would come from Dover-Foxcroft to Greenville in order to increase fiber optic options for the community (plan is located in County Section of report)

\*A tower in Rockwood that we mapped for our planning process in Somerset could potentially serve Kineo Cove on Moosehead Lake

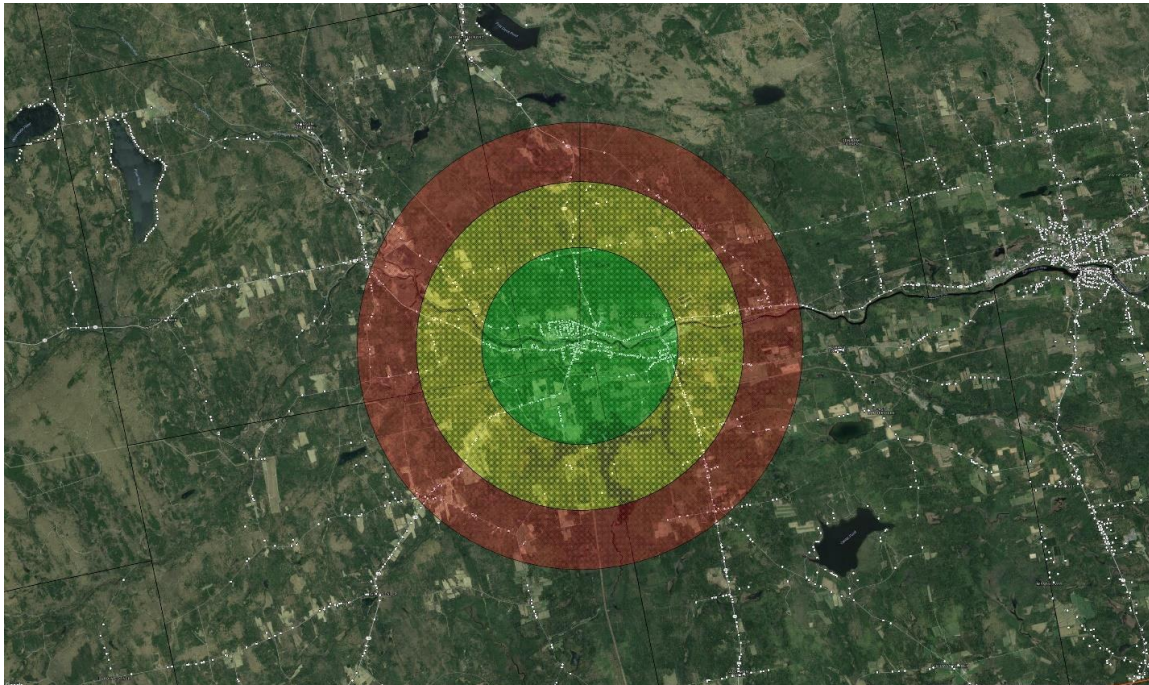
## Guilford

Population: 1531

Homes: 652

Service Provider: FairPoint Communications, Moosehead Cable TV


Guilford currently has two providers of broadband service, FairPoint Communications and Moosehead Cable TV. Our understanding of the situation is that FairPoint recently upgraded their equipment to provide up to 25Mbps in certain limited areas and 15Mbps and 10Mbps in the outer areas of Guilford. Due to the varying quality of the copper lines and other equipment factors, the map below is a general representation of service levels and coverage areas.





Guilford FairPoint Coverage Area

### Legend

DSL Coverage

 DSL 25M/2M

 DSL 20M/1M

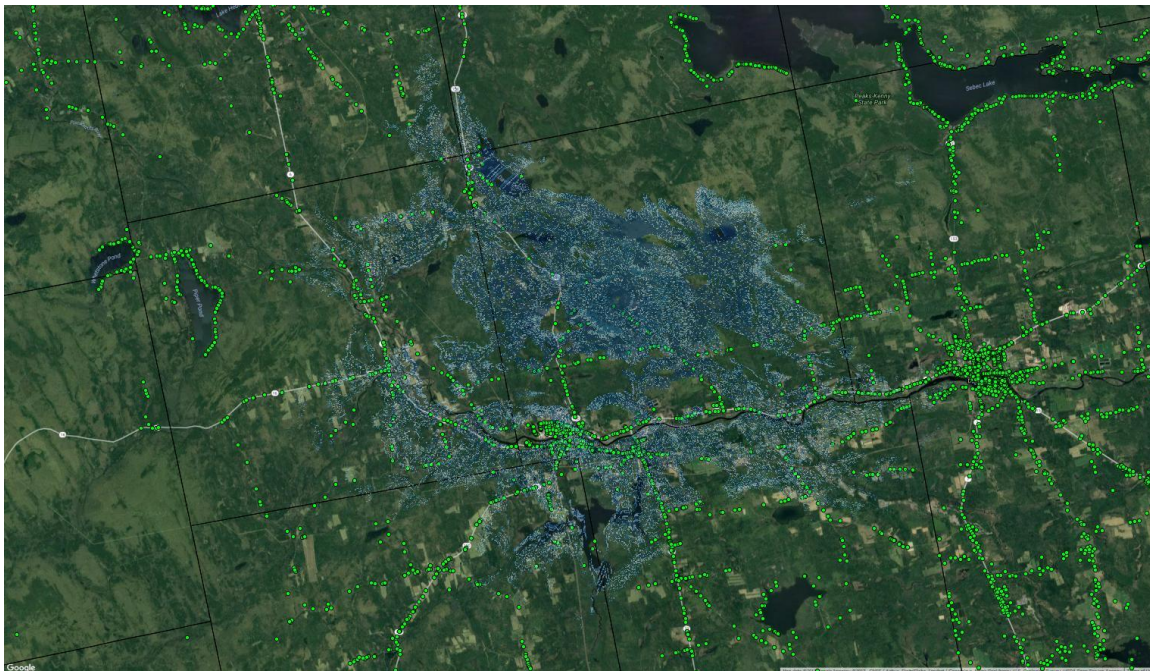
 DSL 15M/1M

Guilford, having already received an upgrade from FairPoint, and not being eligible for FairPoint CAF II federal funding (a federal program designed to bring 10/1Mbps service to 36,000 homes in Maine), is left with minimal options for expanded service, especially in more remote areas of the community.



Moosehead Cable TV is a cable company that offers broadband services in Greenville and Guilford. They have stated that they have approximately 90% of Greenville and 60% of Guilford covered. We were not able to obtain a map of their coverage area, but because Premium Choice Broadband acquired them, the town does have the option of working with them to expand their cable and broadband offerings. Our understanding is they currently offer internet packages of up to 5Mbps. Premium Choice Broadband has successfully partnered with communities to apply for ConnectME (State of Maine) funds to expand broadband. If there are areas of the community that currently cannot receive speeds greater than 1.5Mbps, this would be an eligible area for ConnectME funds to be used.

Using an FCC licensed existing tower, we propose a wireless expansion to help cover parts of the community that are currently unserved or underserved. For those areas that have a connection of 1.5Mbps or less, ConnectME infrastructure grant fund eligibility should make a grant opportunity competitive.



Guilford Prospective Wireless Propagation

Estimated Expansion Costs for 100 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$35,000
Installation Labor	\$40,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$151,000</b>

**Recommendation:**

If service levels were a major concern of the community we would recommend two options:

- Initiate a RFP process for additional service to create a competitive environment between possible carriers to price an expansion
- Work with a carrier to investigate a ConnectME grant to expand service

## Kingsbury Plantation

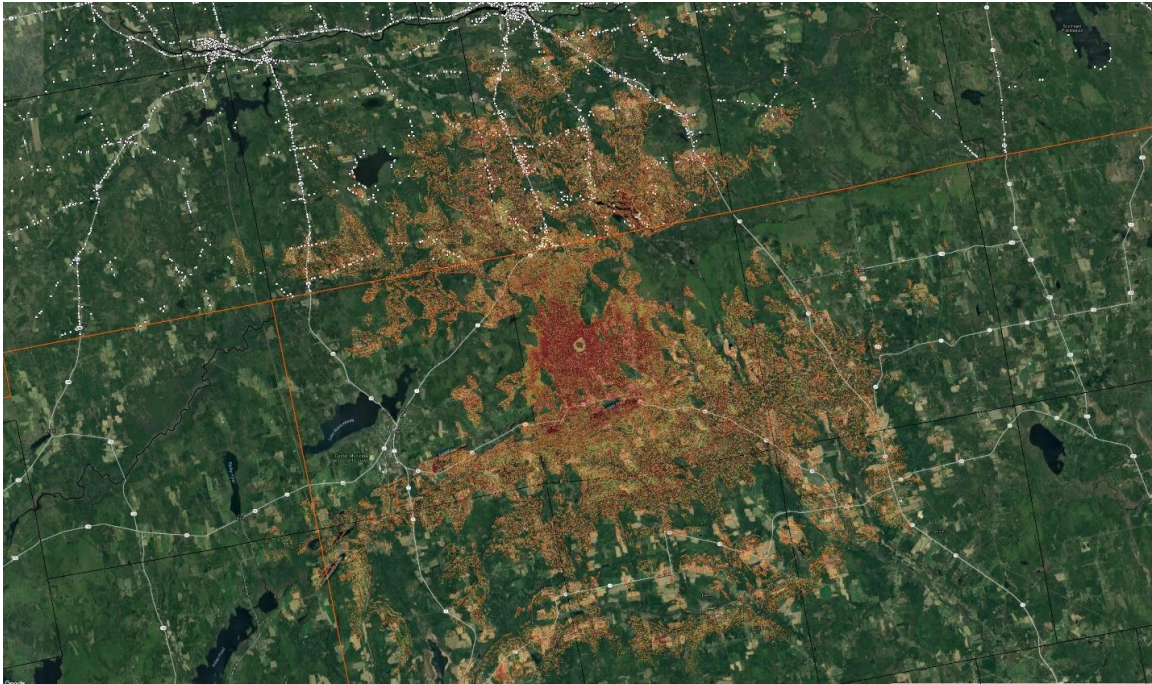
Population: (2010 census) 9

Homes: 6

Service Provider: FairPoint Communications

Because of its size we are not 100% clear that any of the 6 homes are served by any service provider. Because FairPoint is the Provider of Last Resort for phone service, we assume that they serve these homes with telephone with the potential to also receive internet.

In order to serve them with an alternative solution, we would suggest working with the communities around Kingsbury to provide a solution that could benefit more people and create economies of scale. There is an existing FCC licensed tower in Garland, just over the Piscataquis County line that might provide a wireless service to the homes in Kingsbury Plantation.



Garland Tower Propagation map

### Recommendation:

- ✓ The Plantation might consider partnering with Abbot, Parkman or Sangerville as part of a comprehensive solution for the southwestern parts of Piscataquis County.

## Lakeview Plantation

Population: (2010 census) 43

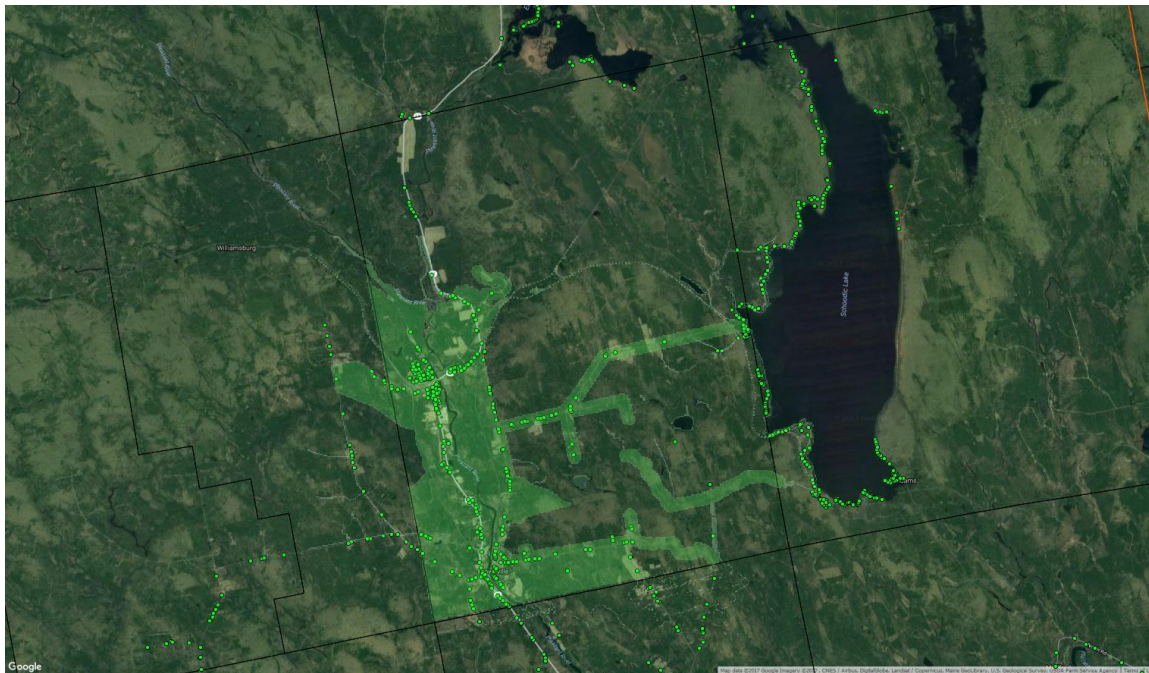
Homes: 25

Provider: FairPoint Communications and ProTech Solutions (around Schoodic Lake)

ProTech Solutions is a small internet service provider that provides Line of Sight service of up to 25Mbps around the Schoodic Lake area using equipment on a nearby tower to serve homes that have LOS to the tower equipment.

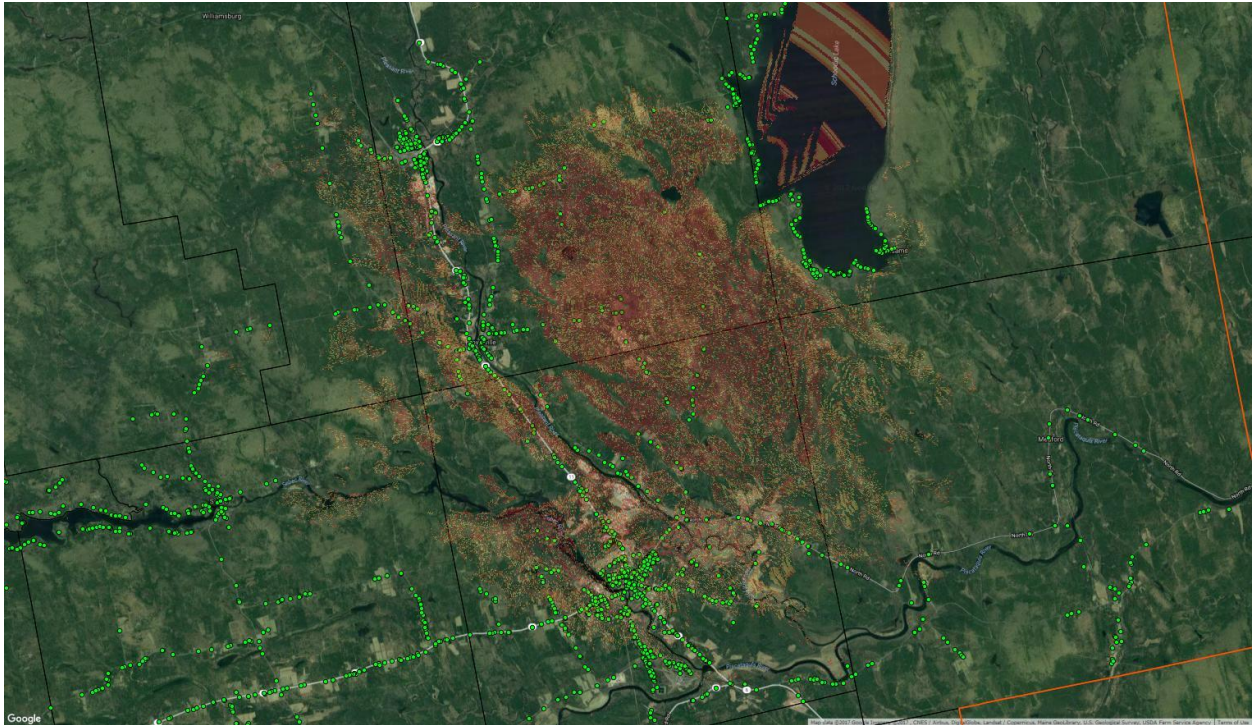
Because FairPoint is the Provider of Last Resort for phone service, we assume that they serve these homes with telephone and potentially internet service from them.

It's also possible that Spectrum service reaches close to Lakeview Plantation and may be worth pricing out an extension of their service, possibly with help through a state ConnectME infrastructure grant, if current offerings do not exceed 1.5Mbps, the maximum threshold for eligibility.



Spectrum Coverage Map in area

If working with Spectrum is not feasible because of cost or Spectrum is not interested in expanding service because of the lack of return on investment, it is possible that Lakeview Plantation can work in partnership with Brownville and/or Milo to bring a fixed wireless solution to the area. There is an FCC licensed tower near the town line between Brownville and Milo. That tower's propagation does not reach Lakeview Plantation on its own, however, it could be used to create a point-to-point link to a high point or tall structure that could be used to serve the area and possibly many of the homes surrounding the lake.



### Brownville Tower

There is still a significant amount of additional engineering to fully understand what such a project would look like, but below are some general costs to help the community understand what this project scope would look like.

Lakeview Plantation Point to Point solution	
<b>New 100' Tower Build</b>	\$40,000
<b>Equipment (tower)</b>	\$30,000
<b>Distribution Equipment</b>	\$30,000
<b>Subscriber installation and equipment (20 Homes)</b>	\$17,000
<b>Total</b>	<b>\$117,000</b>

This project would most likely include other homes along the lake shore, but we have not priced equipment for those homes. In addition, working directly with ProTech Solutions to look for grant funding or invest in his expansion to serve more homes might be something this company could be interested in pursuing.

Lakeview Plantation also is eligible for Connect America Funds (CAF II) that are administered through FairPoint. FairPoint is in the midst of a six-year, 36,000 home upgrade and expansion of their service in Maine. While this area is eligible, and FairPoint has committed to upgrades in this area, there has been no indication of when these upgrades may occur.



Lakeview CAF II Approved Areas

**Recommendations:**

- Contact FairPoint to request an update on the status of a potential CAF II upgrade
- Contact Spectrum to understand cost of expanded service into the community
- Work with Axiom, Pro Tech, or other wireless vendors to engineer a tower location that could serve Lakeview Plantation residents

\*Axiom can contact Spectrum or FPC on behalf of Lakeview Plantation if there is interest in moving ahead

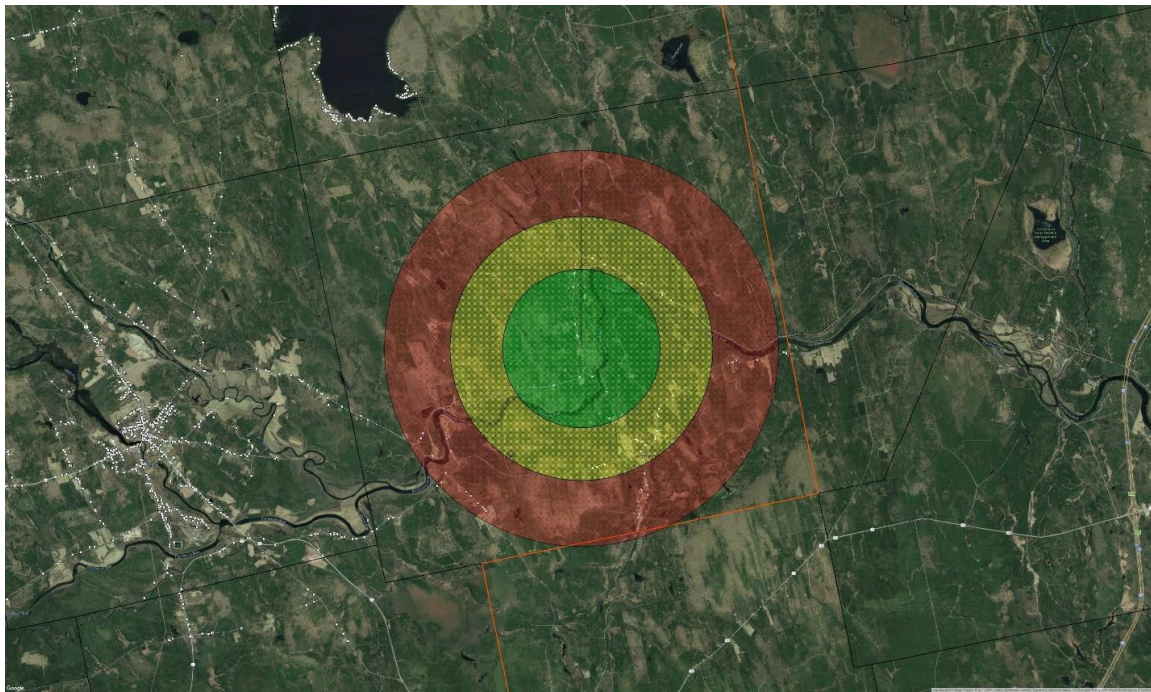
## Medford

Population: (2010 census) 231

Homes: 88

Service Providers: FairPoint Communications, ProTech Solutions (limited area with up to 25Mbps)

Medford's main internet service provider is FairPoint Communications. FairPoint has made an effort to upgrade its current footprint to offer up to 25Mbps speeds in limited areas, typically within 6000 feet from its equipment located in a Central Office on at a Remote Terminal. The map shows the general areas where particular speeds can be obtained. This is a general estimation and individual homes, because of the quality of the copper lines, or a particular location, may not be able to achieve the maximum speeds indicated on the map.



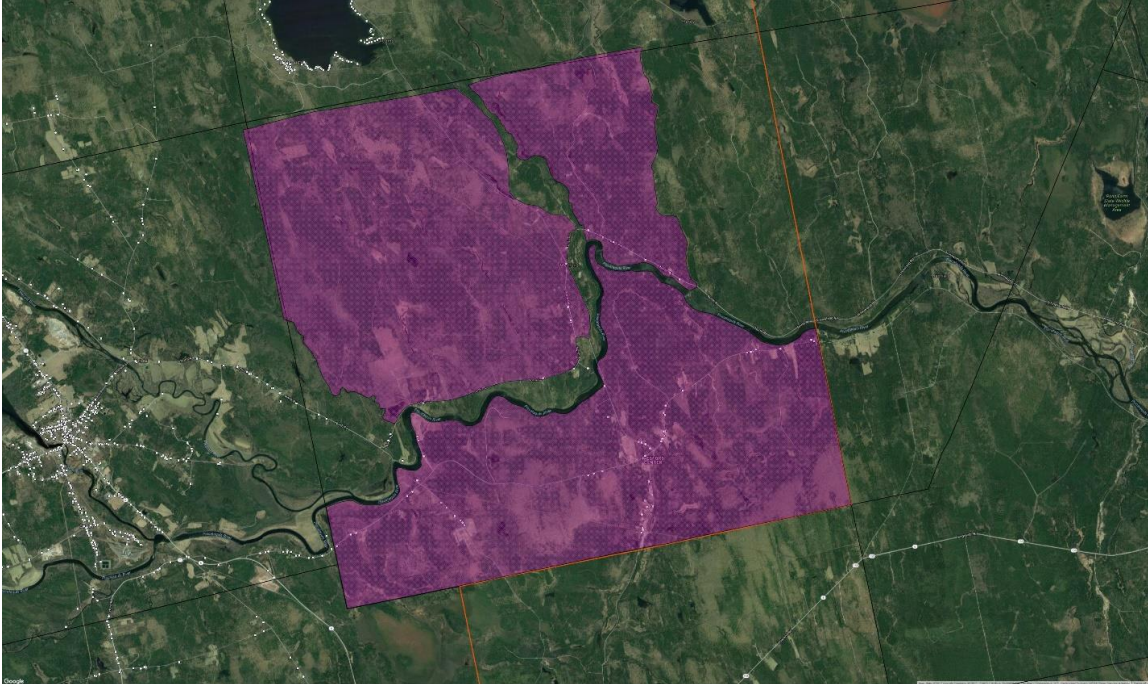
Medford FairPoint coverage area

### Legend

#### DSL Coverage

- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

Medford is also eligible for Connect America Funds (CAF II) that are administered through FairPoint. FairPoint is in the midst of a six-year, 36,000 home upgrade and expansion of their service in Maine. While Medford is eligible and on their upgrade list, there has been no indication of when these upgrades may happen. Below is a map of the areas of Medford eligible for upgraded service levels, typically a minimum of 10/1Mbps.



Medford CAF II Approved Areas

In addition, a FCC registered tower is located in LaGrange. A propagation map below will give you a general idea of coverage area using a 3.6GHz technology that can penetrate light foliage and trees and deliver a subscriber service of up to 50Mbps for those looking for additional speed. This tower could serve a good portion of the southern area of the town, especially the more remote areas currently unserved.





Estimated Expansion Costs for 50 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$17,500
Installation Labor	\$20,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$113,500</b>

Recommendations:

- Contact FairPoint to determine when upgrades will be implemented
- Partner with adjacent communities to bring a new service provider to area
  - Work with Axiom on the estimated cost of service
    - Potentially work on a ConnectME grant to serve areas that currently receive 1.5Mbps or less of service

## Milo

Population: (2010 census): 2340

Homes: 1034

Service Providers: Spectrum, FairPoint Communications

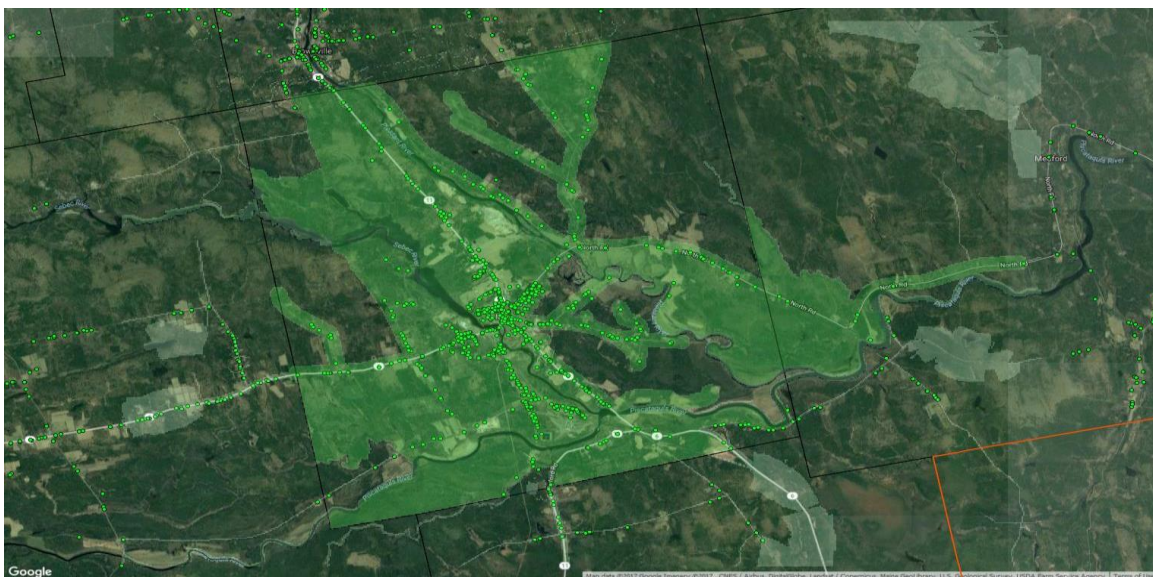
Spectrum offers their services in several municipalities within Piscataquis County, including Milo. They can offer broadband services to these areas using a combination of fiber and coaxial cable to provide packages of up to 100 Mbps to their subscribers and up to 300 Mbps using fiber-to-the-premise (FTTP) hardware. According to Spectrum, this service is available everywhere they can offer their TV or phone service. Subscribers will not always get their maximum speed offerings since bandwidth is shared with other subscribers who are connected onto the same line and “node”.

Spectrum, like many cable TV operators, has exclusive rights to offer their television service to a specific town or territory in the form of a franchise agreement. These agreements typically provide a certain percentage of the revenue collected from their residents back to the municipality while the cable operator will be required to reach a specific threshold of coverage, usually a certain number of structures per mile (20-25 homes per mile typically).

In many cases these franchise agreement have been ignored or forgotten by the municipality and most have expired. Since the acquisition of Time Warner, Spectrum has been working to update these agreements. This provides a point of negotiation for the municipality to review and update the agreement before renewing it.

Axiom has been advising communities that have a Spectrum franchise agreement to consider working with Spectrum to expand service to unserved areas in lieu of franchise fees or to work together to apply for a state ConnectME grant, if the area being considered for coverage does not currently have service over 1.5Mbps.

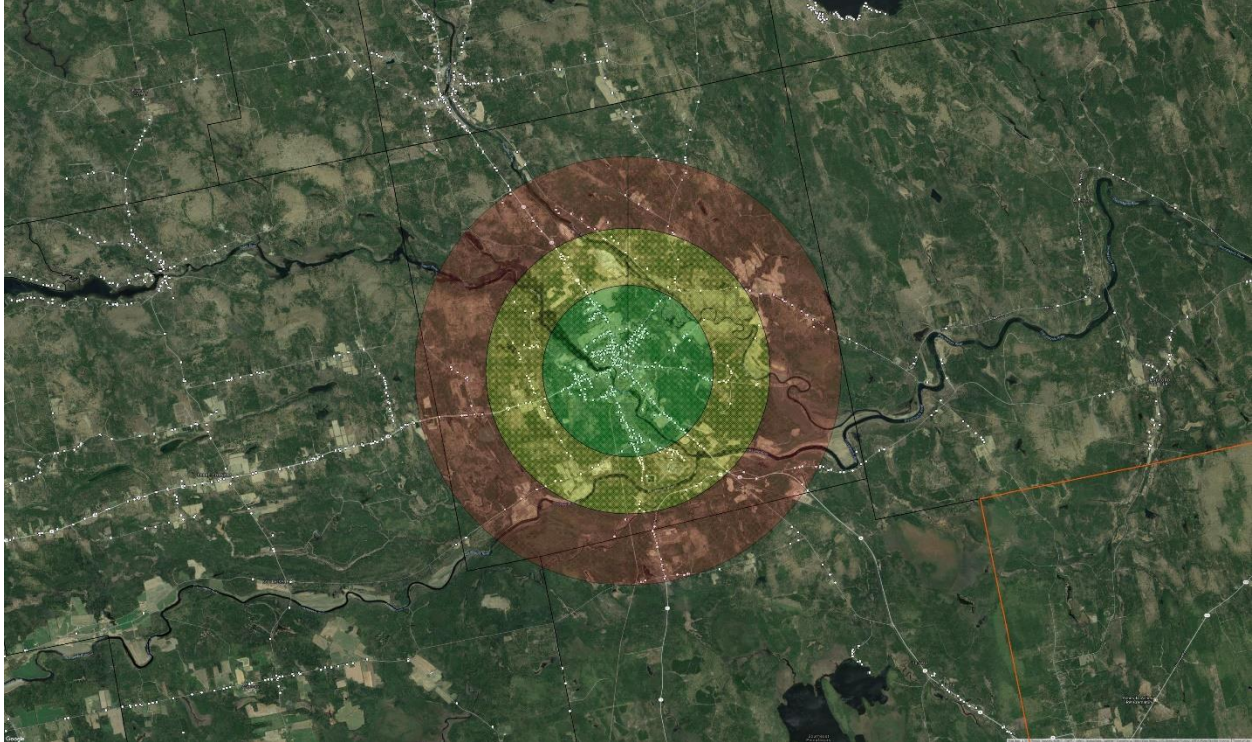
Typically, Spectrum will not expand service on their own without at least 20-25 homes per mile. If Milo would like to discuss how to approach Spectrum, Axiom would be pleased to work with the community on some suggested approaches.



Spectrum Coverage Map

Because of the Spectrum coverage area in Milo, it is likely that only the most remote homes are not being served because of cost to extend service.

FairPoint Communications also serves Milo:



Milo FairPoint Coverage Area

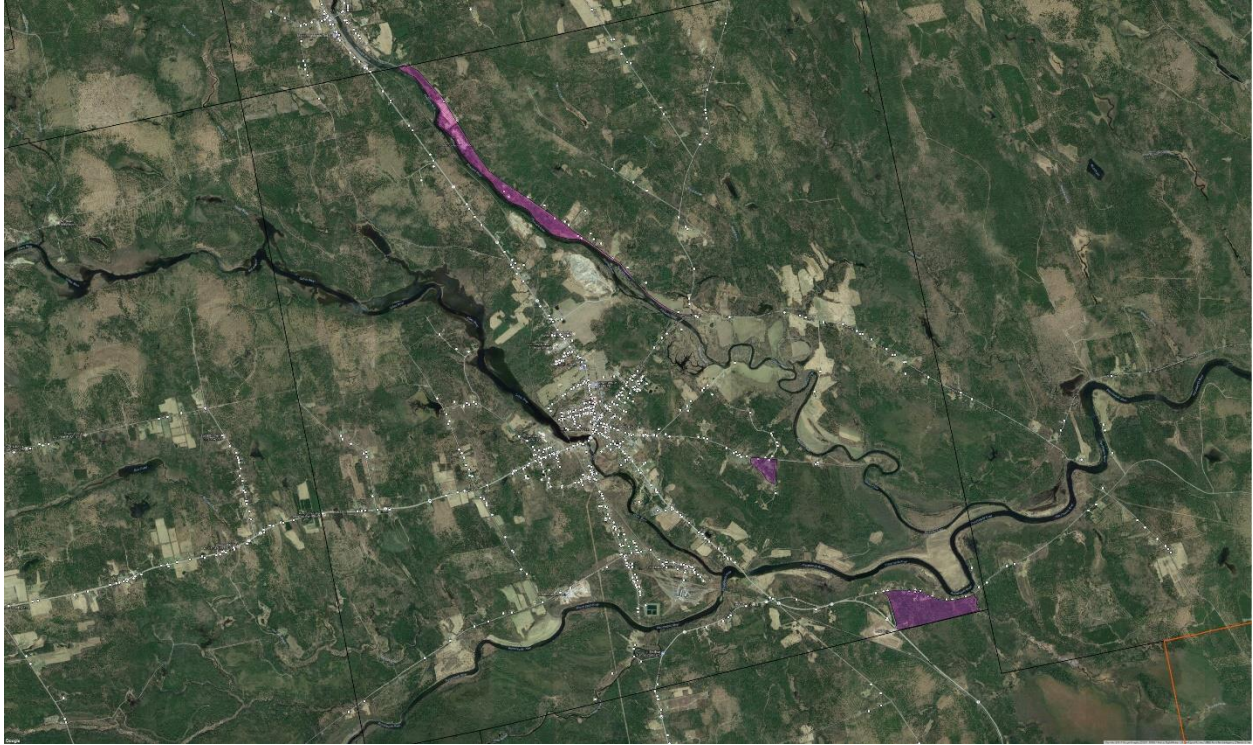
### Legend

#### DSL Coverage

- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

FairPoint Communications provides telephone services to the majority of the County including Milo, and as such is the provider of last resort. They primarily offer DSL service to their residential subscribers with some fiber service available to businesses that reside along their fiber paths. FairPoint has performed a significant series of upgrades to their network in Maine over the last several years due to a grant from the second round of the Connect America Fund, colloquially called CAF II. This grant has allowed FairPoint to target approved areas based on census block data. These upgrades have primarily consisted of improving the hardware in their central office and remote terminals with the ability to offer bonded DSL service out of these locations. These upgrades also included running fiber cable to each of their remote terminals allowing an increase in the bandwidth capacity that can be served out of these remote locations. When these upgrades have been completed they will be able to offer up to a maximum of 25 Mbps connection based off the distance the subscriber location is from the distribution point.

The map of FairPoint's coverage area in Milo is a representation and individual home location speed and reliability will be based on a number of factors that include the quality of the copper lines and the equipment location that serves a particular address.



Milo CAF II Approved Areas

It is unclear whether any of these eligible areas are being considered by FairPoint to upgrade or build out service.

**Recommendations:**

- Work with Spectrum to update Franchise Agreement and potentially extend coverage to pockets of unserved areas beyond Spectrum's current footprint
- Discuss possibility of getting on FairPoint CAF II construction list to upgrade eligible areas

## Monson

Population (2010 census): 686

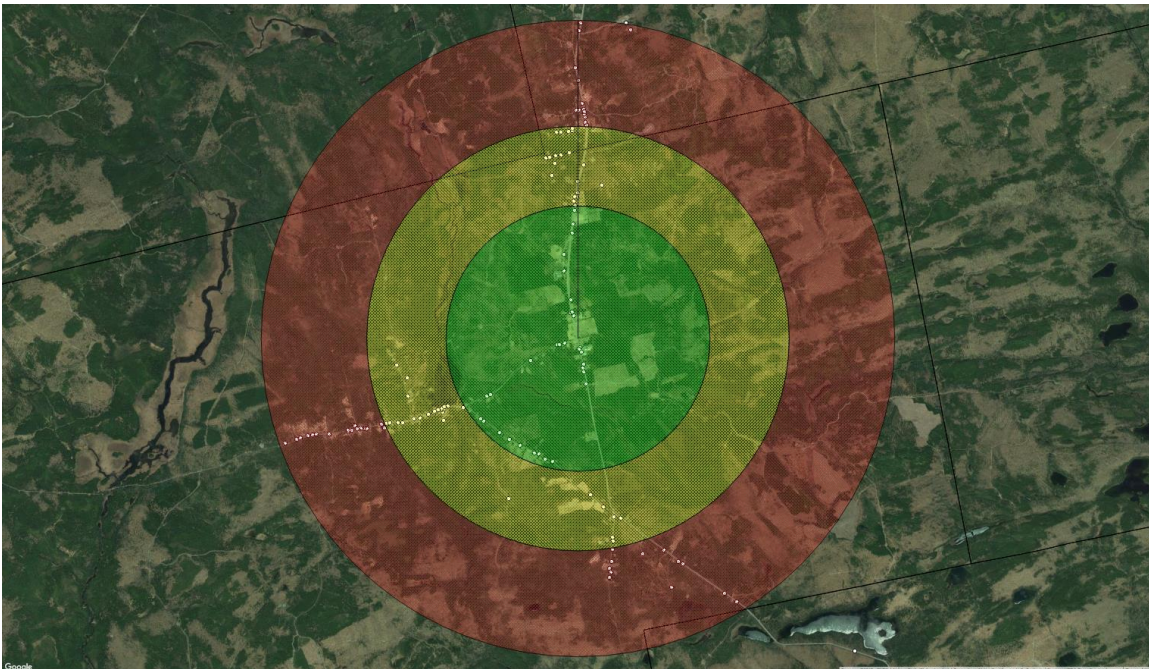
Homes: 308

Service Providers: FairPoint Communications, MaineStream Internet, Moosehead Cable TV (cable television only)

Monson is in the midst of a downtown revitalization project that is being sponsored by the Libra Foundation. As part of the project, we understand that Libra has been working with Premium Choice Broadband to bring fiber into the downtown. Currently, Moosehead Cable TV has cable in Monson (owned by Premium Choice) and we suspect that bringing fiber service into Monson to augment their existing cable service would be a logical step to providing high capacity service in Monson. We are currently unaware of the timeline for this service expansion, but this is a good project to expand fiber optics into Monson. We suggest working closely with Premium Choice Broadband to fund and expand fiber into other parts of the community, as this project moves forward.

Fiber service is the most reliable, offering the greatest amount of bandwidth upgrades and will be an investment that can last well over twenty years. If the fiber expansion moves forward, Monson will be one of only a handful of communities in Maine that will be able to offer Fiber to the Premise (FTTP). This is a selling point to attract new businesses and families to the community and the importance of this opportunity cannot be overstated. With the Libra project and the possibility of fiber expansion, this may be the most transformative project in the region.


This year, FairPoint Communications also upgraded their equipment that serves Monson and speeds between 10-25Mbps are now achievable with bonded DSL service.





Monson FairPoint Coverage Area

## Legend

### DSL Coverage

 DSL 25M/2M

 DSL 20M/1M

 DSL 15M/1M

Also serving Monson is MaineStream Internet, a company acquired by Premium Choice Broadband that offers DSL service to the community, with similar speeds to FairPoint. Both MaineStream Internet and FairPoint did not offer enough information about their equipment locations to produce a map of their coverage area in Monson.

Both Moosehead Cable and MaineStream Internet are connected to Premium Choice Broadband either through partnership or acquisition and we would recommend having a meeting with Premium Choice Broadband, if that has not already occurred, to discuss possible options for expansion.

### Recommendations:

- Meet with Premium Choice Broadband to discuss options for expansion
  - Potential for grant opportunity with ConnectME for areas unserved (1.5Mbps or less)
- Discuss with Axiom creating a wireless plan and cost to overlay current service in areas not anticipated to be served with fiber optics

## Parkman

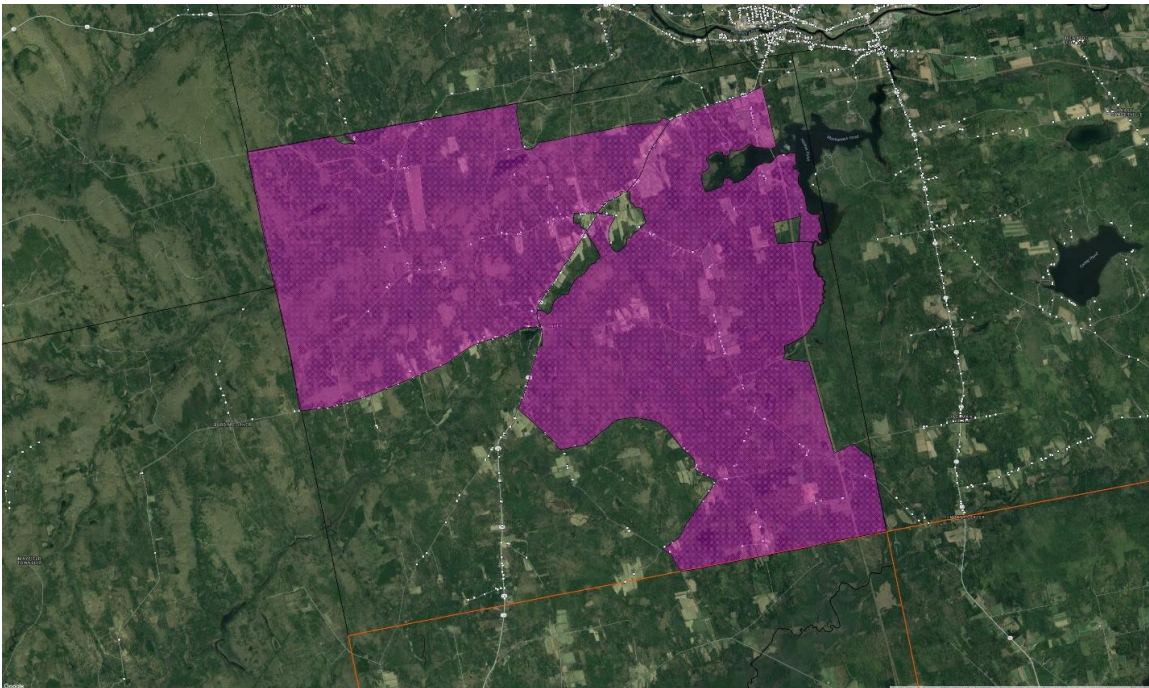
Population (2010 census): 843

Homes: 353

Service Providers: TDS, FairPoint Communications

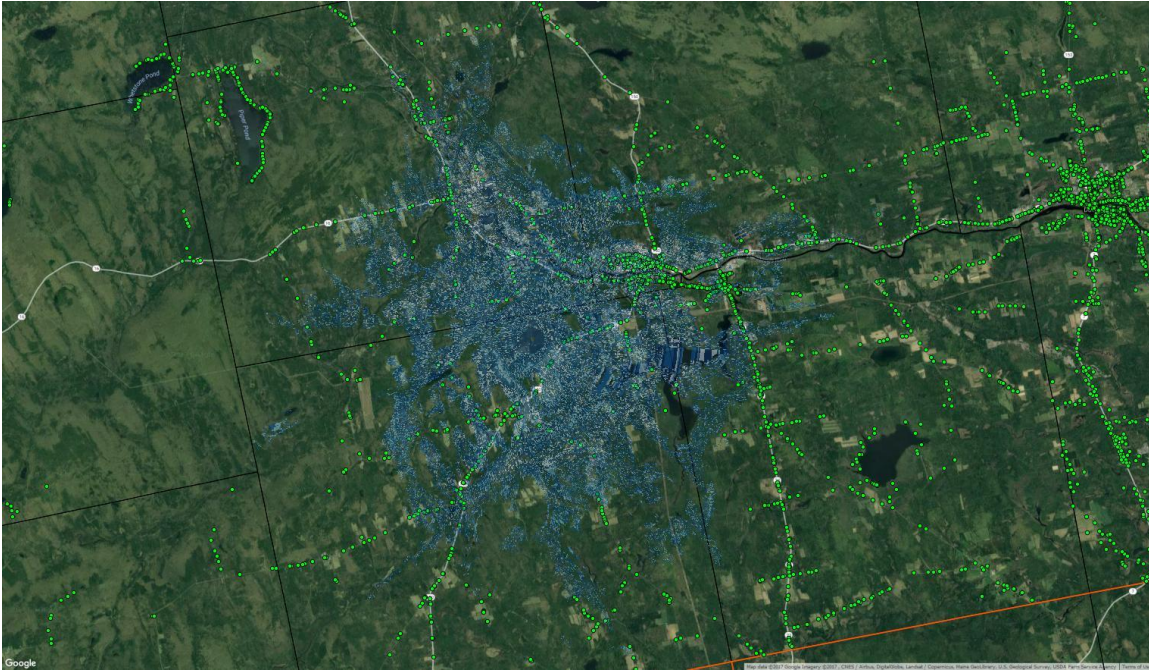
Axiom made many attempts to obtain a TDS coverage map for Parkman, with no success. Axiom does have contact with the TDS representative for Maine and can provide that contact to Parkman, if they would like to pursue a map of TDS's coverage area.

In 2017 FairPoint upgraded their equipment in a number of communities in Piscataquis, including Parkman. They utilized federal money through a grant from the second round of Connect America Funding, commonly called CAF II. While FairPoint stated that they had completed the upgrade, we were not given any mapping of the coverage area. Below is the area in Parkman that are eligible for upgrade. The upgrade allows FairPoint subscribers to now purchase speeds from 10-25Mbps.



Parkman CAF II Approved Areas

As a way to provide an alternative to current coverage, speeds and reliability, Axiom proposed a fixed wireless solution utilizing a nearby tower location.



Parkman Prospective Wireless Propagation

Estimated Expansion Costs for 100 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$35,000
Installation Labor	\$40,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$151,000</b>

As you notice, this propagation map also covers areas of Guilford and Abbot and may provide an opportunity to partner with those communities if this recommendation is something that is of interest to Parkman.

#### Recommendations:

- Explore partnership options with surrounding communities to enhance coverage
- Prioritize areas of community currently unserved (1.5Mbps or less) partner with a current provider or other Internet Service Provider to explore a ConnectME Infrastructure grant (March-April 2018 application likely)



## Sebec

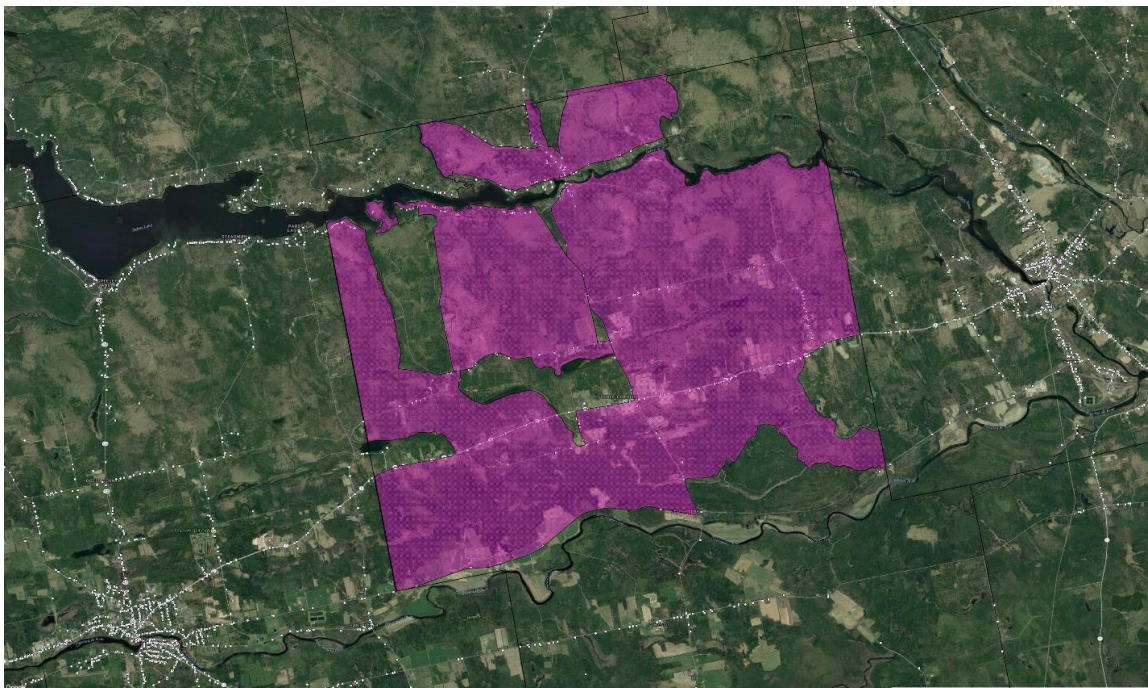
Population (2010 census): 630

Homes: 273

Providers: FairPoint Communications, MaineStream Internet, ProTech Solutions (serves around Sebec Lake)

FairPoint Communications recently upgraded its service across a good portion of Piscataquis County, with 20 construction projects, including in Sebec that now allows subscribers to acquire speeds between 10-25Mbps depending on your location in relationship to the FairPoint equipment.

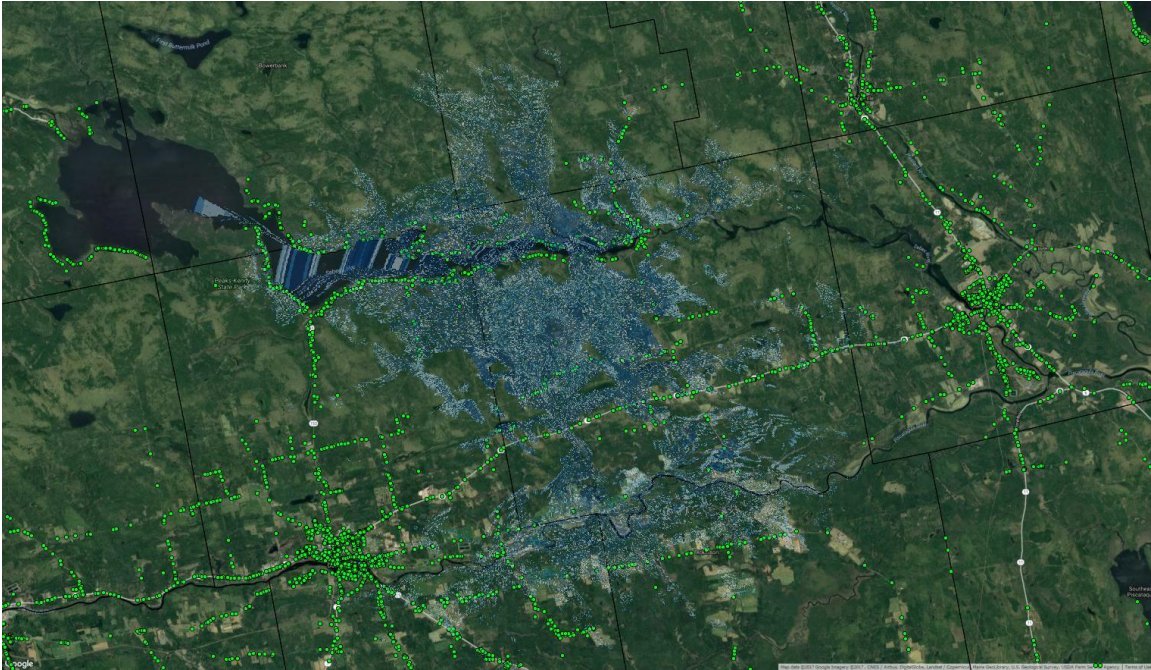
These series of upgrades were made possible by a grant from the second round of the Connect America Fund, colloquially called CAF II. This grant has allowed FairPoint to target approved areas based on census block data. These upgrades have primarily consisted of improving the hardware in their central office and remote terminals with the ability to offer bonded DSL service out of these locations. These upgrades also included running fiber cable to each of their remote terminals allowing an increase in the bandwidth capacity that can be served out of these remote locations. Below is a map of the eligible areas approved for upgrades through this project. In our meeting with FairPoint, they indicated that their Remote Terminal (box that holds the equipment) had been upgraded in Sebec.



Sebec CAF II Approved areas

MaineStream Internet also serves Sebec with a DSL product similar to FairPoint's and offers an alternative carrier for residents. While MaineStream did not provide mapping of their coverage area, they did mention the desire to build out fiber into Sebec. Recently, MaineStream was acquired by Premium Choice Broadband, who also serves much of the southern part of Piscataquis with a wireless service from several tower locations.

We have created a potential project to increase coverage and bandwidth speeds with a wireless solution for a tower that can serve Sebec and parts of the surrounding communities.



Sebec Prospective Wireless Propagation

Estimated Expansion Costs for 100 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$35,000
Installation Labor	\$40,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$151,000</b>

As you notice, this propagation map also covers some parts of surrounding communities and may provide an opportunity to partner with those communities if this recommendation is something that is of interest to Sebec.

#### Recommendations:

- Meet with MaineStream Internet to discuss possibility (cost and location) of fiber planning and build
- Implement wireless solution in partnership with other communities or individually

## Sangerville

Population (2010 census): 1343

Homes: 612

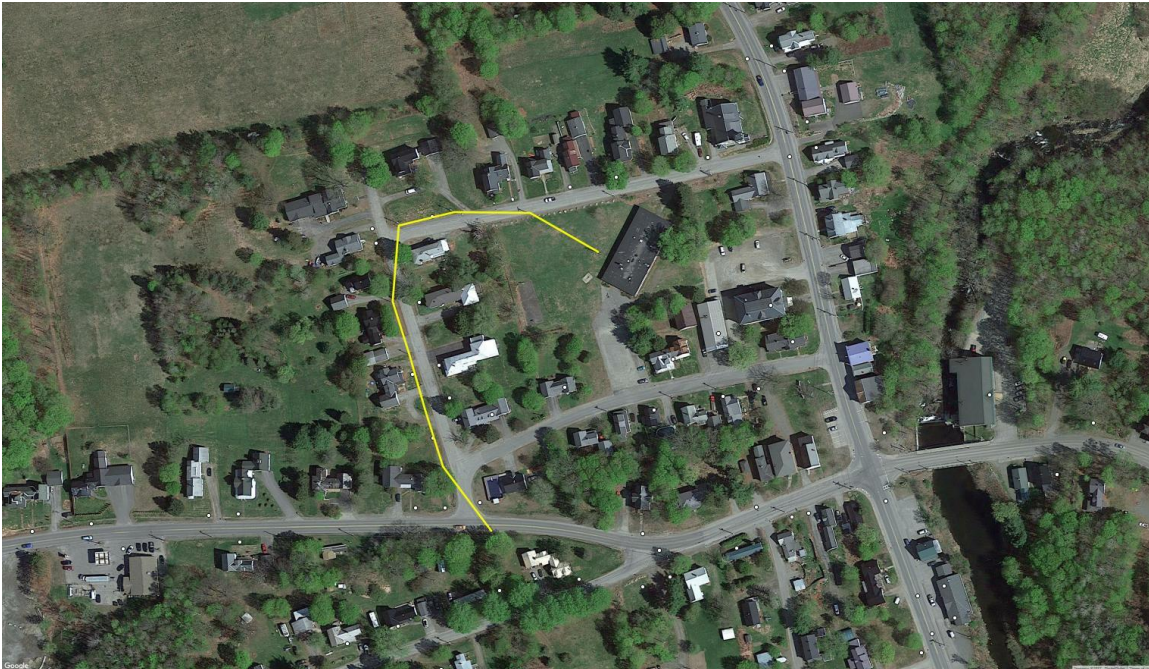
Providers: FairPoint Communications, MaineStream Internet

Sangerville has two internet service providers in town; both offer comparable DSL (copper line) service. In meeting with MaineStream Internet, they did not provide maps of their service areas, but indicated that their current DSL service is not going to be built out any further and they were going to concentrate their efforts on fiber builds. They did mention areas where fiber extensions make sense to extend their network and we are confident that they would be interested in working with any community that they have service to upgrade or extend service in partnership with your community.

Recently MaineStream Internet was acquired by Premium Choice Broadband, which offers a variety of internet service connections in Piscataquis County. Premium Choice Broadband typically works with a community by partnering on grants through the ConnectME Authority, a state agency that provides up to \$1 million in grants every year.

In addition to MaineStream Internet, FairPoint Communications also provides DSL internet service to the community. FairPoint has upgraded a good portion of their equipment in Piscataquis County, and Sangerville. FairPoint customers can now access between 10-25Mbps depending on the location of the home in proximity to their equipment shack or remote terminal.

In meeting with Sangerville officials, they indicated they were looking for a fiber connection to the Old School Building. The following will detail a fiber build to the school and the estimated cost of connecting.



Our recommendation for this project is to work with FairPoint Communications to reach this location. They have a fiber optic cable that runs along Pleasant Ave, which is the closest access point, and therefore the least costly option. FairPoint typically has allowances for structures that are within a certain distance from their fiber distribution lines and can absorb the build cost into the MRC (monthly recurring cost) as long as certain terms are met in their contracts.

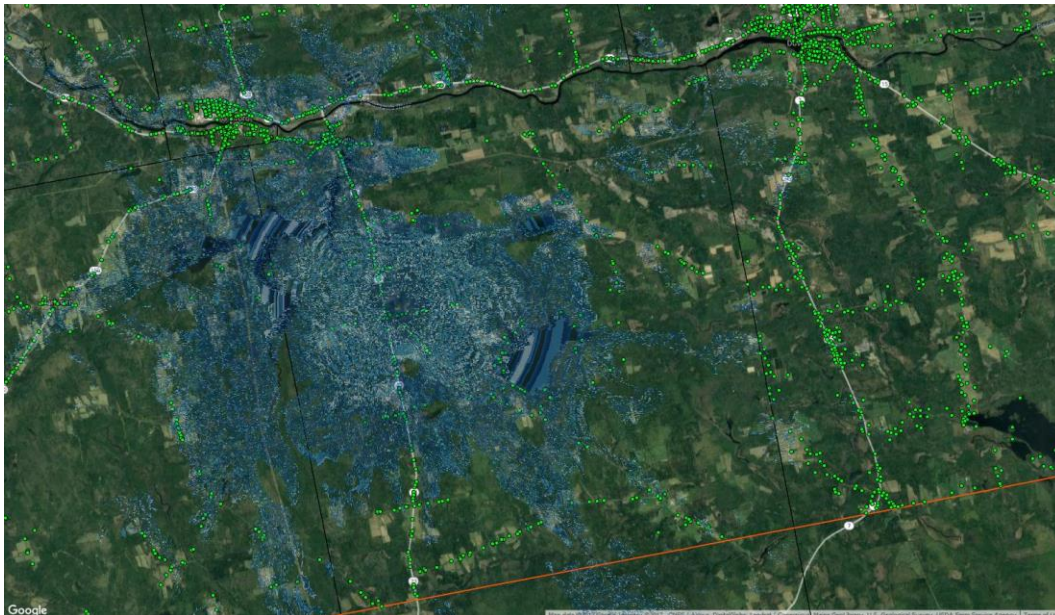
In the instances where locations are considered outside of their contract scope the below chart will provide an idea of the costs that could be incurred in running a fiber cable to the school building.

School fiber cost	
Fiber Materials	\$5,500.00
Fiber Labor	\$4,000.00
License pole attachments and Make Ready	\$3,200.00
<b>Total Cost</b>	<b>\$12,700.00</b>

Any other fiber optic solution would require a build that would need to reach Dover-Foxcroft and the Three Ring Binder at close to 7 miles distance from Sangerville, making other options too costly to consider.

Once constructed, the community would be expected to provision a monthly internet connection for some amount of bandwidth from FairPoint, but typically, that cost would be part of the end users responsibility. If the school was being used to attract companies or other economic development opportunities, the cost could be divided by the various entities using the facility.

A final option available to the community to obtain better connectivity is a wireless solution that could be provisioned in partnership with an internet service provider.



Sangerville Prospective Wireless Propagation

Estimated Wireless Solution for 100 customers:

Hardware/Materials (on tower)	\$45,000
Engineering/Labor (for tower)	\$16,000
Equipment/Materials (\$350 per subscriber)	\$35,000
Installation Labor	\$40,000
Backhaul (unknown estimate)	\$15,000
<b>Total Cost of Build</b>	<b>\$151,000</b>

This coverage area would be significant and reach into some of the more remote locations in the community. Axiom is available to discuss this project in more detail if the community is interested in learning more about this and if they decide to look to fund such a project.

Recommendations:

- Contact FairPoint about a fiber connection to the school
- Potentially work with an Internet Service Provider to initiate a new Wireless Service

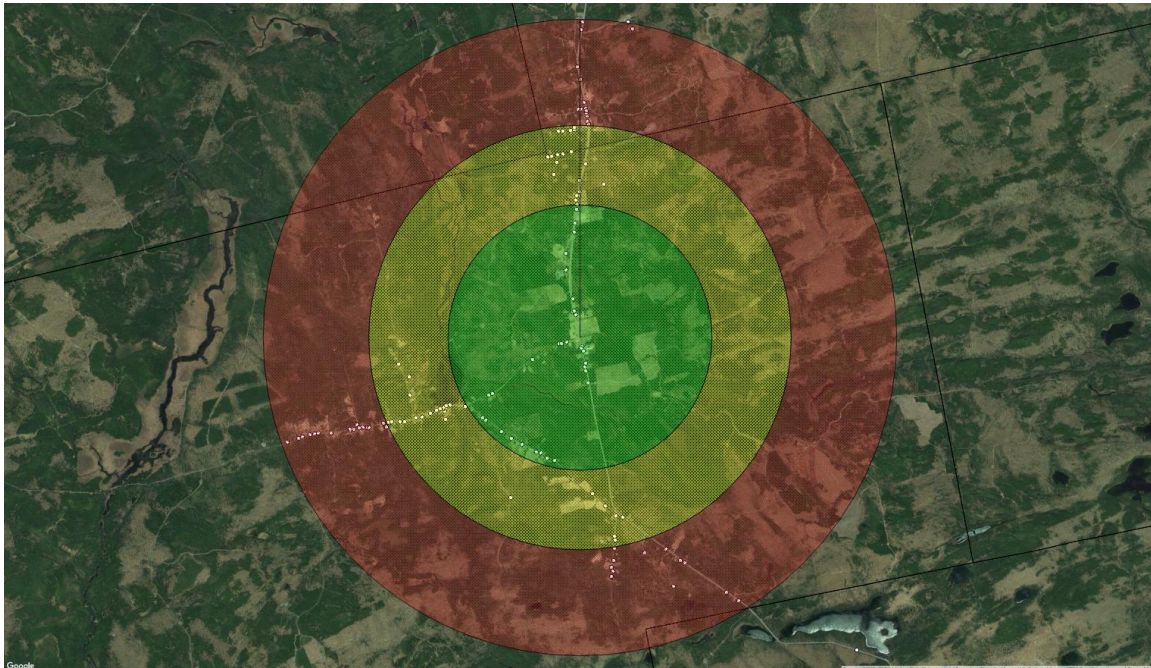
## Shirley

Population (2010 census): 233

Homes: 116

Providers: FairPoint Communications

During the planning process, we did not have any conversation with Shirley. However, FairPoint did mention that service in Shirley was upgraded to allow for speeds between 10-25Mbps.



Shirley FairPoint Coverage Area

### Legend

#### DSL Coverage

- DSL 25M/2M
- DSL 20M/1M
- DSL 15M/1M

Because of its location, it is possible that an engineered solution could be produced if there was an indication from Shirley that current service levels are not meeting the needs of the residents. This comes with a caveat that any new service would come with a cost that would most likely not be the responsibility of the internet provider, but the town or county. If there is a population of unserved homes, they may be eligible for a state grant through the ConnectME Authority.

This serves as a placeholder for further planning. Should Shirley engage at some point, Axiom would be willing to discuss options and create a planning document specifically to meet their goals.

## Wellington

Population (2010 census): 260

Homes: 124

Service Providers: FairPoint Communications

We did not have any direct conversations with representatives of Wellington. In our meeting with FairPoint, they did not indicate that Wellington was on their list of upgrades. This may have been an oversight on their part, as Kingsbury Plantation was mentioned, as was Parkman. However, because the main road in and out of Wellington enters Somerset County, it is possible that FairPoint equipment does not service Wellington in the same way as other locations.

Axiom stands ready to work with Wellington, should they be interested in planning, engineering and implementing an internet solution.

## Willimantic

Population (2010 census): 150

Homes: 69

Providers: FairPoint Communications, North County Broadband, ProTech Solutions (service around Sebec Lake)

FairPoint provides telephone services to the majority of the County and as such is the provider of last resort. They primarily offer DSL service to their residential subscribers with some fiber service available to businesses that reside along their fiber paths. FairPoint has performed a significant series of upgrades to their network in Maine (and 20 projects in Piscataquis County) over the last several years using a multi-year grant from the second round of the Connect America Fund, colloquially called CAF II. This grant has allowed FairPoint to target approved areas based on census block data.

These upgrades have primarily consisted of improving the hardware in their central office and remote terminals with the ability to offer bonded DSL service out of these locations. These upgrades also included running fiber cable to each of their remote terminals allowing an increase in the bandwidth capacity that can be served out of these remote locations. When these upgrades have been completed they will be able to offer up to a maximum of 25 Mbps connection based off the distance the subscriber location is from the distribution point. FairPoint indicated that they have upgraded two remote terminals in Willimantic and most of the town should be able to receive between 10-25Mbps, depending on a home's location and the distance to the FairPoint equipment.

In addition to FairPoint, the community is also served by North County Broadband. North County Broadband provides a mix of fiber and DSL connectivity of up to 8 Mbps to subscribers.



### Willimantic North County Broadband Service Area

Having North County Broadband in the community is an asset not to be overlooked. Our understanding is that they possibly have fiber connecting some or all of their customers. Fiber is upgradable, with the proper equipment, to offer unrivaled speeds and reliability. The issue with both FairPoint and North County Broadband is that they currently do not meet either the federal standard of 25/3Mbps or the state standard of 10/10Mbps.

If the community is looking to create more robust internet for its citizens, our recommendation would be to work closely with North County Broadband to determine if there is a partnership that would help pay for the upgrades necessary to improve and meet or exceed the federal or state standards. This could become a project that would attract new families and businesses to the community that could be assured that good internet would be available to them. This is an increasingly important asset for people looking to relocate with children, work from home or start a business.

#### Recommendation:

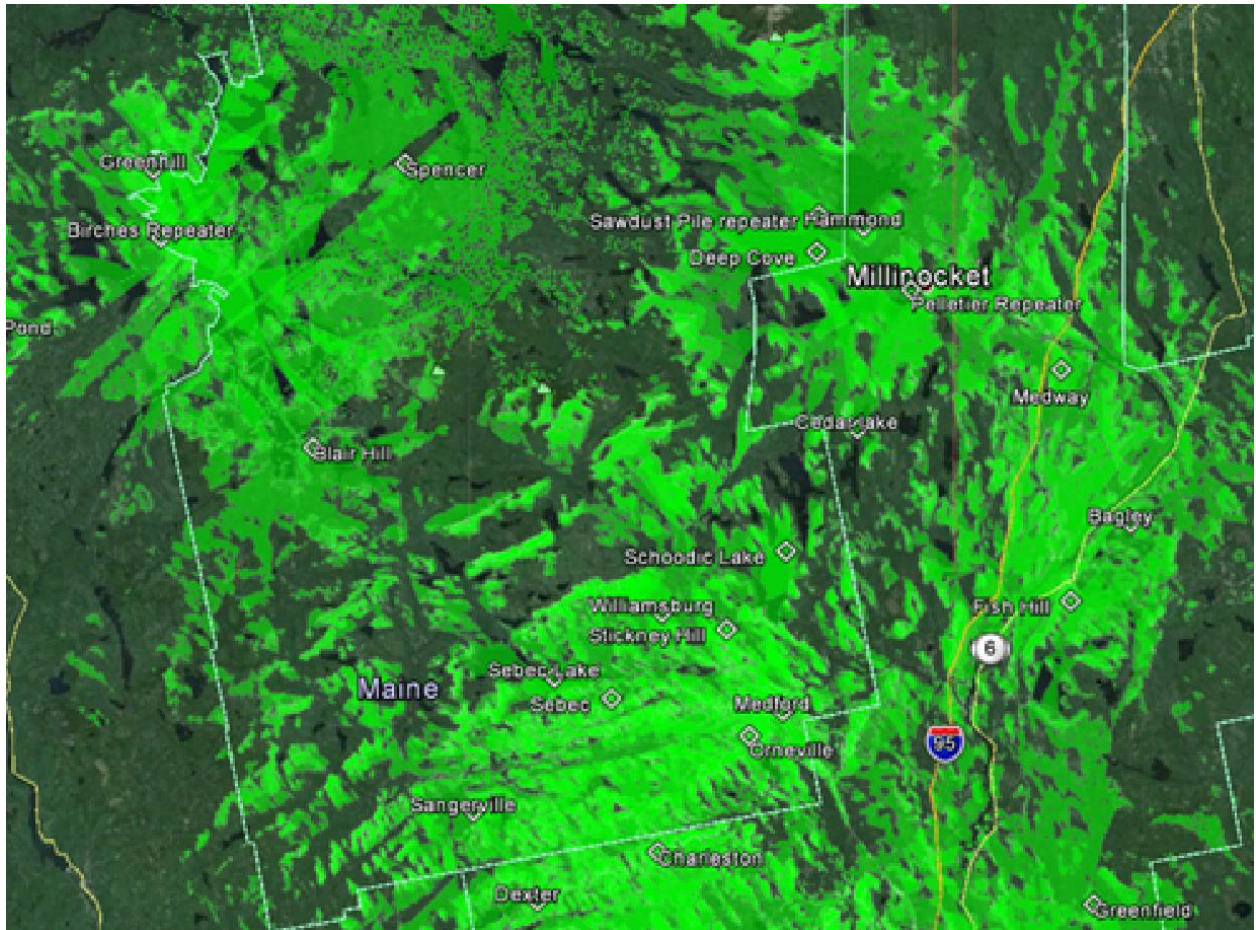
- Work closely with North County Broadband to understand and support the cost of enhanced and potentially expanded service in the community using their fiber assets



## Other Providers:

In our town-by-town analysis, we have tried to give the communities a good idea of the providers in that community, the coverage area and the level of service. Because of the nature of fixed wireless, it seemed redundant to place a map of Premium Choice Broadband's wireless coverage in all the towns that might have Premium Choice Broadband wireless service available to them.

While sometime lacking in speed levels and reliability, this service is nevertheless extremely important for last mile customers that do not have other options available to them for service. It also serves as a competitive counterbalance to other provider services, offering another choice in the marketplace.



Premium Choice Wireless Coverage Areas in Piscataquis County

This coverage map is a representation of Premium Choice's wireless coverage area in Piscataquis. An individual home location, the terrain, the density of trees and equipment used, all dictate the ability of someone to receive a signal. Each home is surveyed by the provider to qualify a particular location as positive for install.

## Final Thoughts:

As PCEDC and the county consider investments to improve Broadband connectivity across Piscataquis County, the question of ownership will become an important concern that will need to be addressed. In any project that uses public money, whether through federal or state grants or local bonding or TIF monies, any assets would need to be owned by the entity applying, the local community, the county or PDEDC. This should be seen as an opportunity to better control the region's destiny moving forward, giving local leaders a larger say in Broadband connectivity that have been typically dictated by the marketplace and internet service providers who must make any investment profitable.

Typically, communities that invest in networks do so because the current providers are not providing connections that can keep up with the demands of its subscribers, leading to complaints about service speeds, reliability and cost. In rural areas, these concerns are especially troubling. As Piscataquis County considers these investments, it must do so carefully and with some understanding of the pros and cons of these investments. On balance, we believe that the benefits outweigh the concerns of government investment into the private marketplace.

It is important to note that these investments are coming from a place where private companies are not keeping up with demand, cannot justify the Return on Investment for expensive upgrades and generally feel they need financial assistance or other guarantees for build out. In Maine, and Piscataquis County, you can see this playing out.

In the case of Time Warner Cable, the purchase by Spectrum infused both cash and a new business model that created two tiers of internet service, 50Mbps and 100Mbps; additional build outs are carefully considered and must meet a financial model that can internally justify the investment. Often, Spectrum will look to partner with the community to apply for public funding to bring the project to reality.

In FairPoint's case, the Connect America Fund, a federal grant program that FairPoint was awarded to expand and upgrade internet in high-cost areas is bringing a minimum of 10/1Mbps service to 36,000 homes across Maine. In Piscataquis, 20 projects were completed in 2017. It is clear that our providers are working hard to expand and enhance networks. They also look to partner with communities and have applied and been awarded state grant dollars to expand service in partnership with the community.

### What now?

When there is a public investment in a Broadband network, it often does so with the expectation that there will be economic benefits to the investment. The debate around these investments is how much benefit and can it be quantified. As an Internet Service Provider ourselves, we see the tangible benefits of connectivity every day including:

- Job creation
- Business Attraction
- Telecommuting
- Home Business creation and enhancement
- Family attraction
- Homework Gap
- Property value increases

Fiber Optic cable offers the best investment because it is the most reliable, can accommodate significant speed upgrades over time and offers a minimum of 20 years of service with little to no investment in equipment over the life of the fiber. While more expensive upfront, the return on this investment overtime makes this a smart investment for public dollars.

As you consider next steps, we stand willing to work with you to attract grant funding for the projects contained in this report. In the appendices, we have created a list of possible funding sources. Axiom has applied for and been successful in attracting federal, state, local and foundation support for a variety of projects related to Broadband connectivity. We look forward to next steps with PDEDC and the communities of Piscataquis County.