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Oregon Statewide Broadband Assessment and Best Practices Study

Prepared for:

Oregon Business Development Department

January 31, 2020

1. Abstract

Oregon Statewide Broadband Assessment and Best Practices Study presents findings and insights regarding the current state of broadband in Oregon, drawing from multiple independent data sources. The goal of the study is to identify those areas of the state that are unserved or underserved with broadband and the cost to bridge broadband gaps. With this understanding, informed policies and programs can be developed to address broadband gaps and encourage advancement in productive use of broadband technology (utilization).

As in most states, Oregon's broadband landscape has distinct splits between urban and rural areas, with Oregon's challenges further complicated by its geographic distances and features. Areas with low population density and difficult terrain still remain underserved, or even unconnected. While much of Oregon's geography in urban areas is well-served by terrestrial broadband, several Senate Districts show lesser coverage.

This Oregon Broadband Study provides maps and insights derived from numerous sources of broadband data. Analyses were conducted at a census-block level, with additional breakdowns by legislative districts and counties. These insights will inform state legislators and other decision-makers to understand which broadband service capabilities and technologies exist, where there are gaps, and what it will take to close those gaps.

January 31, 2020

Christopher Tamarin
Oregon Broadband Office
Oregon Business Development Department
121 SW Salmon Street, Suite 205
Portland, Oregon 97204

Subject: **SNG Statewide Broadband Assessment and Best Practices Study**
OBDD RFP No. C2019367

Strategic Networks Group, Inc. (SNG) is pleased to submit our final report for the Statewide broadband assessment, market research, and best practices to assist Business Oregon in broadband planning efforts.

SNG's broadband assessments have informed nine State Broadband Offices and legislatures with highly accurate, granular data on broadband availability and the productive use of online practices. Our goals are to help Business Oregon and elected officials across the State identify broadband gaps and barriers. This will provide decision-makers with the right information needed to develop plans and budgets that will effectively address Oregon's broadband needs.

Rather than solely relying on Federal Communications Commission Form 477 data or broadband infrastructure maps to identify areas that are unserved or underserved with broadband, the SNG team is providing granular and validated data:

- Fiber infrastructure data by Census Block
- Internet technologies by Census Block
- Fastest speeds by Census Block
- Tested download and upload speeds, internet spending, and benefits of internet use by households and businesses

Our team understands the issues facing Oregon communities. Like many states, rural communities across Oregon are fighting for their survival and are greatly impacted by the quality of their broadband infrastructure. We understand that in order to move forward successfully, Oregon needs to have verifiable broadband assessment data with rigorous comparative analyses to make the right decisions for the Oregon's present and the future.

Sincerely,

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2. Executive Summary

There is a rural urban digital divide in Oregon. Furthermore, there are gaps in quality of broadband service as many areas of the State are not Future Ready with digital infrastructure.

Oregon has a choice between having communities and regions across the State continue to fall behind, or incentivizing and funding investments in digital infrastructure and digital transformation (i.e. driving the productive use of online practices).

Broadband in Oregon

As in most states, Oregon's broadband landscape has distinct splits between urban and rural areas, with Oregon's challenges further complicated by its geographic distances and features. Areas with low population density and difficult terrain still remain underserved, or even unconnected. While much of Oregon's geography in urban areas is well-served by terrestrial broadband, however there are areas that show lesser coverage. In reviewing these areas, lower household income is a factor.

In terms of geographic coverage across Oregon, a total of 54 percent of all census blocks are capable of providing Basic Broadband (21.8 percent) or Future Ready broadband (32.2 percent)[1]. The census blocks with Basic Broadband cover 27.6 percent of the Oregon population and Future Ready census blocks cover 67.4 percent of the population. The unserved[2], underserved, and unconnected areas in Oregon comprise 46 percent of census blocks and 5 percent of the population, mostly in rural areas.

In total, 95 percent of Oregon's population live in areas that have at a minimum Basic Broadband service level. However, it must be noted that it is unknown how comprehensively each census block is serviced with Future Ready (100/100 Mbps)[3] or Basic Broadband (25/3 Mbps)[4]. SNG's research with businesses and households across Oregon show that access and quality of broadband is a significant issue, even in urban areas (see Section 6.4 – Open Text Responses from Businesses and Households).

- **1.14 million Oregonians live in areas with Basic Broadband**
- **962,000 of those do not have access to Future Ready technologies**

That 95 percent of the Oregon population has access to at least Basic Broadband is a good news story when viewed at a statewide level. However, in addition to the issue of broadband coverage potentially being overstated in both urban and rural areas, across Oregon there

[1] According to Federal Communications Commission (FCC) Form 477 data which is the data of record used by the US for decision-making at a census block level
[2] Unserved - internet service where the fastest advertised service is capable of speeds less than 10 Mbps download and 1 Mbps upload (10/1). Underserved - internet service where the fastest advertised service is capable of speeds greater than or equal to 10/1, but less than 25 Mbps download and 3 Mbps upload (25/3).
[3] Future Ready – internet service where the fastest advertised service is capable of speeds greater than or equal to 100 Mbps download and 100 Mbps upload (100/100).
[4] Basic Broadband – internet service where the fastest advertised service is capable of speeds greater than or equal to 25/3, but less than 100 Mbps download and 100 Mbps upload (100/100, or 100 symmetrical).

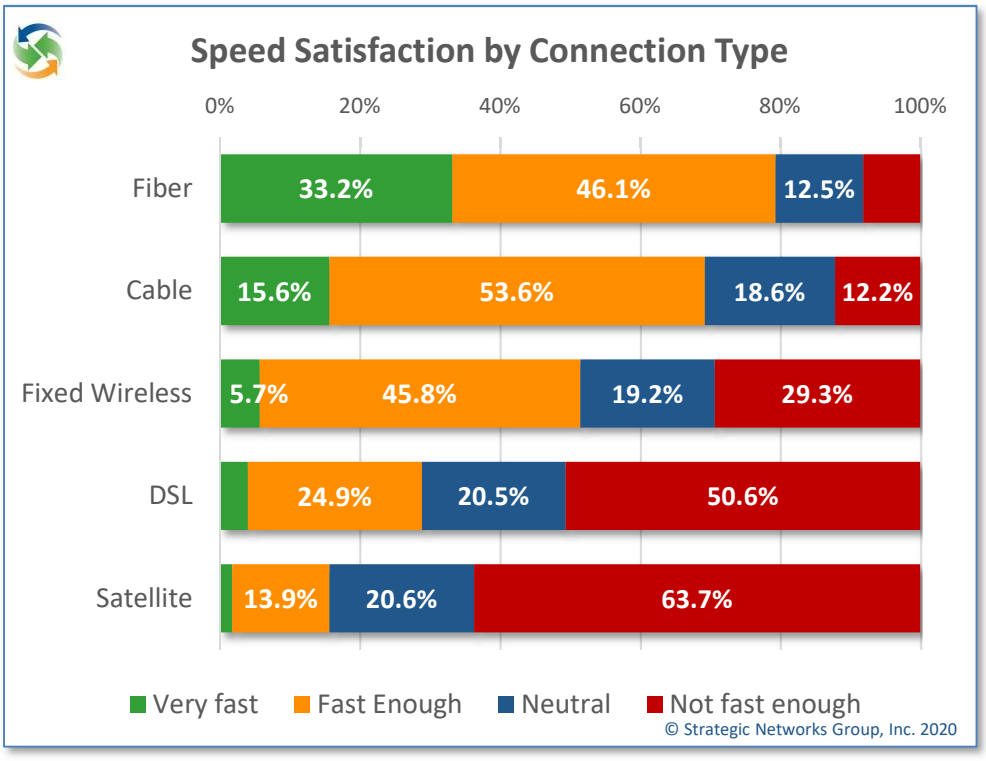
are significant areas – mostly rural – that are at risk of being left behind because they do not have the quality of broadband they need. This has negative local economic and community impacts. Furthermore, when examined more deeply, a large proportion of the Basic Broadband areas will also become at risk due to a reliance on technologies that cannot evolve to be Future Ready broadband service.

Although 27.6 percent of the Oregon population (approximately 1.14 million people) have access to Basic Broadband, there are issues with the quality of their internet service:

- 28 percent of households report that their internet connection speed is not fast enough, with 38 percent reporting occasional or frequent problems.
- 49 percent of Oregon household would definitely or very likely relocate in order to get a better level of broadband service. This likelihood increases with younger age groups and higher incomes, putting broadband-deficient communities at risk.
- Three quarters of households and businesses across Oregon are very likely to change service providers to get better broadband services, another strong indication of dissatisfaction with current services in many areas.

While at a state level it may appear that Oregon is in good shape for broadband availability, there are many areas where businesses and households are clamoring for better service with approximately 1.17 million Oregonians living in areas that are unconnected, unserved, underserved, or have older technologies providing Basic Broadband. This implies that approximately 28 percent of the Oregon population has **no** access to Future Ready broadband services and this manifests itself as a broadband quality issue in terms of speed of actual service and reliability for subscribers.

"Not fast enough" is how 50.6 percent of DSL subscribers and 63.7 percent of satellite subscribers report their internet service based on findings from SNG's research across Oregon for this study. Similar low satisfaction with reliability is reported by subscribers to satellite and DSL. A similar pattern exists for satisfaction with reliability for the different technologies, with fiber coming out far ahead of DSL.



Recommended Next Steps for Broadband in Oregon

Aspirational digital infrastructure and transformation targets need to be set, funded, and implemented if Oregon is to be a place where people choose to work and live. Oregon has a short time – 5 years or less – to solve its broadband gaps, or risk passing the point where many of its rural areas can remain vital, attractive places where businesses and communities can thrive.

The private sector cannot be expected to solve this problem alone as the community benefits of broadband are largely off-balance sheet to them. The rural-urban digital divide in Oregon is not likely to decrease unless public investments are made in digital infrastructure and transformation. Policies, strategies, and programs in Oregon should therefore be developed.

To maximize returns on investments from broadband so that it drives competitiveness of businesses and quality of life for households across Oregon, attention and investment must also be made to ensuring all citizens and businesses have access to affordable broadband – along with the awareness, digital skills and capacity to take advantage of that digital infrastructure.

Although technology continues to evolve at unprecedented rates, it is no surprise that less-populated localities have still not reaped the same benefits of broadband accessibility and affordability as urban areas. This disparity has far too long been rationalized and generally accepted that "there always has been and always will be a gap in the quantity and quality of services available in rural vs urban localities."

With the release of data and recommendations presented in this Oregon Statewide Broadband Assessment and Best Practices Study, legislators and other elected officials across the State are equipped to address Oregon's digital divides. The State has a choice between placing this critical issue on the back burner, or directing attention and incentives for investments in digital infrastructure and digital transformation. Bridging the digital divide will allow Oregonians the option of living and working in the locality of their choosing, rather than limiting their options to certain segments of urban centers. Universal, reliable, and affordable broadband is critical for Oregon as a whole to be competitive, as well as to retain and grow both businesses and population.

Acknowledgements

The SNG members on this broadband research were:

- Michael Curri – project lead
- Gary Dunmore – data and research lead
- Deborah Watts
- Derek Murphy

SNG would like to thank our project team:

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- James Salter and Jason Galloway from AEG for fiber infrastructure cost estimates.

The SNG team would like to thank:

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    - League of Oregon Cities
    - Association of Oregon Counties
    - Oregon Business Development Department
    - Oregon Department of Agriculture
    - Oregon Department of Education
    - Oregon Office of the State Chief Information Officer
    - Oregon Department of Transportation
    - Citizens' Utility Board
    - Technology Association of Oregon
    - Oregon Economic Development Association
    - Office of the Governor
    - Oregon Association of Telecommunications Officers and Advisors
    - Oregon Telecommunications Association
    - Oregon Library Association
- MYND Global
- Individuals across Oregon that took the time and effort to provide their feedback and insights to their broadband situation and issues they are facing

3. Assessing Broadband across Oregon

Broadband is the most important differentiating infrastructure today and is critical to the quality of life for Oregon residents and the economic competitiveness and sustainability of businesses across the State. Without broadband[5], communities face (and will increasingly face) population and business losses, higher costs in providing civic services, stalled business attraction, and limited economic growth.

In order to drive local economic benefits and business growth across the State, Oregon needs to have a clear picture of broadband availability, adoption, and utilization. Equipped with such data and critical insights on broadband supply and demand, Oregon can take a holistic and sustainable approach to bridging broadband gaps and barriers. This is critical input to the development of strategies and incentivizing investments in broadband infrastructure, as well as broadband adoption and utilization across Oregon.

3.1 Context and Relevance of Broadband to Oregon

Global and regional economies are fully in the midst of a digital transformation, and Oregon is not exempt from this dynamic. Most metropolitan areas in the US are engaged in this transformation with access to future-ready broadband (which we define as affordable, competitive, and reliable connections to the internet capable of delivering speeds of at least 100 Megabits per second (Mbps) download and upload[6].

In communities and regions (localities) across Oregon, economic development agencies, and other business and community support organizations have the opportunity to foster growth locally by helping individuals and businesses – especially small businesses – access and fully utilize broadband technologies and enabled applications. This goes beyond merely improving broadband availability to also driving awareness and stimulating broadband demand. Such a comprehensive approach will

[5] Broadband refers to high-capacity, reliable internet access meeting the FCC's definition (minimum rate of 25 Mbps download and 3 Mbps upload). For further information, see: http://sngroup.com/broadband-demand-definitions/
[6] Also adopted as future ready by the Benton Institute in https://www.benton.org/publications/broadband-policy2020s

improve the quality of life for Oregonians, generate local economic benefits, and enhance the sustainability and profitability prospects for network partners throughout the State.

Businesses and the public sector are actively adopting and utilizing digital tools to produce and deliver goods and services online. Users that can effectively access these goods and services online are benefitting significantly in using online practices for business, work, and access to services and information. However, those located outside of metro areas, and even within underserved urban areas, are struggling to cross the digital divide. As stated by a senior municipal official in rural Oregon: "We don't want to be a community that is left behind."[7]

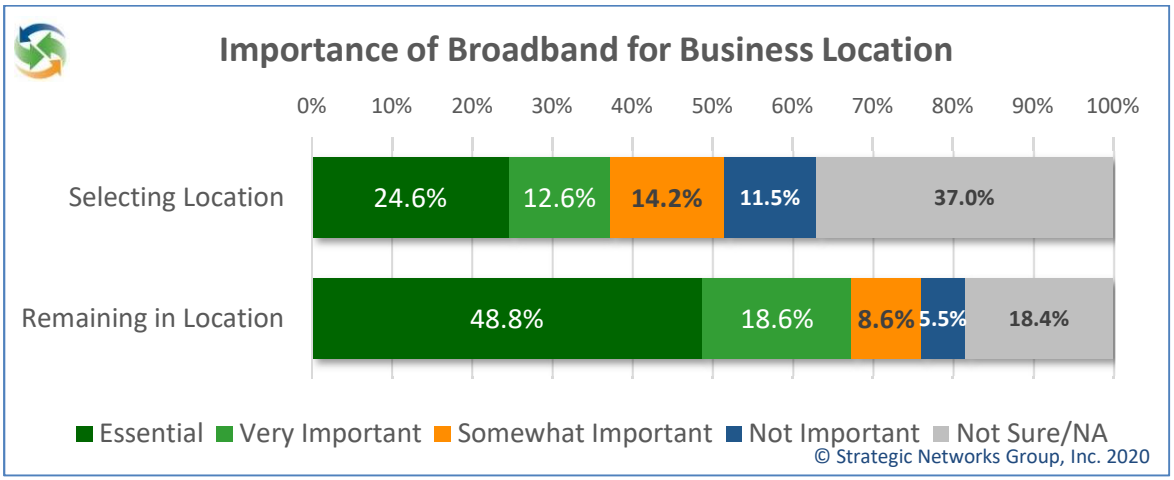
Findings from SNG's statewide data collection confirm the importance of broadband for residents and businesses across Oregon. SNG has developed key metrics and indicators that enable us to collect highly accurate, granular broadband availability data – but also assess demand (current and potential) for online practices. This enables us to create broadband demand profiles which uncover new business-case investment opportunities for providers – for more details see "APPENDIX – SNG Research Methodology".

Below are some of the key findings from SNG's research that underscore the critical importance of broadband to Oregon.

3.1.1 Importance of Broadband to Retaining Businesses and Residents

Without at least Basic Broadband, communities risk losing businesses and population, as well as finding it more and more difficult to attract new residents and businesses. Moreover, the population that communities risk losing are in the very segments they can least afford to lose.

Broadband is an essential factor in deciding to ***remain*** in a location for almost half of businesses. Another 27% of businesses responded that broadband is important or somewhat important, making broadband a decision factor for three-quarters of businesses staying in their current location.

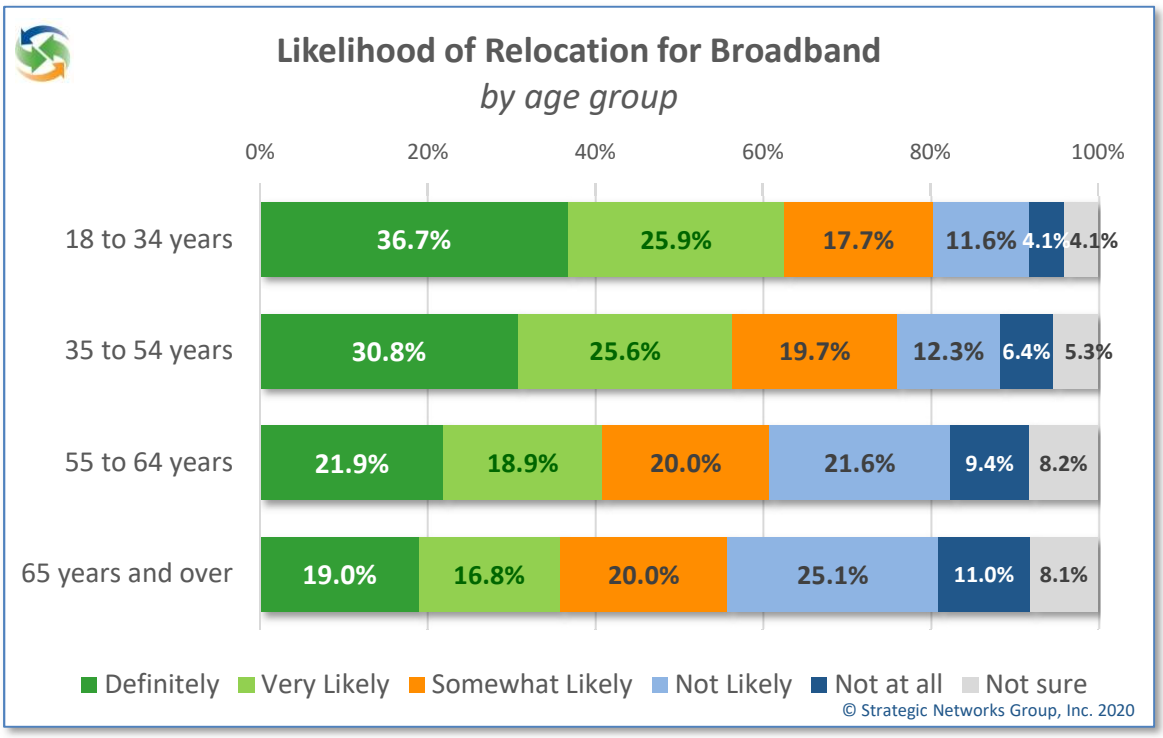


[7] Quote from City of Veneta's CAO, Ric Ingham.

In households, over a third of 18-34 year-olds would definitely relocate for improved broadband, with another 43 percent responding that they would very likely, or somewhat likely relocate for broadband. The percentage of 35-54 year-olds who would definitely relocate is 31%, roughly six percentage points lower than for 18-34 year-olds.

Implications on the core local workforce are significant with 80 percent of 18-34 year-olds and 76 percent of 35-54 year-olds potentially relocating for improved broadband.

Two out of five in the older workforce bracket (55-64 year-olds) and those retired (65 years and over) would definitely or very likely relocate for better broadband – with another one out of five somewhat likely to relocate.

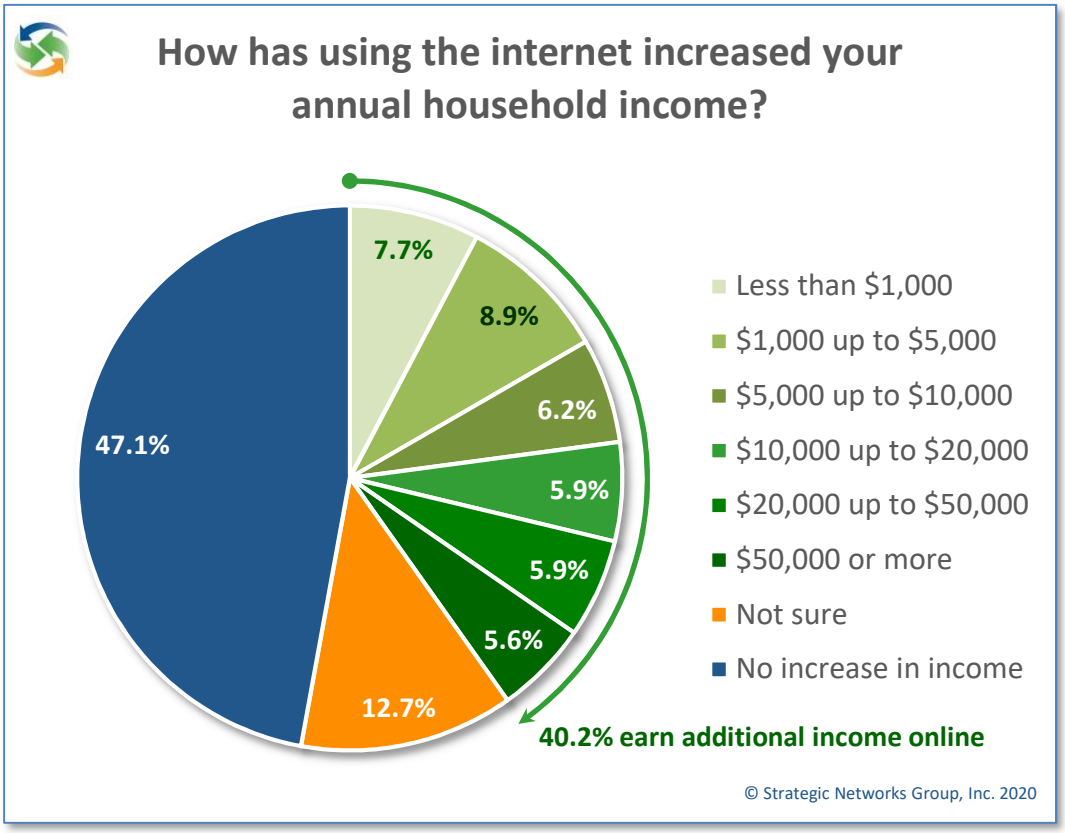


In addition, the likelihood of relocation for broadband increases with higher household income groups and with residents who have been in the community longer. Thus, the lack of quality broadband puts communities at risk not only of eroding their essential workforce, but also their ability to retain high-income earners and long-standing residents that form the fabric of the community.

The importance of broadband to avoiding business and population losses is clear and potentially devastating to communities across Oregon. Localities (and the individuals residing within them) that do not have adequate broadband will be left behind.

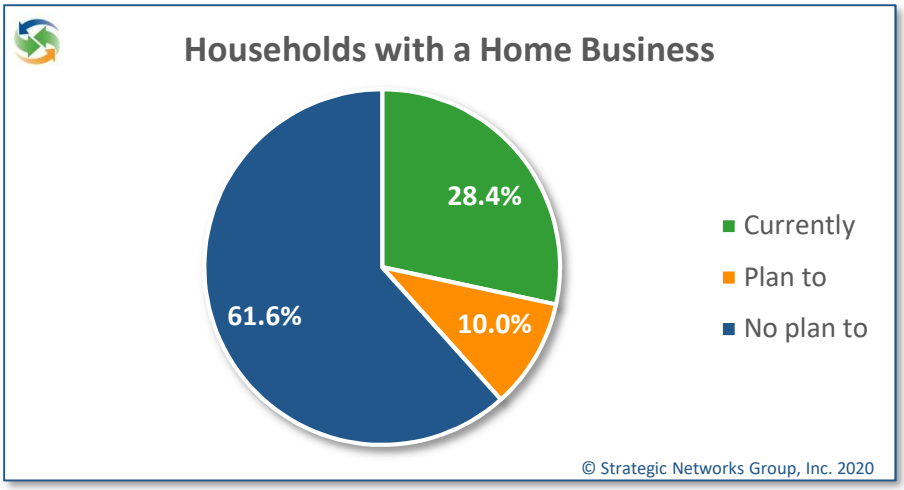
3.1.2 Importance of Broadband to Household Income

Broadband enables Oregonians to supplement their income, where 40 percent of respondents indicated that they earn additional income from online activities. This income benefit from internet use is significant, especially fur rural areas where new income opportunities are limited.



The 47 percent who indicated no increase in income and almost 13 percent not sure represent an untapped potential for new income opportunities with increasing awareness and training.

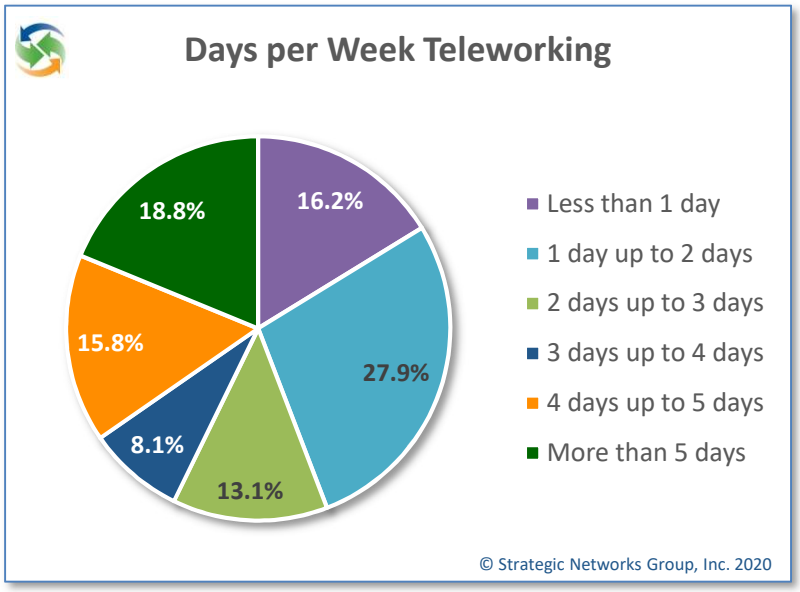
In Oregon there are new local economic growth opportunities from 38 percent of households currently with a home business or planning to launch a home business.



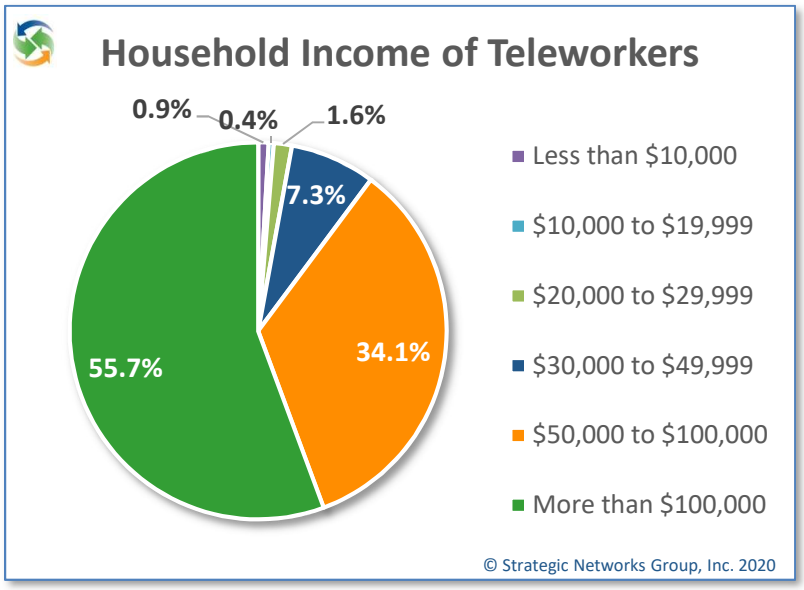
3.1.3 Importance of Broadband to Teleworking in Oregon

One in five (20.3 percent) Oregon households have one or more teleworkers working from home on a formal, regular basis[8] in an arrangement with their employer. Teleworking is having a significant impact on people's lives. Of those teleworking, 34 percent of respondents telework four or more days per week while another 49 percent telework between one and four days per week.

With 90 percent of teleworker respondents earning over $50,000 per year, teleworking has significant income potential for those with the necessary experience and sufficient broadband. Increasing the capacity of rural areas to support teleworkers has significant potential to increase average income those areas and open up new income opportunities overall.

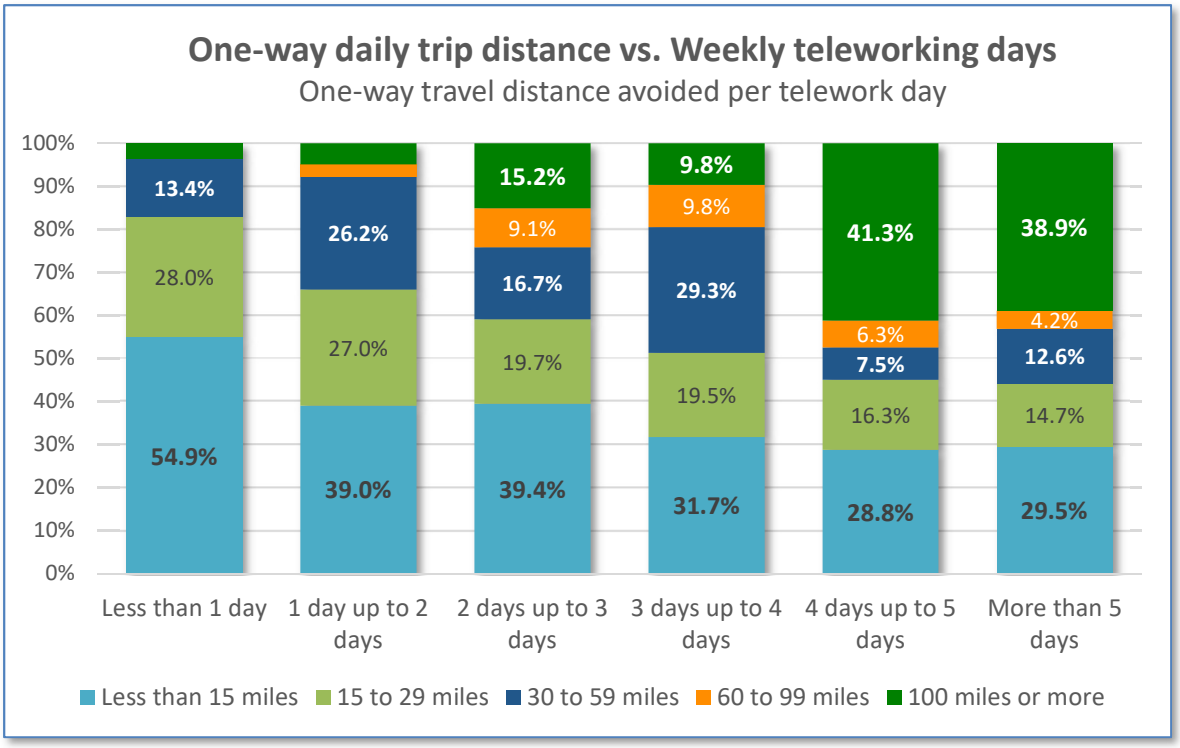


The positive impacts of teleworking can result in significant time and cost-savings for teleworkers, as well as a significant positive impact to the environment in terms of reduced distance driven. The chart below shows the trip distance avoided by teleworkers. For those teleworking more than five days per week, almost 40 percent are avoiding a round trip of 200 miles or more per day.



The reported frequency of teleworking and distance avoided further suggests that time and travel costs would be prohibitive to living and working remotely in communities lacking capacity to support telework.

[8] This does not include "occasional teleworking" where people may decide to work from home occasionally for convenience, but not on a regular basis.



Based on the one-way daily-trip distance findings above for teleworkers in Oregon, SNG has estimated the following environmental and cost reduction impacts based on average distance, fuel economics and emissions per teleworker

Teleworking Environmental and Cost Impact - Assuming single-passenger automobile travel

Teleworker Averages	Per Teleworker	Per 1,000 Households	Units
Teleworkers	1	203	
Average days per week	3.4		
Average **one-way** commute distance (miles)	47.2		
Average weekly commute distance (miles)	300.1		
Commuting Costs Avoided			
Trip-miles avoided per year	15,005	3,046,105	Miles
Commuting hours per year	469	95,191	Hours
Fuel consumption per year	603	122,334	US gallons
Fuel cost per year	$1,501	$304,611	
CO_2 emissions per year	6.06	1,230.6	Metric tons

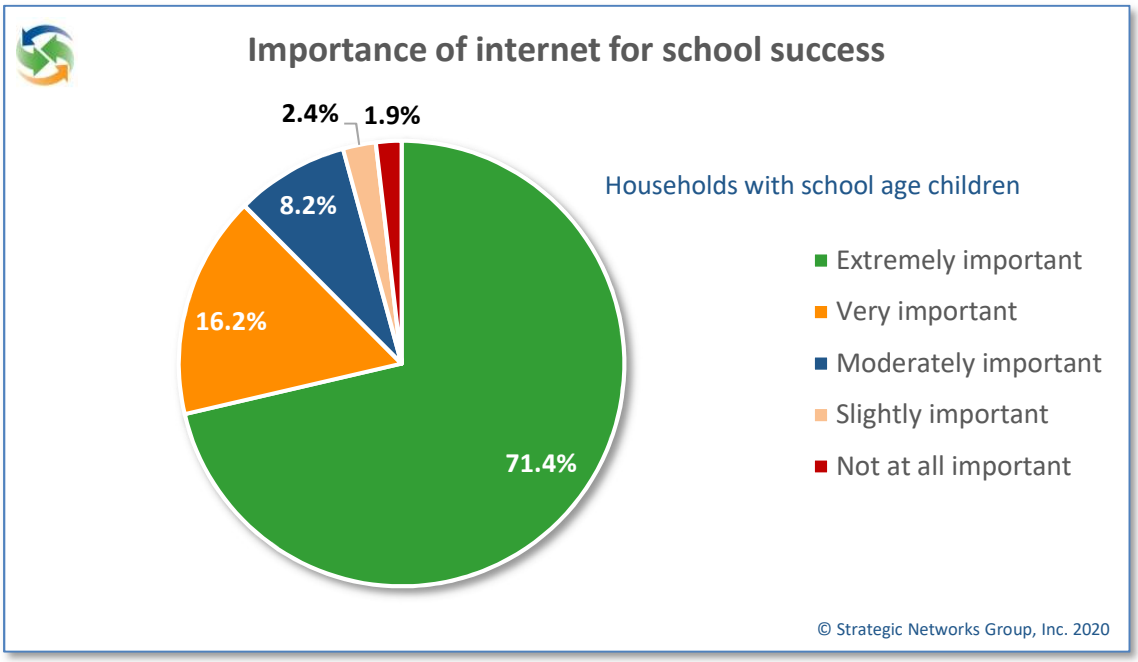
To illustrate some of the issues teleworkers across Oregon are facing regarding their quality of internet service, below is a selection of feedback from SNG's statewide research:

Open text feedback from respondents to SNG's eHousehold Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Community	**Home Business**	**Telework**	
Corvallis	No	Yes	More telework opportunities, reducing vehicle travel & congestion
Central Point	No	Yes	I live in Sam's Valley and internet in our community is very bad. I telework and need more reliable and faster internet. It is a big problem out here for many people.
Roseburg	No	Yes	More telework from home, increased ability to utilize smart home devices
Roseburg	No	No	I would like to find a full-time telework job.
Camp Sherman	Yes	Yes	Adequate and reliable internet connection will enable me to telework more frequently. This allows me to be more present and engaged with my family and community. It also opens up many more opportunities for employment outside of the area.
Clatskanie	No	No	It COULD support things like telework and telehealth, but it would have to be more universally available in this community to make a difference. As it is, there is a distinct digital divide, and it is unclear whether it can be effectively addressed or not.
Salem	Yes	No	We need reliable, faster internet so I could telework from home with confidence. That I will be able to bring my work laptop home daily so when the children are home from school sick, I can be there and still get some work done. We would connect more often and reliably with other farmers who share our industry issues. We could plan family events on line with more reliable service. We have 9 children and when they are all at home we need more powerful access to internet.

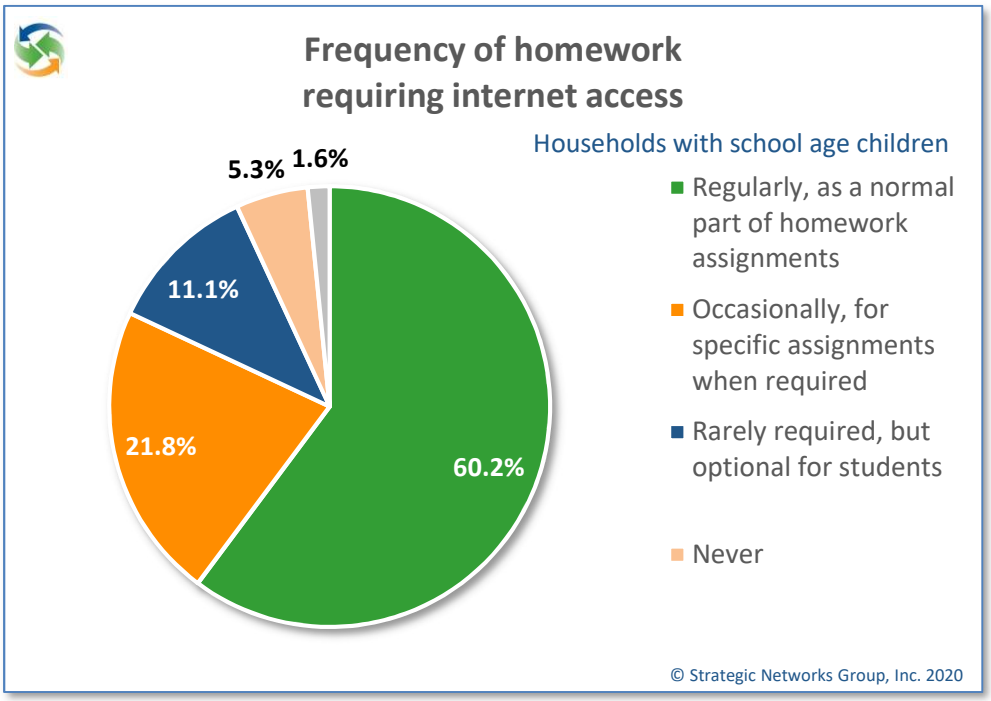
* See Section 6.4 for full set of business and household responses.

3.1.4 Benefits from Using Internet for School Success

With 87 percent of parents responding that the internet was extremely important or very important for school success, it is critical that all children have access to broadband.



With 82 percent of children regularly or occasionally requiring internet access for homework, it further emphasizes the serious disadvantage that children without internet access are facing.



According to the latest Census American Community Survey (ACS), internet data, 8.8% of children younger than 18 years old in Oregon either have no internet or no computer in the home – over 75,500 children.

Below are a few of the needs and issues expressed by Oregon families about education and the need for good broadband connections.

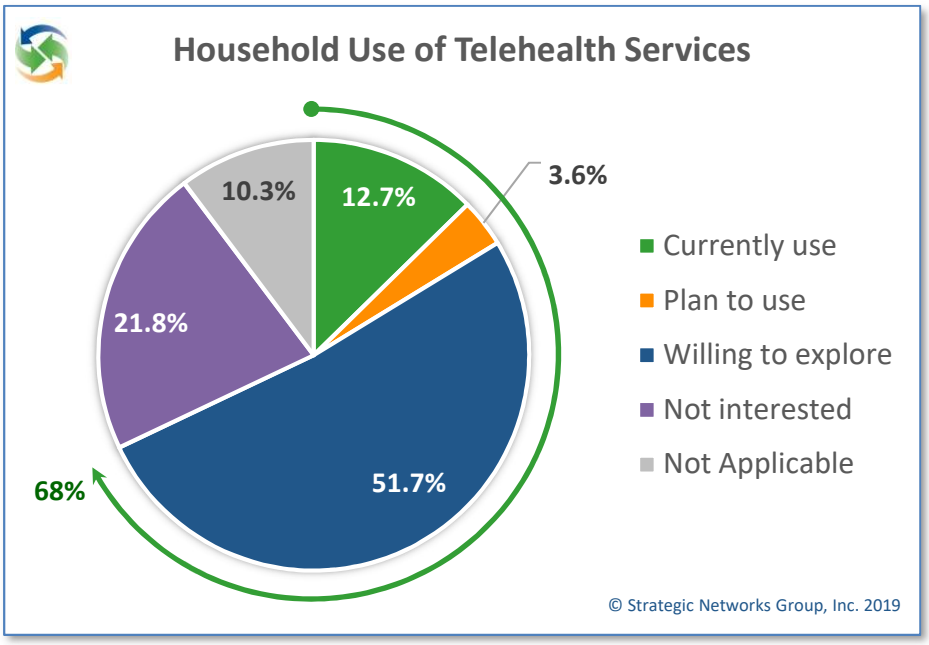
Community	Home Business	Telework	In what ways do you think that broadband can be used to further benefit your household and your community?
Junction City	No	Yes	Better educational opportunities for younger students in our area, they live here only because their parents chose to live where they do, but are at a disadvantage when they're not able to access online data needed to complete school projects. Our young people, as our future, need to have better educational resources. It's not just about Netflix, it's about educational opportunities for everyone, not just those that live in large cities. I am paying $150 per month for average service, many people could not afford this.
Medford	No	No	We live in a rural location in Jackson county. The internet speed and reliability is poor. Our children home school through a virtual online program. Their classes are via the internet. When the internet does not work they have to switch to mobile devises and stand in a particular spot in the house to maintain connectivity with their virtual class room. I work remotely 30% of my time. I often can not connect to the internet and there for can not work.
Salem	Yes	Yes	Broadband is to slow for our area. We need more speed with fiber optic connectivity. It is hard to do everything we want (home security, tv, school, work) with our current speed. There is no way to get more unless we get fiber optic in our neck of the woods
North Plains	No	No	Since we have limited internet access (max 30 GB/Month), we are (a) unable to use the internet very often. (b)our son's school requires access for his studies (6th Grade). (c) we believe the value of our residence is inhibited by the lack of internet access (no DSL, no Satellite-too many trees) and the lack of television. (d) We plan to move after our son completes 6th grade so we can enjoy the internet, television, and normal life!!, etc. for less than the $$4,600/year limited access costs us. (e) Currently, we go to the library every week to be able to update software or download important documents (e.g. tax information). (f) we are unable to participate in PGE's energy saving programs since full-time internet access is required. Why would you want our house? No television, no internet, nothing except electricity.

Community	Home Business	Telework	In what ways do you think that broadband can be used to further benefit your household and your community?
Tygh Valley	No	No	I am the director of technology for South Wasco County School District. Many times I need to fix or work on things from home for our district. Whether it be working on the Student information system or servers. With slow connections at home it is difficult to remote into the school reliably. Often I have to drive to the school to login. On the other side of this I have a 5 and 7 year old and they are using the internet more and more to learn and discover everything. Often they come up with interesting questions we can research and watch videos to help them learn. However, often when accessing videos or even audio it needs to buffer to the point of frustration. Lastly, it is very heartbreaking to know the fiber internet that goes to our school district goes right past Tygh Valley from The Dalles. Without stopping or being able to be used in Tygh Valley. We are only a short distance away that could make Tygh Valley become a better place to live with getting more people that could work from home and utilize the internet that is underground only yards away.
Tygh Valley	No	No	I homeschool my son and we can rarely even watch a video that is streaming over the Internet due to slow speeds. It's extremely frustrating to lack the ability to enhance his learning opportunity due to unreliable internet. My husband has the opportunity to occasionally work from home but much of his work requires a reliable internet connection which we just don't have. We live 1/4 of a mile from Hwy 197 and there is fiber internet cable running right up that road. We are SO close and would love that connection to turn down our road and connect to our house. We HATE satellite internet but we don't have any other options. High speed internet would be helpful for our household from a work and school perspective and it would likely help our community in the same way.

* See Section 6.4 for full set of business and household responses.

3.1.5 Benefits from Use of Online Practices

With 68 percent of households currently using, planning to use, or willing to use telehealth services, there is a huge potential for improved healthcare access, faster response times, and realized cost and time savings (e.g. travel) to deliver indirect and community benefits that aggregated can significantly offset the costs of broadband network deployment and operation.



Other benefits from making productive use of broadband and online practices that offset network costs include:

- Education - completing school work, conducting research, engaging in distance learning or continuing education, and taking advantage of online training and certification for professional development
- Workforce development and access to employment opportunities
- Civic / smart community services – crime prevention, micro-grids and distributed power generation, public transportation and traffic management
- Local economic development – teleworking and home-based business start-ups, economic diversification and sustainability
- Enhanced public safety and first responder capacity

3.2 Broadband Investment and Digital Transformation

Affordable and reliable access to broadband is an essential service if businesses in Oregon are to be competitive. However, both private and public sectors are holding back on investing in broadband infrastructure for two main reasons:

- Sufficient demand for broadband may not materialize – a 'build it and they will come' approach has too often proven unsuccessful as a broadband deployment strategy
- High costs of deploying in unserved and underserved areas because of low population densities, difficult terrain, and long distances, etc. which results in a weak business case.

Furthermore, over the last twenty-five years, governments and large internet providers have focused primarily on the supply side of the broadband equation, i.e., internet availability through the provision of infrastructure and related internet services. Meanwhile, on the demand side of the broadband equation, productive utilization of the internet has been a low priority for both the public and private sectors, even as its importance has grown dramatically (see Section 4.4.2 on digital transformation and its impact on competition, compliance, and scale). Businesses and organizations have had to learn on their own, or with limited support from industry associations, chambers of commerce and the like.

Broadband is a necessary, but not a sufficient condition for economic competitiveness in Oregon. Productive utilization of the internet and online practices are integral to the digital transformation[9] of advanced economies.

It is in the interest of all Oregonians to develop strategies and initiatives that bridge the digital divide by focusing on both demand and supply sides of broadband. Deliberate focus needs to be given not just to service availability, but also raising awareness and driving productive use of online practices. A holistic approach to broadband supply and demand – that includes digital inclusion – maximizes returns on investment for those investing in broadband networks.

Specific goals that can be informed by this report include:

1. Identification of communities in Oregon that have inadequate internet connectivity, as well as a business case for building Future Ready broadband infrastructure. Part of the business case should include projected costs as well as revenues and tangible benefits.
2. Development of options for broadband policies and strategies that will promote and support initiatives that address gaps and op opportunities for improved broadband identified in this Oregon Broadband Study.
3. Identification of the various funding options that can be applied to improving connectivity in underserved and unserved areas of the State.

[9] "Digital transformation is the process of using digital technologies to create new — or modify existing — business processes, culture, and customer experiences to meet changing business and market requirements." Wikipedia

3.3 Definitions of Broadband Service for Oregon Study

One of the key goals of the study is to identify areas across the Oregon that are considered unserved and underserved with broadband in order to assess where additional broadband investments may be required. It was determined that clear definitions of unserved and underserved were required and that the availability of broadband based on these definitions would be at the census block level.

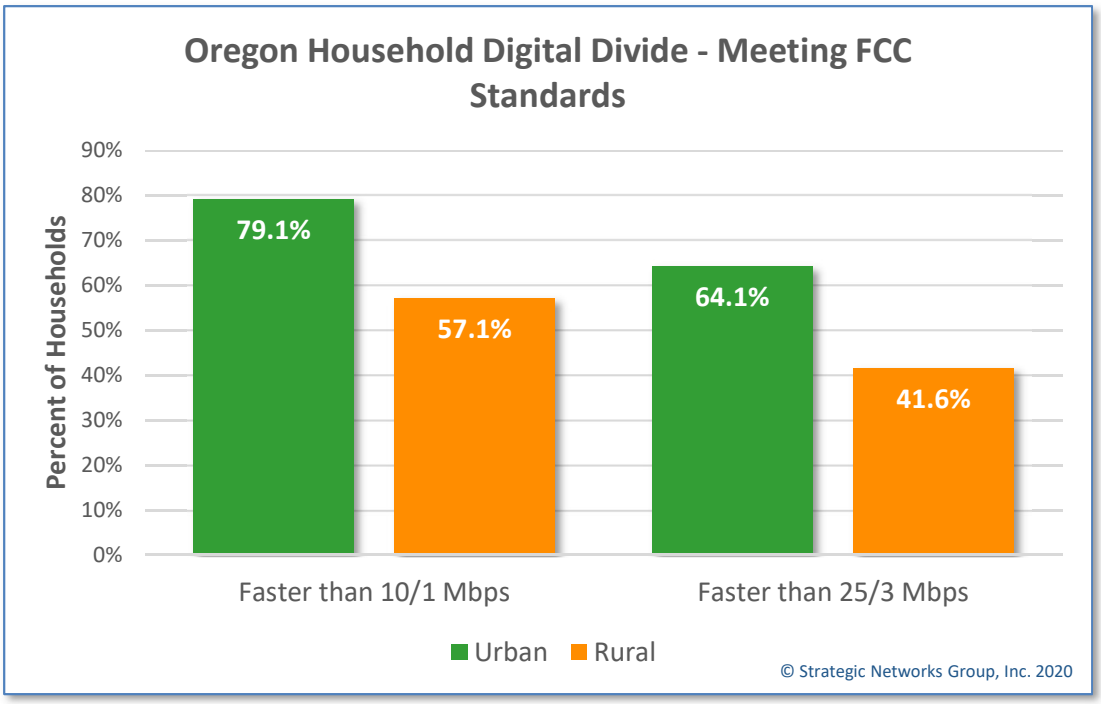
The parameters of broadband service and speed levels were defined through discussion and agreement with the Oregon Broadband Office and include not only unserved and underserved, based on past and current FCC recommendations, but also forward-looking speed levels for "Basic Broadband" and "Future Ready" broadband. These speed ranges are defined as follows:

Speed Blocks – broadband service level speed ranges for mapping and analysis purposes at the census block (CB) level

- **Unconnected** – no evidence of broadband connections within a census block.
- **Unserved** – census blocks where the fastest advertised service is capable of speeds lower than 10 Mbps download and 1 Mbps upload (10/1).
- **Underserved** – census blocks where the fastest advertised service is capable of speeds greater than or equal to 10/1, but less than 25 Mbps download and 3 Mbps upload (25/3).
- **Basic Broadband** - census blocks where the fastest advertised service is capable of speeds lower greater than or equal to 25/3, but less than 100 Mbps download and 100 Mbps upload (100/100, or 100 symmetrical).
- **Future Ready** - census blocks where the fastest advertised service is capable of speeds greater than or equal to 100 Mbps download and 100 Mbps upload (100/100).

FCC Speeds vs Subscriber Speeds and Satisfaction

As part of this study, SNG conducted a statewide assessment of households and businesses to independently determine broadband availability, actual connectivity of households and businesses, and broadband utilization, as along with a range of other parameters. The following chart shows the percentages of urban and rural households that exceed the unserved speed block, as well as the percentage of urban and rural households that exceed the underserved speed block (according to the current Federal Communications Commission minimum speeds).

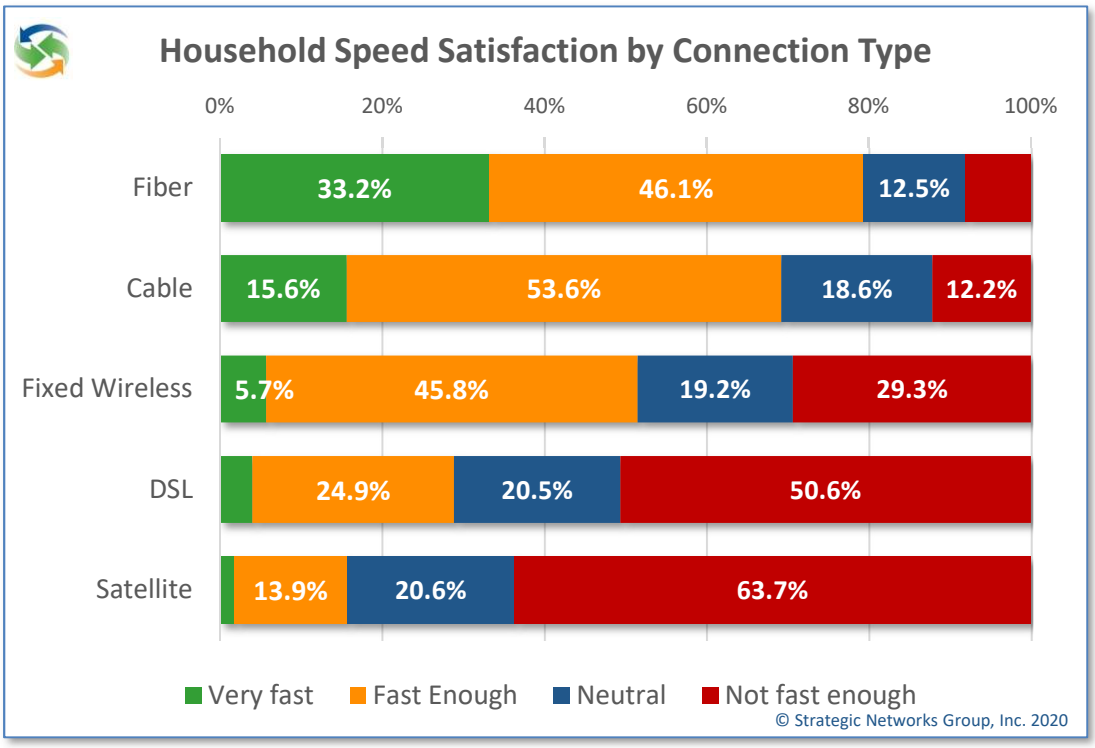


While 64.1 percent of urban households exceed the current FCC minimum speed recommendation, only 41.6 percent of rural households do, illustrating the continuing digital divide between urban and rural areas. In addition, almost 60 percent of rural households are considered underserved by our speed block definitions above.

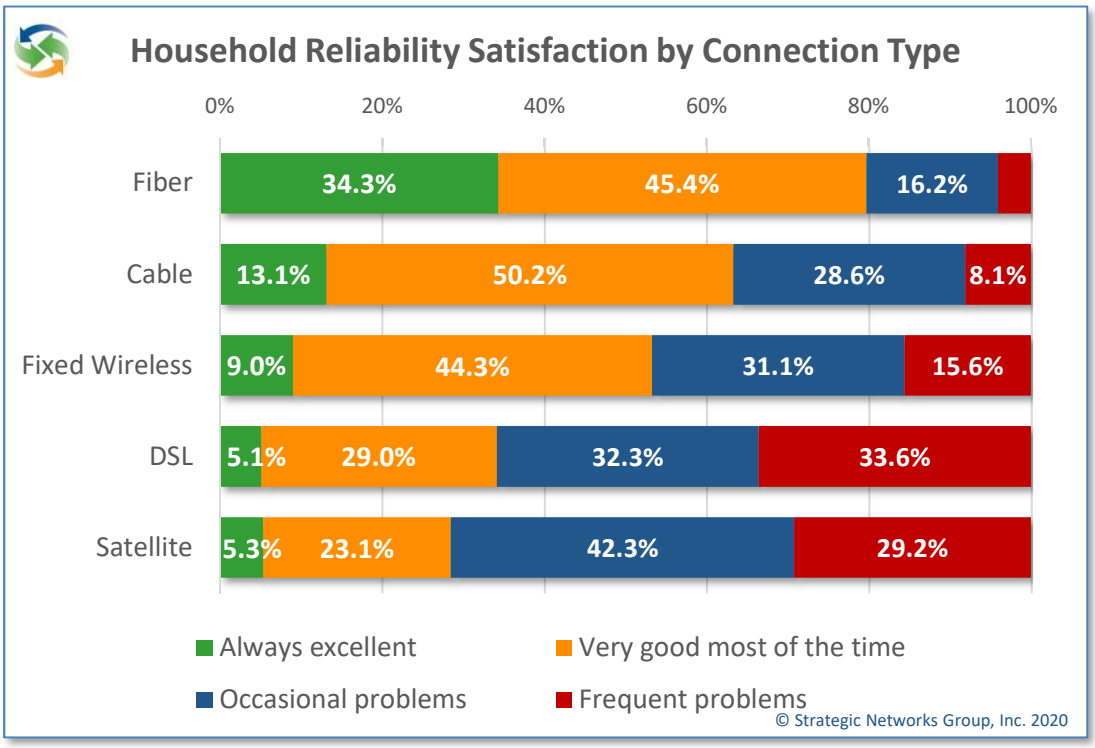
Households were also asked about their satisfaction with their current service. The satisfaction with speed of service varies significantly with the technology used. With respect to investing in technologies to deliver fast and reliable internet service, fiber dominates as 'very fast'. Conversely, DSL and satellite are 'not fast enough' for the majority of their users, which puts into question public funding of DSL or satellite broadband for any community that expects to have access to 'Future Ready' broadband of over 100 Mbps down and up.

While this study focuses on fixed terrestrial technologies of fiber, cable, fixed wireless, and DSL, satellite satisfaction is also shown in the chart below for comparison. Satellite service is sometimes assumed to be an adequate substitute when other technologies are not available. In addition to the above average price and reliability issues, satellite has the lowest satisfaction level for service speed. For this study mobile wireless is not considered a substitute for fixed terrestrial technologies.

Those with no access to Future Ready broadband services report quality issues in terms of speed of actual service and reliability for subscribers. “Not fast enough” is how 50.6 percent of DSL subscribers and 63.7 percent of satellite subscribers report their internet service.



Low satisfaction with reliability is reported by subscribers to satellite and DSL. Fiber has the highest satisfaction with 78 percent for always excellent and very good most of the time.



3.4 State of Broadband in Oregon

Of paramount importance to Business Oregon is to obtain the best understanding possible of the current state of broadband services and service availability across the State. Specifically, it is important to know which geographical areas are relatively well-served versus those that are less well-served and require more investments in broadband.

As in most states, Business Oregon relies on data obtained through the Federal Communications Commission (FCC) Form 477 data reported by service providers. While this provides valuable data down to the census block (CB) level and remains the only comprehensive data source that covers all geographic areas, the way that broadband service availability is reported using the form 477 has some gaps that undermine its reliability with respect to identifying broadband service coverage. Most notably, the FCC Form 477 data ("FCC data") reports a CB as served based on at least one customer receiving, or able to receive service within that CB. This means that if there is only one subscriber within a CB, that CB is shown as served. As a result, the actual availability of broadband in a CB can be overstated, affecting potential investments.

In an effort to overcome this gap in availability analysis, this study has sought and utilizes several supplemental, independent data sources to be used in conjunction with the FCC data. The data sources include the SNG data obtained through the statewide data collection, data obtained from SpeedUpAmerica.com crowd-sourcing, and GeoTel data on fiber infrastructure and fiber-lit buildings, all of which are detailed at the CB level.

For analysis and presentation, data is analyzed at the CB level and aggregated up to State Senate District or County level, as needed. For reference, Oregon has a total of 196,621 census blocks, of which from our analysis 116,525 are deemed to be populated (59.3 percent). Each census block was assessed for broadband connectivity in terms of technologies, speed tiers, and fiber infrastructure.

3.4.1 Internet Technologies and Speeds

Based on the analysis of multiple data sources, including FCC data, 54 percent of all census blocks have Basic Broadband service or better. This represents 95 percent of the population as having access to broadband service that is 25 Mbps download and 3 Mbps upload speeds or higher. Over 32 percent of census blocks representing 67 percent of the population have access to Future Ready broadband at 100 Mbps symmetrical.

Speed Blocks[10] (census blocks by speed)	Populated Census Blocks	Unpopulated[11] Census Blocks	Total	% of Census Block	Population	% of Population
Unconnected	17,523	54,330	71,853	36.5%	61,053	1.5%
Unserved (< 10/1)	6,915	3,828	10,743	5.5%	77,607	1.9%
Underserved (< 25/3)	5,026	2,729	7,755	3.9%	70,556	1.7%
Basic Broadband	33,305	9,582	42,887	21.8%	1,141,460	27.6%
Future Ready	53,756	9,627	63,383	32.2%	2,792,017	67.4%
Total Census Blocks	**116,525**	**80,096**	**196,621**	100.0%	**4,142,693**	100.0%
Connected Census Blocks	**99,002**	**25,766**	**124,768**	**63.5%**	**4,081,640**	98.5%

In examining the technologies available in each census block a "best technology" determination was made based on ranking fiber first, cable second, fixed wireless third, and DSL fourth. In other words, when multiple technologies are available in a census block, if fiber services are offered, the census block is designated as fiber. If fiber service is not available, but cable is, the census block is designated as cable, and so on.

Over 18 percent of all census blocks have fiber-based services being offered, representing 50.8% of the population. Cable is the best technology available in another 18 percent of census blocks, representing 23.3 percent of the population. For 22 percent of census blocks, fixed wireless is the best technology available for 21.3 percent of the population. Only 5 percent of census blocks and 3.1 percent of Oregon's population do not have any options other than DSL, and 1.5 percent of the population do not have any of the technologies covered in this study.

Best Technology (for each census block)	Populated Census Blocks	Unpopulated Census Blocks	Total	% of Census Blocks	Population	% of Population
Fiber	32,875	3,174	36,049	18.3%	2,103,433	50.8%
Cable	26,796	8,360	35,156	17.9%	967,138	23.3%
Fixed Wireless	31,161	12,725	43,886	22.3%	882,101	21.3%
DSL	8,096	1,507	9,603	4.9%	127,475	3.1%
None, or other technology	17,597	54,330	71,927	36.6%	62,546	1.5%
Total Census Blocks	**116,525**	**80,096**	**196,621**	100.0%	**4,142,693**	100.0%
Census Blocks w/Technology	**98,928**	**25,766**	**124,694**	**63.4%**	**4,080,147**	98.5%

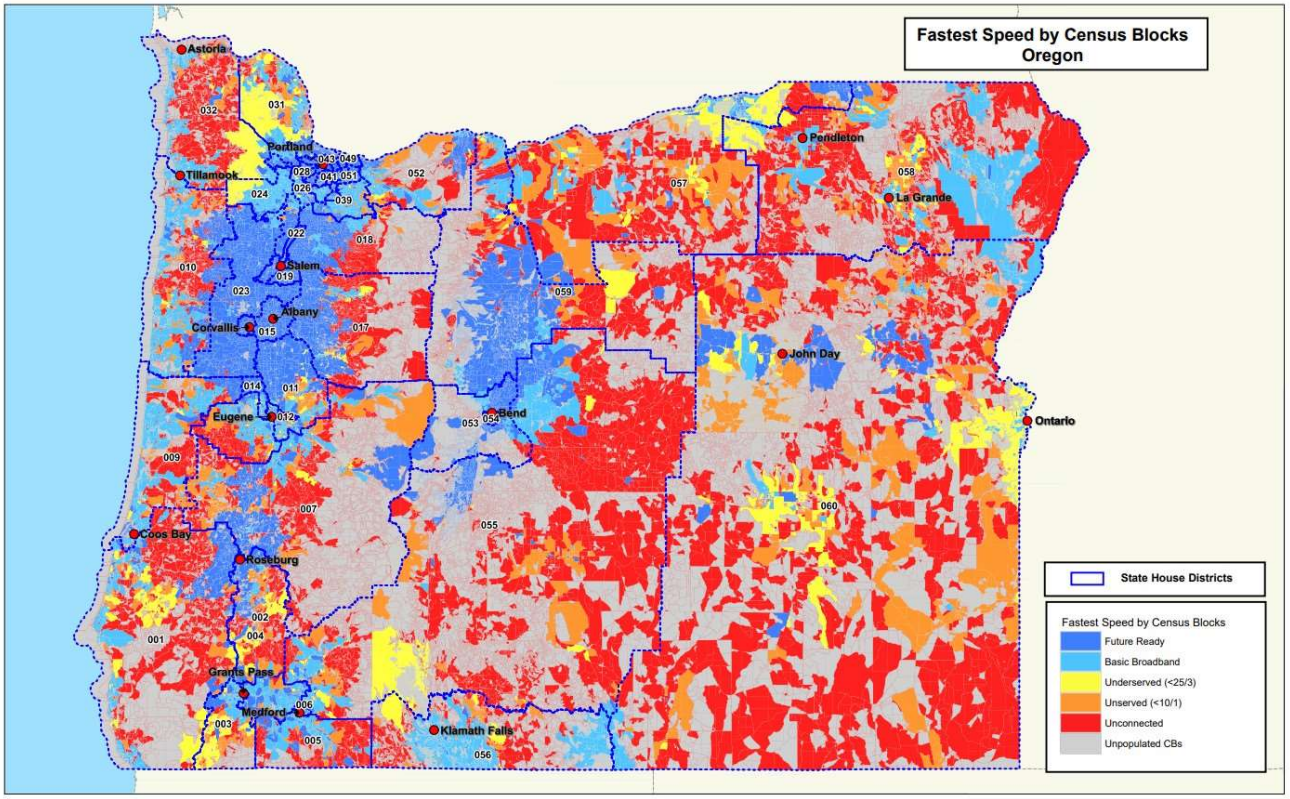
[10] Speed blocks – broadband service level speed ranges defining categories of broadband for mapping and analysis purposes, especially at the census block (CB) level.
[11] Census block with no population according to US Census.

Over 36 percent of all census blocks, and 15 percent of populated census blocks, are unconnected and lack any of the four fixed-terrestrial technologies identified here. These census blocks are sparsely populated with 1.5 percent of the population; however, this still represents more than 61,000 people.

While 95 percent of the population has at least Basic Broadband, that leaves 5 percent unconnected, unserved, or underserved, and 27.6 percent reside in areas that are not yet Future Ready. If the State aspires to making Oregon competitive by improving broadband access for the unconnected, unserved, and underserved populations, as well as moving more areas toward being Future Ready, then knowing where these areas are is important.

The following "heat maps" show the geographic distributions of broadband speed blocks (internet service level speed ranges by census block) and technologies across the State. The Oregon State legislative house district boundaries are shown for reference.

Figure 1. Fastest Speed by Census Blocks Heat Map - Oregon



The "Fastest Speed by Census Blocks" map above clearly shows (with dark and light blue) that some areas of Oregon are well served with at least Basic Broadband, as well as Future Ready broadband, especially along the I-5 corridor and in the urban areas such as greater Portland, Salem, Albany, Eugene. These areas are shown in more detail in the following additional heat maps. There are also several large pockets of unserved and underserved census blocks in the more rural and sparsely-populated frontier areas of the State, especially in the southern and eastern regions of the State.

Figure 2. Fastest Speed by Census Blocks Heat Map – Metro Portland

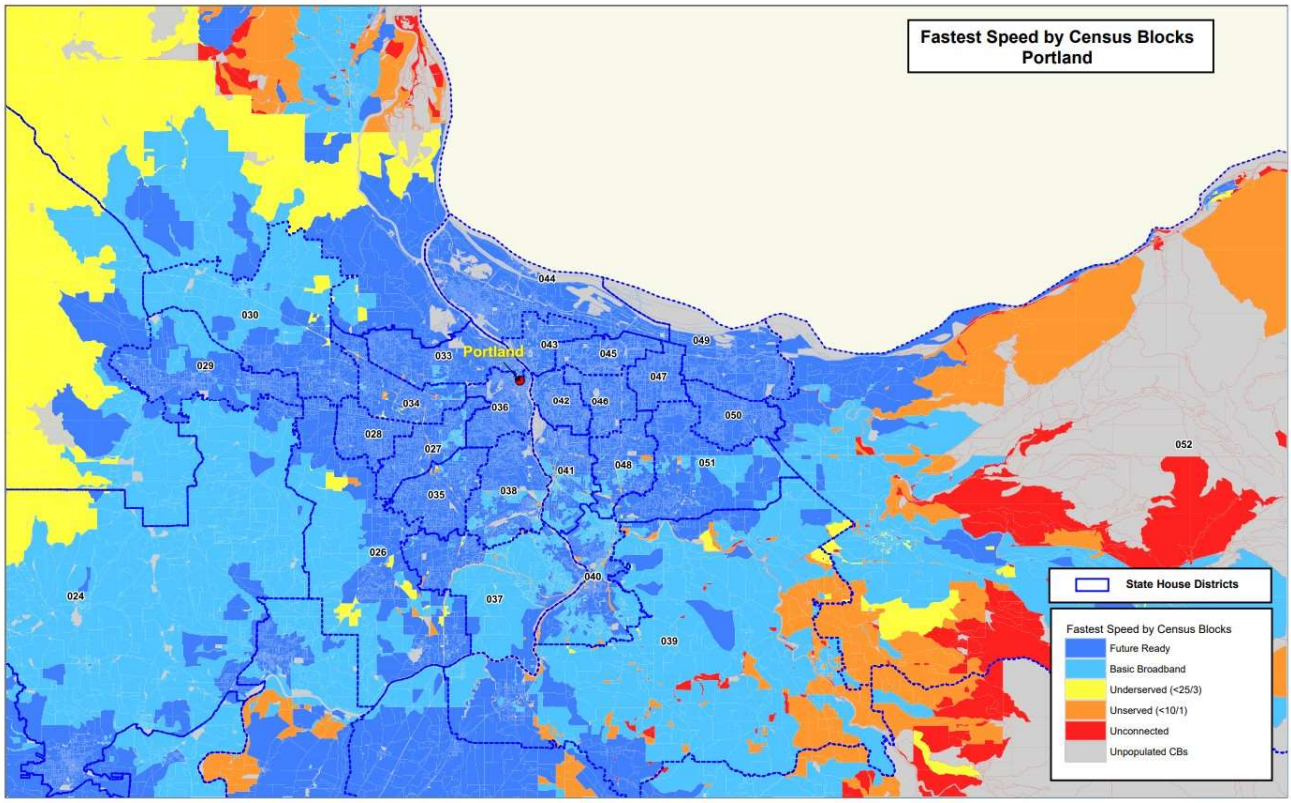
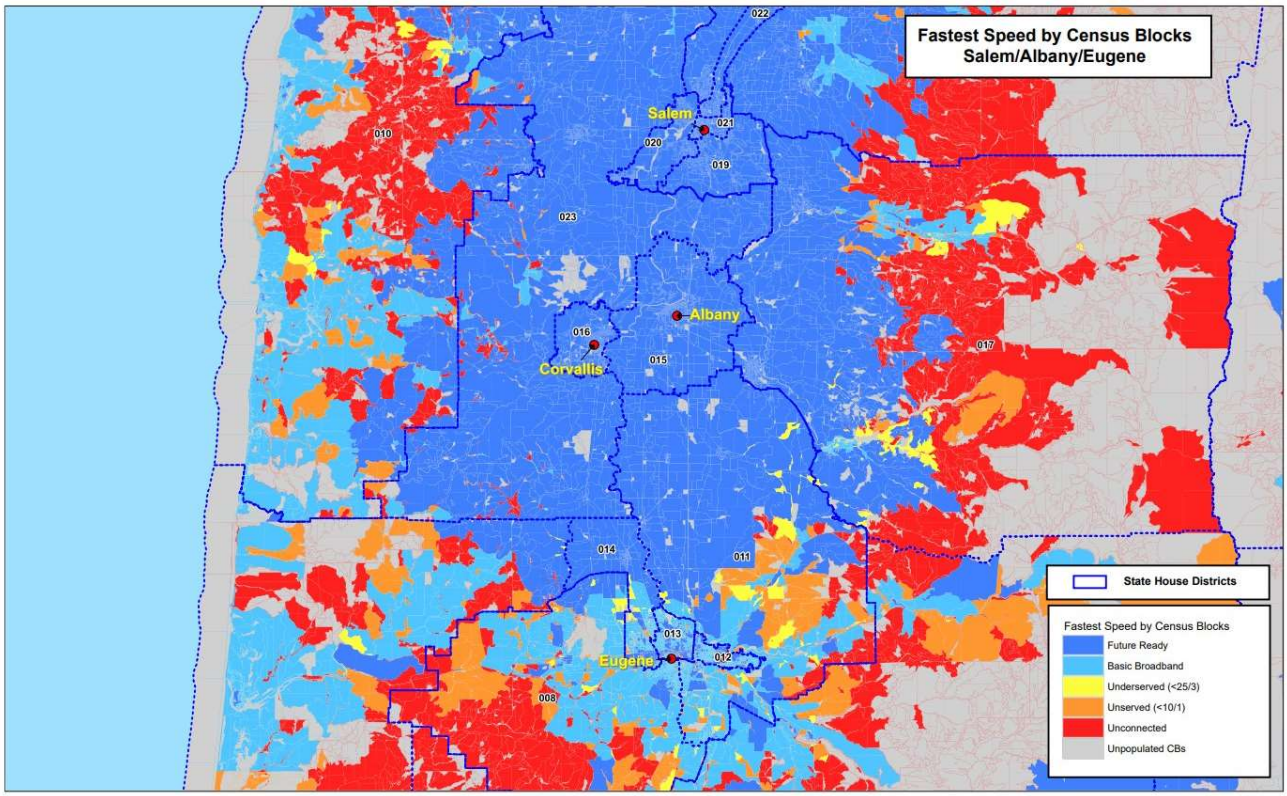


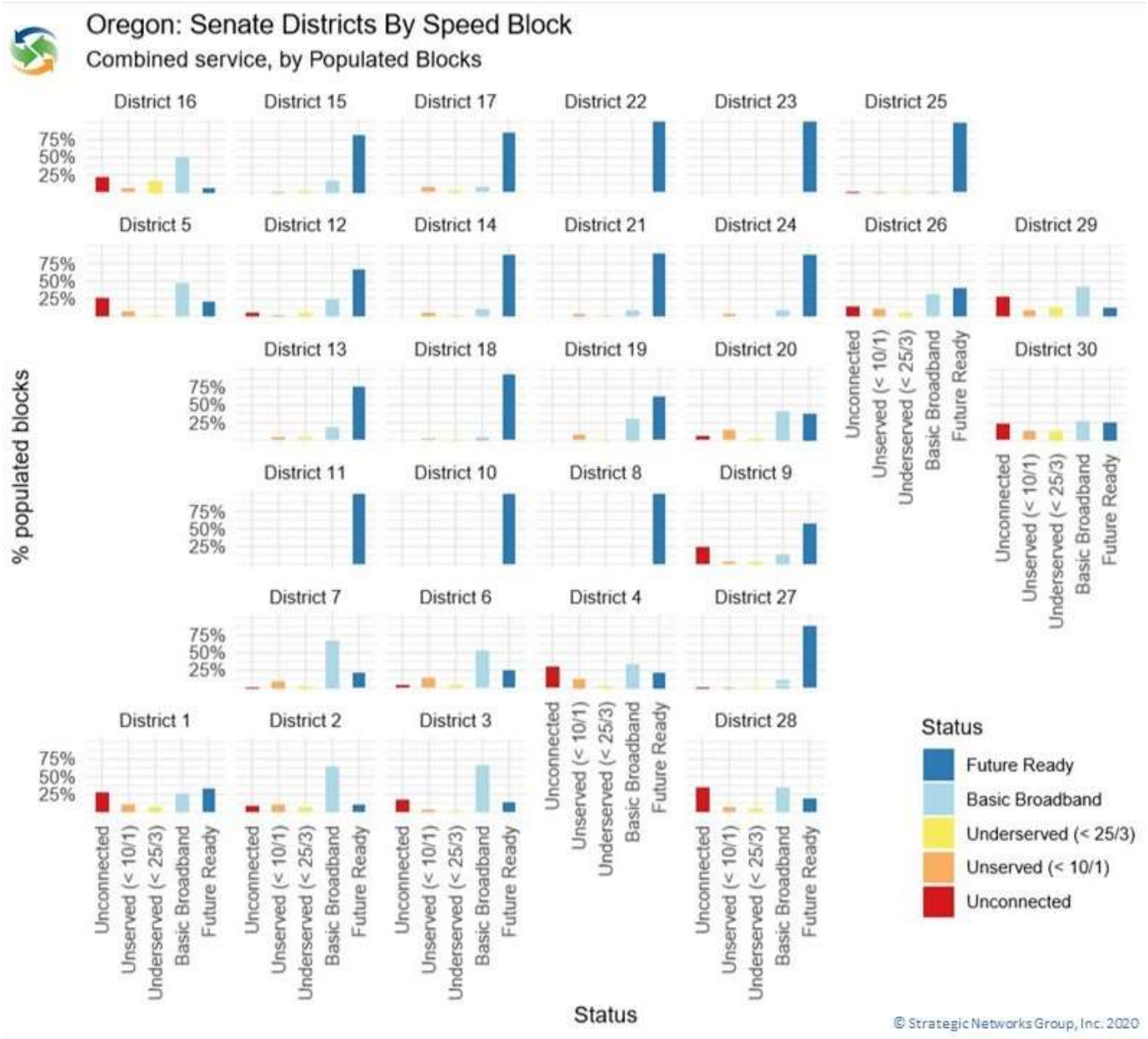
Figure 3. Fastest Speed by Census Blocks Heat Map – Salem/Albany/Eugene



While a heat map is a useful visual, it is important to break down which areas are relatively better served versus those with less access to quality broadband services and technologies.

The following speed block charts show a visual summary of the speed blocks by census block and populations broken down by State senate districts. These block charts are organized to mirror the relative geographical locations of the senate districts, i.e. the top left of the image approximates the northwest of the State, while the bottom right represents the southeast. Additional block charts for counties as well as the supporting data tables are provided in Appendix 6.3.

Figure 4. **Oregon Speed Blocks by Census Block and Senate Districts**

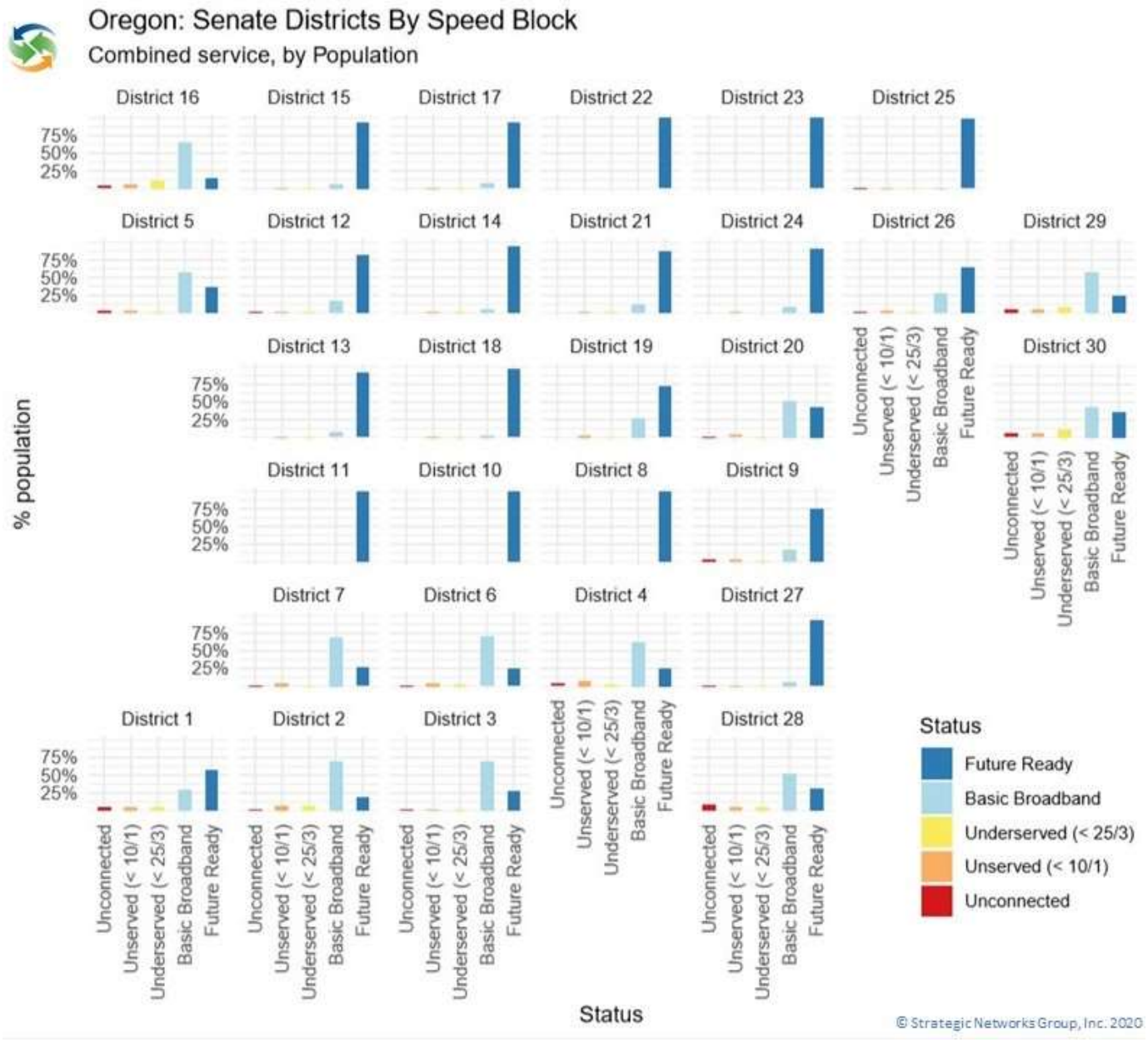


The speed block charts above clearly show that some senate districts contain a high proportion of census blocks that are Future Ready, largely in the highly populated urban areas, while there are a number of senate districts that have very few Future Ready census blocks and even a number of unconnected census blocks.

Unconnected census blocks are those populated census locks that do not have fixed terrestrial connections of fiber, cable, fixed wireless, or DSL. These tend to be sparsely populated and the residents may use satellite or mobile wireless for internet connectivity, or none at all.

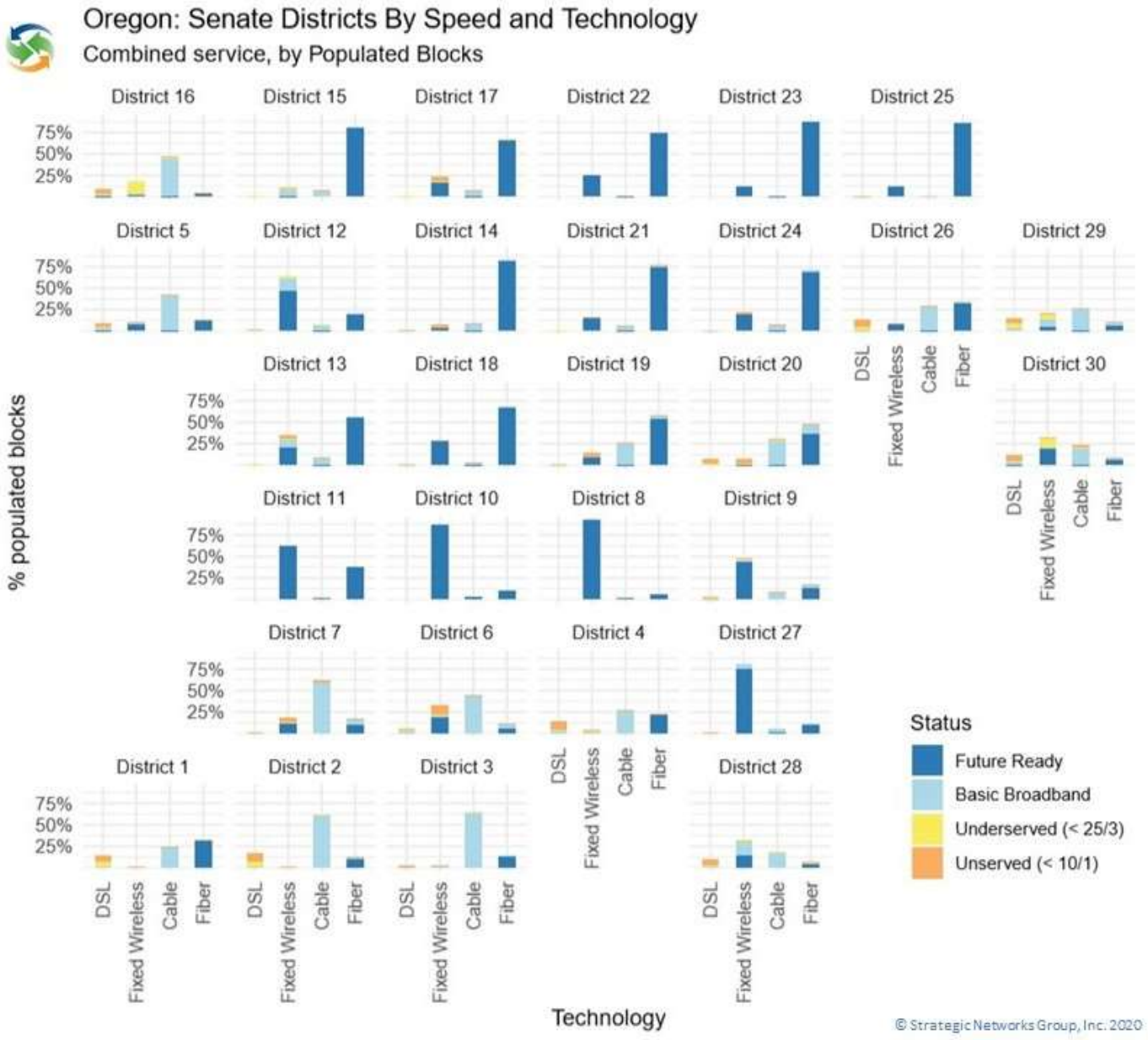
Since population densities vary, and investment in broadband technologies is greatly influenced by population density, the same information is presented below based on population rather than census blocks.

Figure 5. **Oregon Speed Blocks by Population and Senate Districts**



As with previous speed block charts, it is clear that a number of senate districts have significant portions of the population living in areas without access to Future Ready broadband. In terms of addressing broadband speeds and service availability, it is also important to see how and where the different technologies are used. The following charts sets show the speed blocks broken down by the fixed terrestrial technologies.

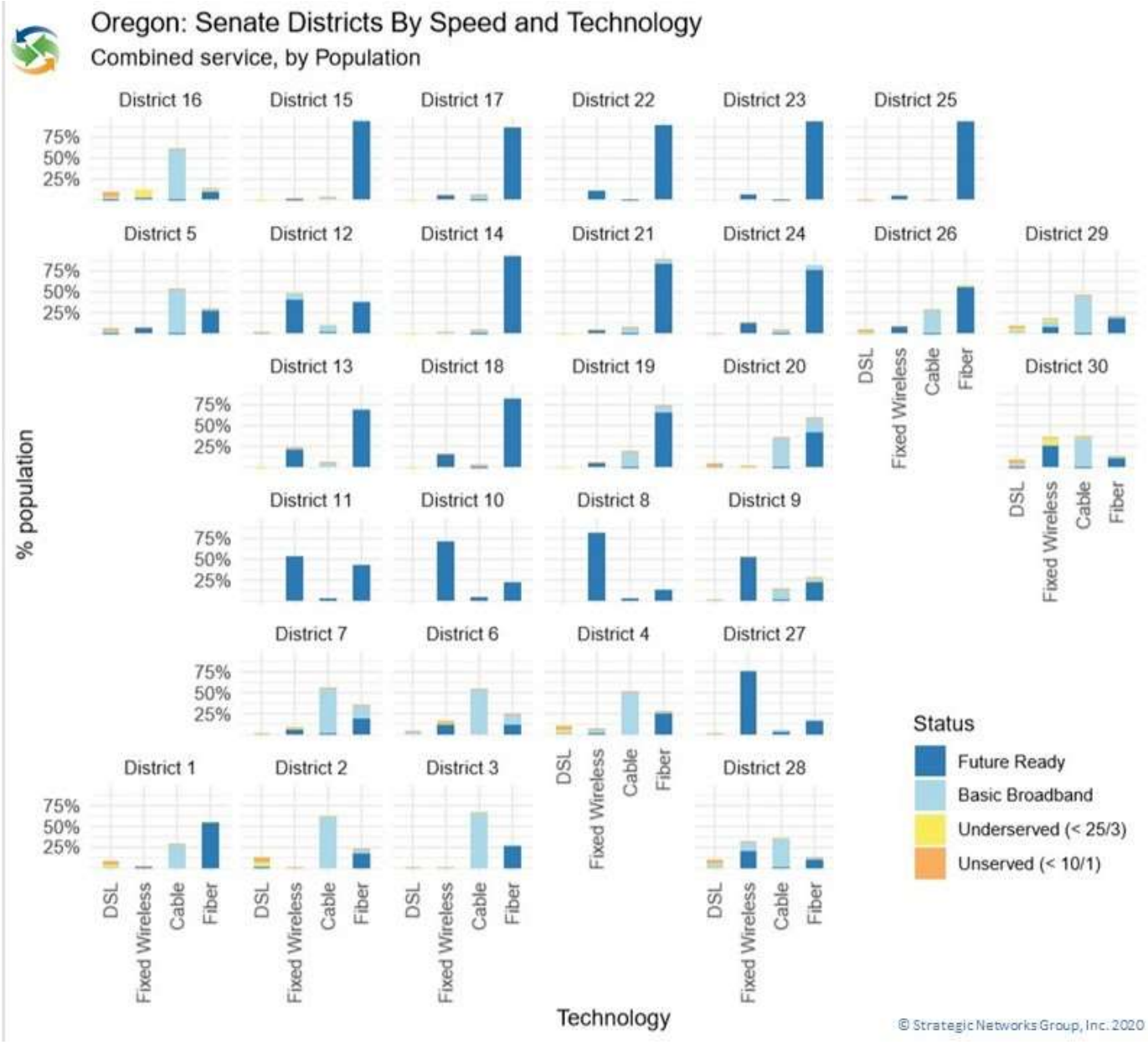
Figure 6. **Oregon Speed Blocks and Technologies by Census Block and Senate Districts**



With these charts it becomes clear that for some senate districts the majority of census blocks have Future Ready broadband available using fiber technologies. Other districts may have little fiber, but have census blocks that are Future Ready using fixed wireless technology.

The following speed block charts show the technology views based on population.

Figure 7. **Oregon Speed Blocks and Technologies by Population and Senate Districts**



These chart sets and the heat maps illustrate a digital divide between rural and urban areas of the State. This is typical and frequently experienced in many states and regions, with the investment in the latest and high-capacity technologies following the population densities and the revenue potential.

The tables below summarize the rural and urban digital divide in terms of the gaps between (1) census blocks and (2) population categories that are Future Ready, having Basic Broadband, and unserved or underserved.

Figure 8. Census Blocks by Urban and Rural Areas

Census Blocks	Future Ready	Basic Broadband	Total Census Blocks	% Future Ready	% Basic Broadband	% Unserved or Underserved
Urban	31,582	5,346	39,384	80.2%	13.6%	6.2%
Rural	31,916	37,581	157,553	20.3%	23.9%	55.9%
Total	63,498	42,927	196,937	32.2%	21.8%	46.0%

Figure 9. Populations by Urban and Rural Areas

Population	Future Ready	Basic Broadband	Total Population	% Future Ready	% Basic Broadband	% Unserved or Underserved
Urban	1,801,567	267,634	2,085,624	86.4%	12.8%	0.8%
Rural	992,490	873,954	2,059,379	48.2%	42.4%	9.4%
Total	2,794,057	1,141,588	4,145,003	67.4%	27.5%	5.1%

Urban areas consist of: Senate districts 13-15, and 17-24 – Metro Portland
Senate districts 10-11 – Salem
Senate District 8 – Albany, Corvallis
Senate District 7 – Eugene

There are clearly populated census blocks that are unconnected, unserved, and underserved, depending on outdated technologies for connectivity. However, there are many more census blocks that meet the Basic Broadband level that also depend on technologies that are not Future Ready, in particular cable and DSL, but also some older vintages of fixed wireless technology.

The following tables provide a sense of the scope of the broadband challenge for Oregon by showing the number of census blocks and populations for each speed block broken down by technology.

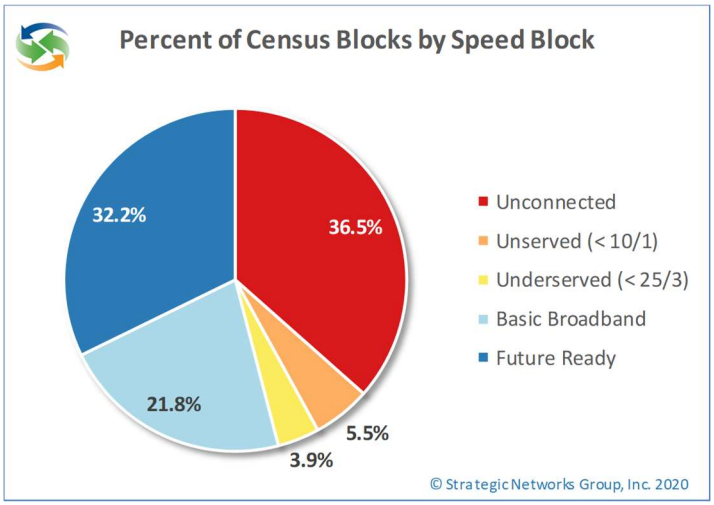
Figure 10. Number of Census Blocks by Speed Block Categories

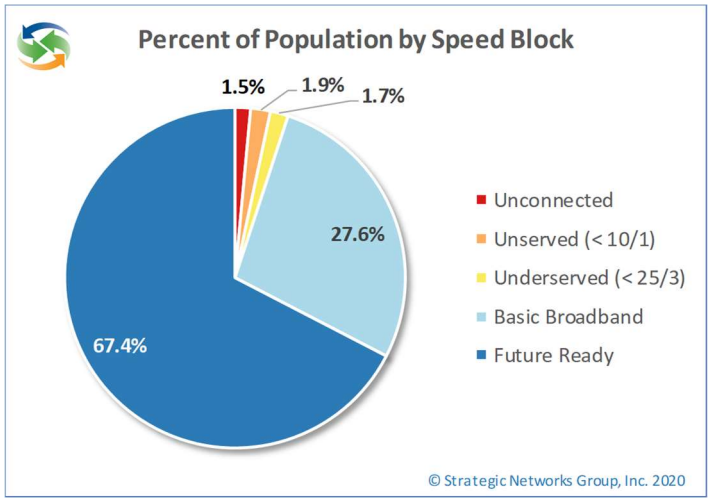
All Census Blocks	Fiber	Cable	Fixed Wireless	DSL	Other	Total
Unconnected	0	0	0	0	71,853	**71,853**
Unserved (< 10/1)	354	1,701	2,966	5,722	0	**10,743**
Underserved (< 25/3)	31	19	5,474	2,199	32	**7,755**
Basic Broadband	1,934	33,152	6,127	1,650	24	**42,887**
Future Ready	33,730	284	29,319	32	18	**63,383**
Total	**36,049**	**35,156**	**43,886**	**9,603**	**71,927**	**196,621**

Figure 11. Populations by Speed Block Categories

Populations All CBs	Fiber	Cable	Fixed Wireless	DSL	Other	Total
Unconnected	0	0	0	0	61,053	**61,053**
Unserved (< 10/1)	1,437	4,272	14,291	57,607	0	**77,607**
Underserved (< 25/3)	845	1,305	35,558	32,167	681	**70,556**
Basic Broadband	122,624	926,814	56,526	35,137	359	**1,141,460**
Future Ready	1,978,527	34,747	775,726	2,564	453	**2,792,017**
Total	**2,103,433**	**967,138**	**882,101**	**127,475**	**62,546**	**4,142,693**

While there is a total of 18,498 census blocks that are unserved or underserved, which represent a population of approximately 148,000.



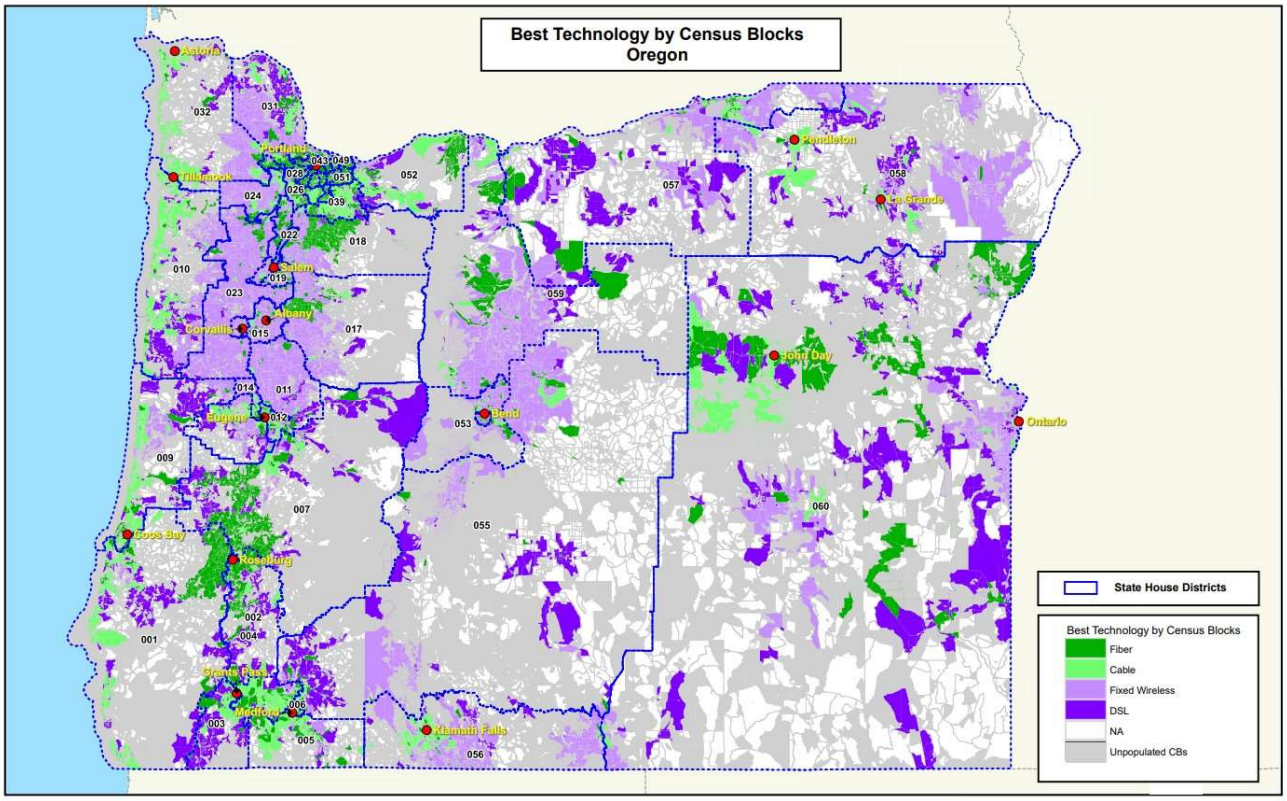


There are also a total of 34,802 census blocks that have Basic Broadband using cable or DSL, which represent a population of approximately 962,000.

The pie charts illustrate the census blocks (Figure 10) and population (Figure 11) by speed block.

The best technologies available by census block are shown in the following additional heat maps. The technologies are ranked "best" in the following order: Fiber, Cable, Fixed Wireless, and DSL. Where there is a mix of technologies, the best one is shown. This does not necessarily mean that service speeds actually offered by service providers are better or faster, but that generally the technologies are more or less capable of higher speeds. For example, fixed wireless offerings may be faster than cable in some areas and not others.

Figure 12. Best Technologies by Census Block Heat Map - Oregon



Similar to the fastest speed heat maps, the fiber services census blocks tend to be prominent in the more densely-populated areas, as shown in the detailed heat maps below. One significant exception is the areas extending north and south from Bend, which shows extensive use of fixed wireless broadband that is also advertised as Future Ready.

Figure 13. Best Technologies by Census Block Heat Map – Metro Portland

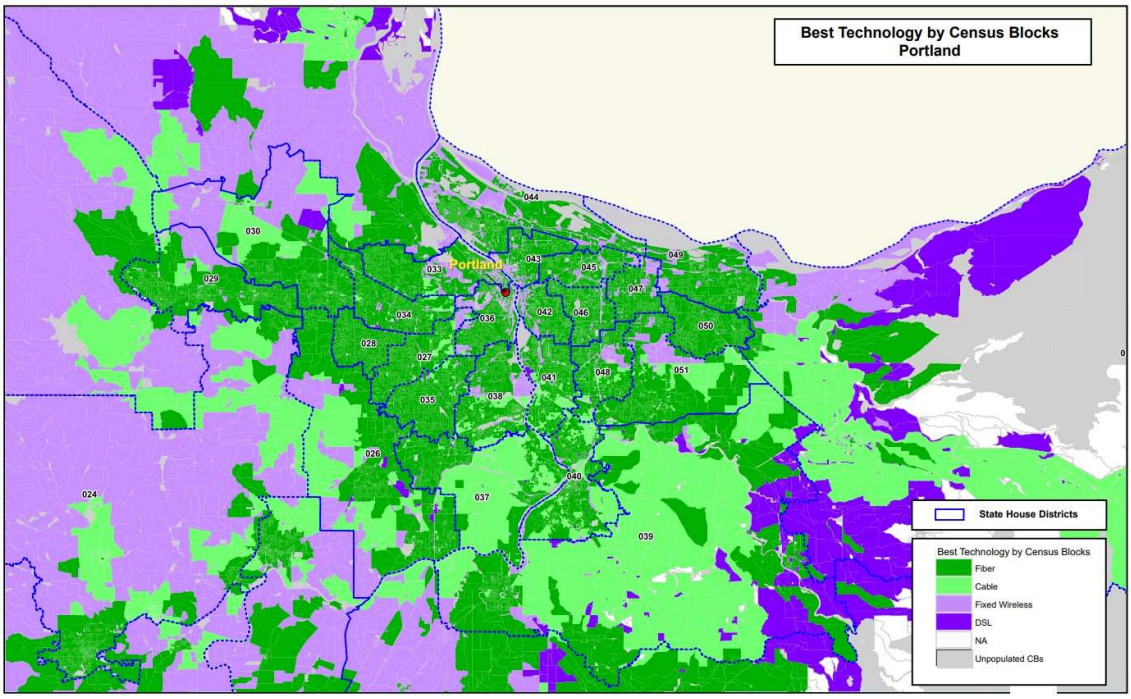
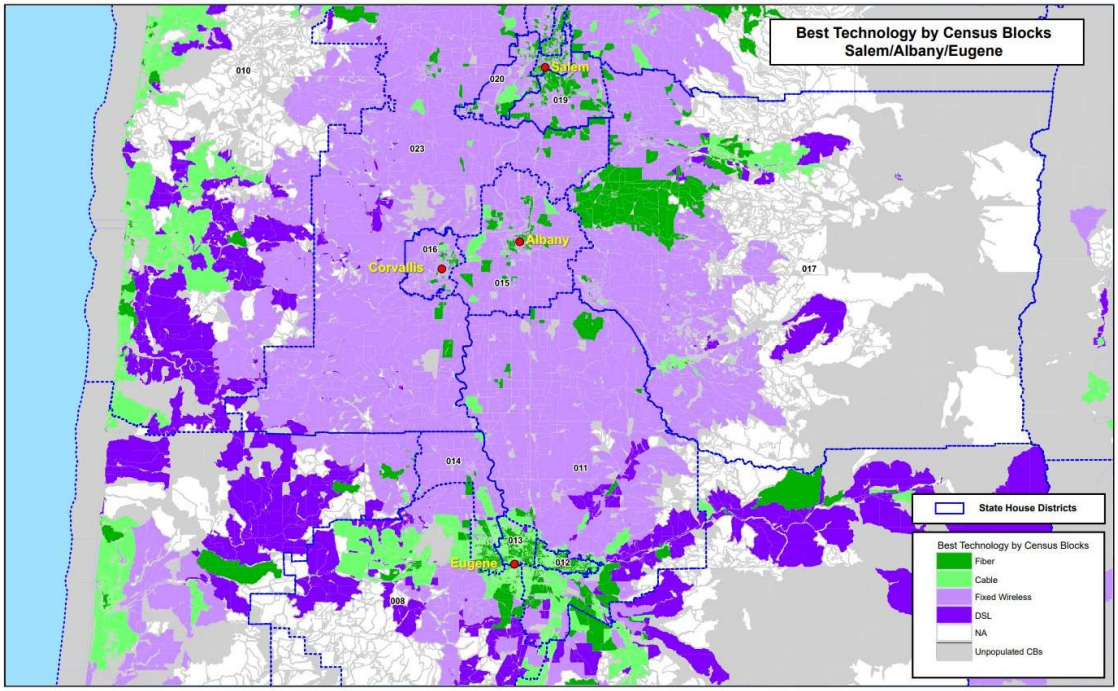
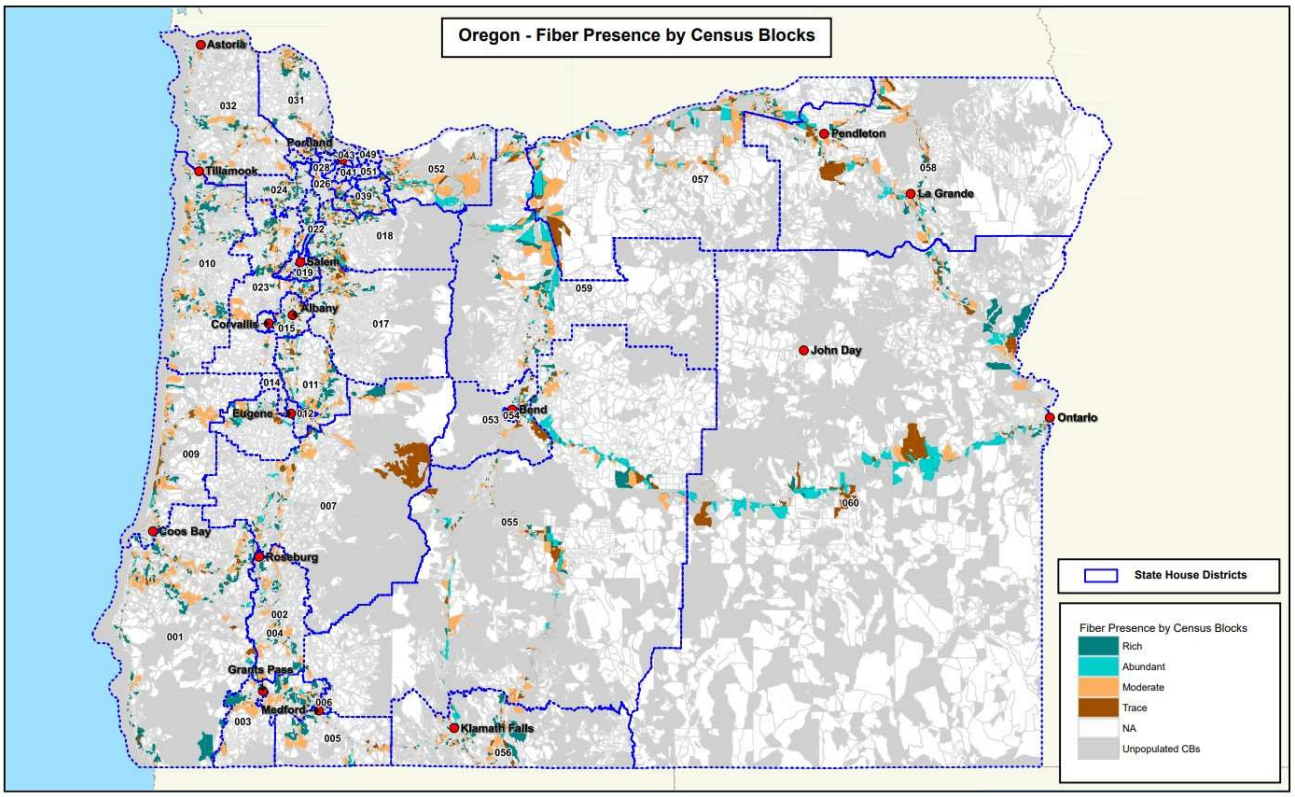


Figure 14. Best Technologies by Census Block Heat Map – Salem/Albany/Eugene



Cable is easily the dominant broadband technology for Oregon's urban households while rural households have to depend on more diverse and generally slower, and frequently more expensive, technology types.

Figure 15. Fiber Presence in Oregon Heat Map - Based on Fiber Infrastructure Data

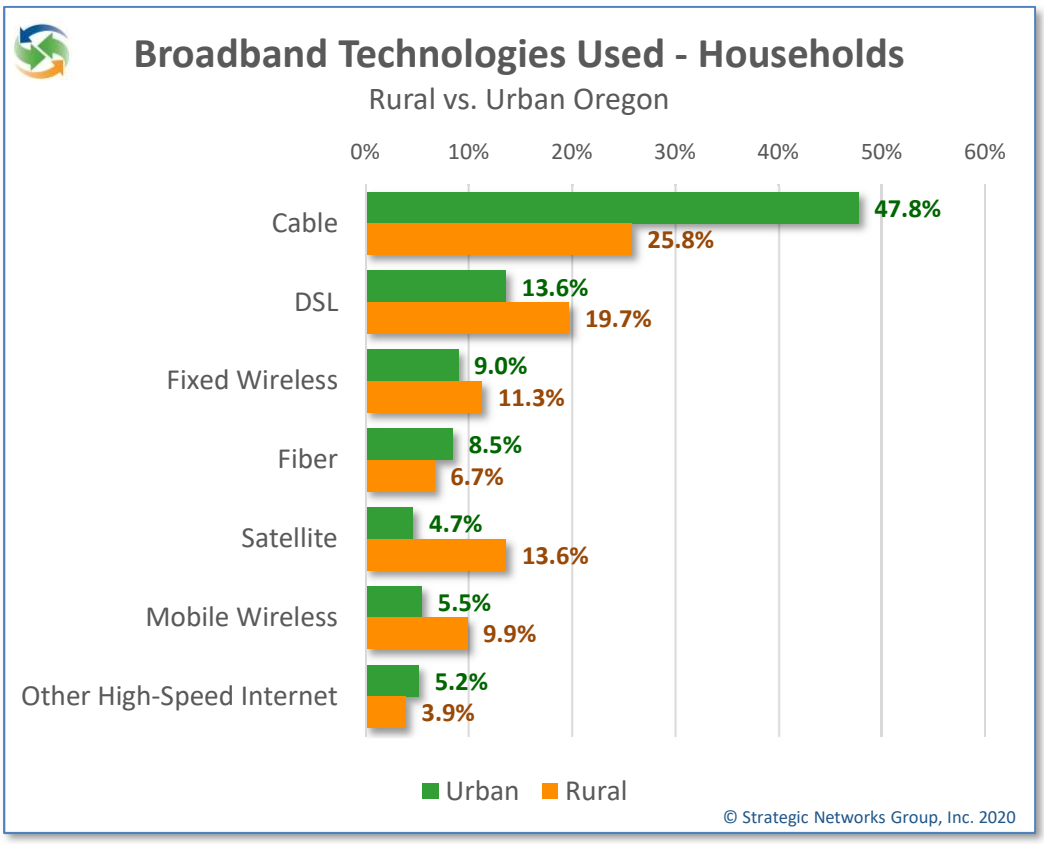


The fiber presence heat map is provided for reference and shows census blocks for which fiber infrastructure is present based on multiple broadband provider sources. Not all fiber infrastructure is shown due to gaps in reporting by some providers (e.g. in and around John Day). The areas around John Day[12] are in fact served by OTC Connections and connected by LS Networks[13], but details of their fiber presence were not available at the time of preparing this study. OTC Connections offers fiber services at 100 Mbps symmetrical, as indicated with Future Ready areas in the speed block heat map in Figure 1. OTC will be expanding its fiber footprint to communities surrounding John Day using its recent grant from the USDA ReConnect program[14].

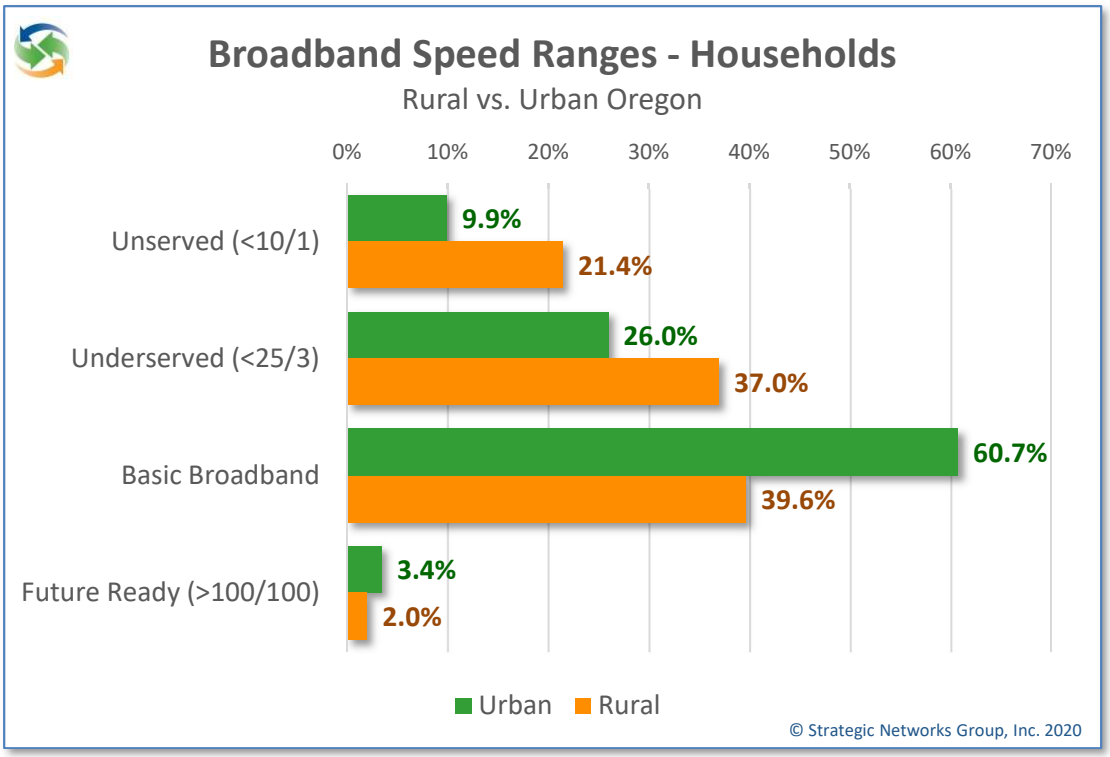
[12] SNG data collection identified three households in John Day that currently use fiber services.
[13] LS Networks is a middle mile fiber provider operating in Oregon and parts of Washington State.
[14] https://www.usda.gov/media/press-releases/2019/12/03/usda-provides-6-million-expand-broadband-infrastructure-two-rural

3.4.2 Broadband Technologies Used by Households

The statewide data collection conducted by SNG also reveals information about what technologies are being used by households. This data is based on a sample of over 3,600 households across all counties in Oregon.



While there are more unserved and underserved households in rural area than urban areas, there continue to be unserved households and underserved households in urban areas. Almost 10 percent of urban households reported using less than 10/1 Mbps services, and another 26 percent of urban households use underserved service levels. However, the majority (60 percent) of urban households use Basic Broadband, compared to less than 40 percent of rural households.

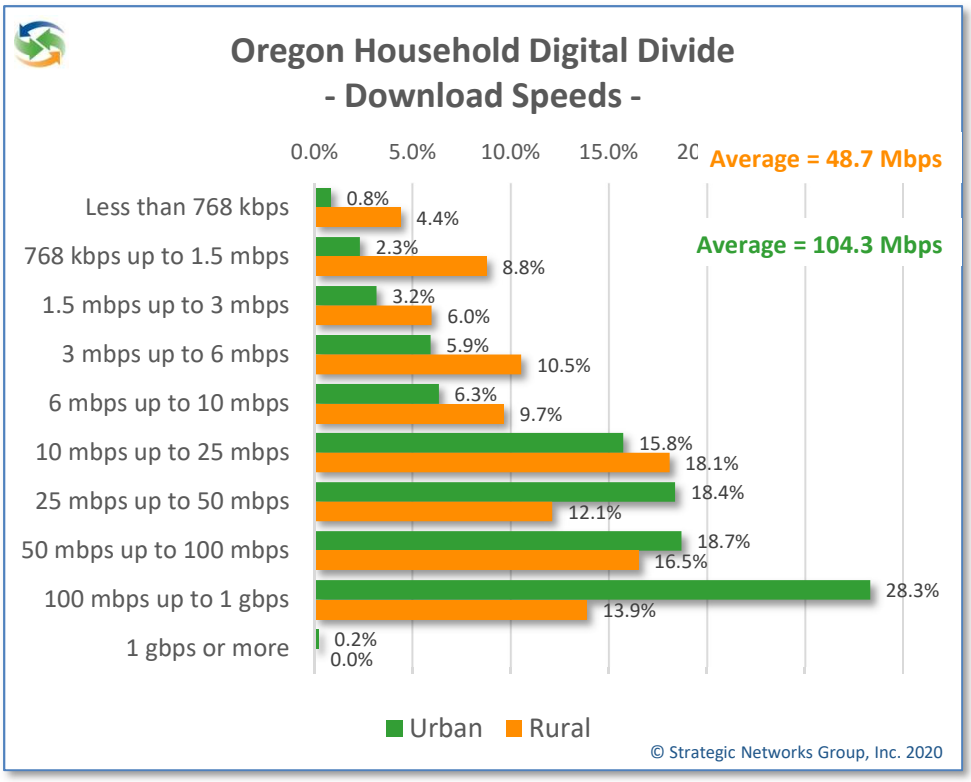


Rural household respondents have on average half the download speed as compared to households in urban Oregon. Similarly, rural households in Oregon have upload speeds that are half as fast as that of urban households.

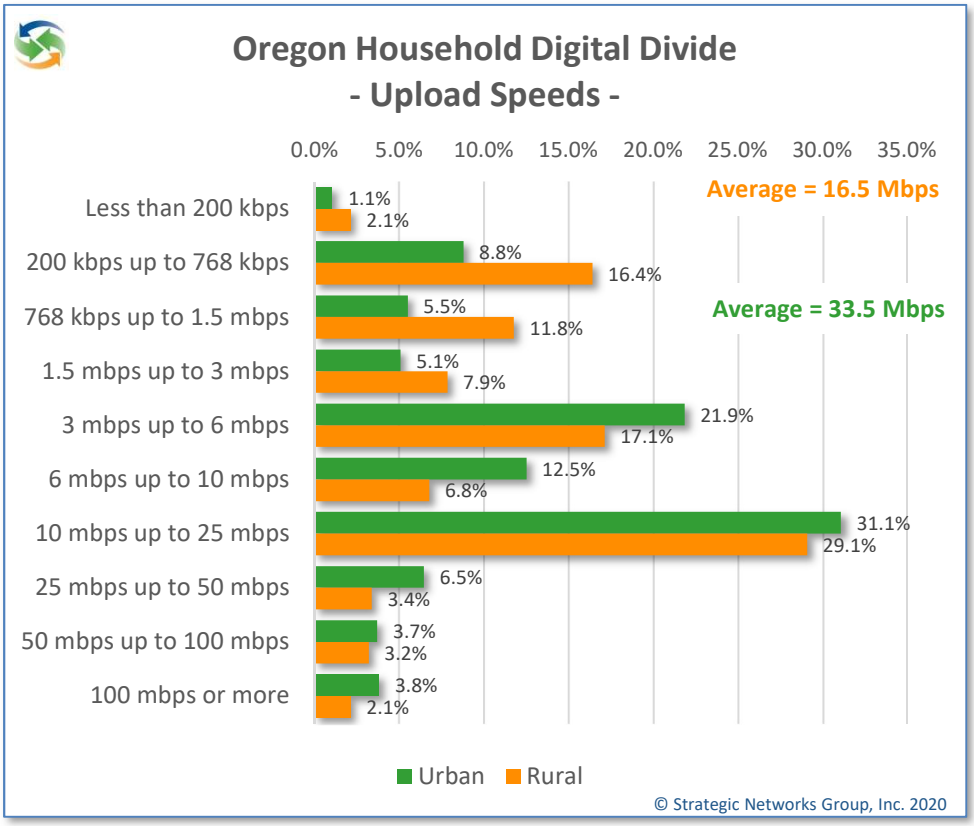
The difference in average upload speeds can be explained by the differing mix in availability of technologies, as well as the vintage of technologies, between urban and rural areas. Urban areas with higher populations and population densities attract more investment by broadband service providers and tend to have better coverage of fiber and cable services than rural areas, as seen in the speed block maps above. These technologies, and competition within these areas, drives the availability of higher speed service offerings.

Rural areas are often left behind in private broadband investment since urban markets generate greater ROI for providers. Hence, even Basic Broadband areas often have to rely on cable, fixed wireless, and DSL services. Cable can provide high download speeds, but is often provisioned where there is sufficient housing density. Fixed wireless can achieve very high speed with current technology and can serve less densely populated areas where terrain allows.

Households in urban areas have significantly higher share of speeds than rural households.

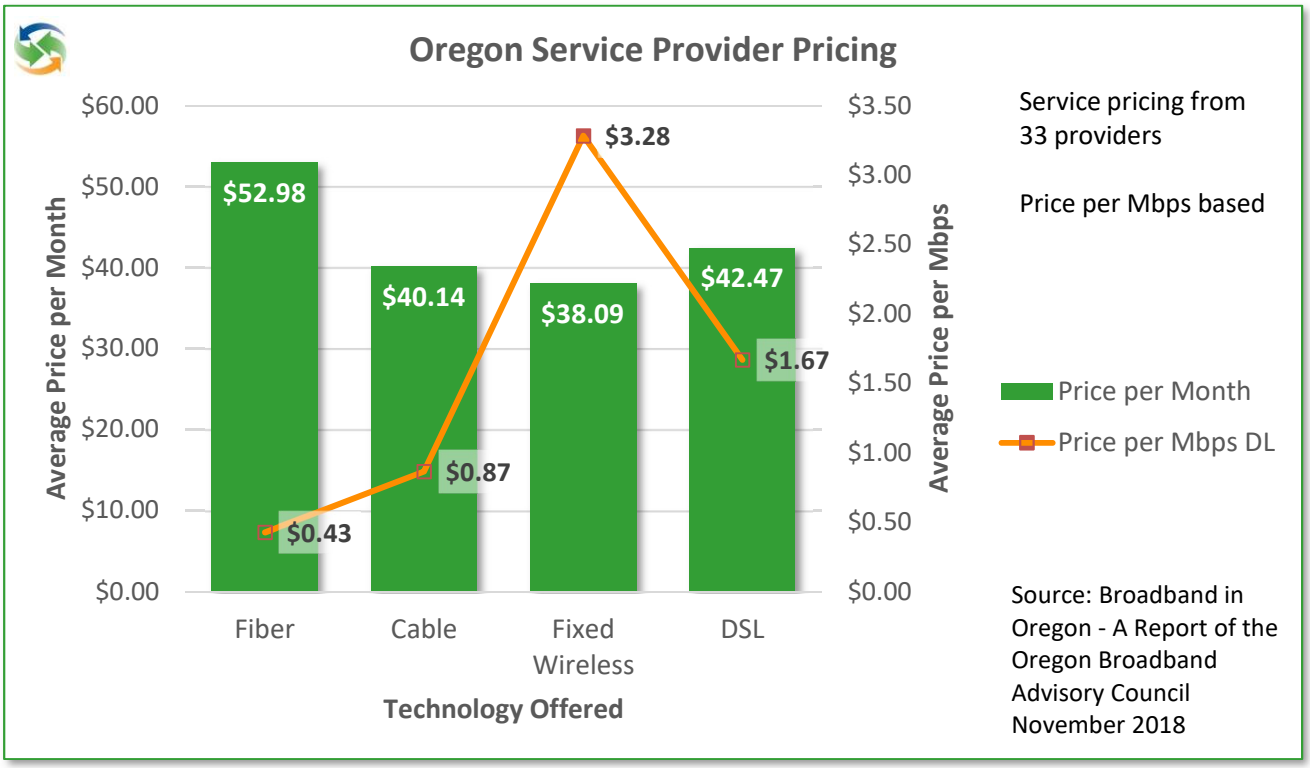


Upload speeds are not symmetric with download speeds, but have less of a rural-urban difference.



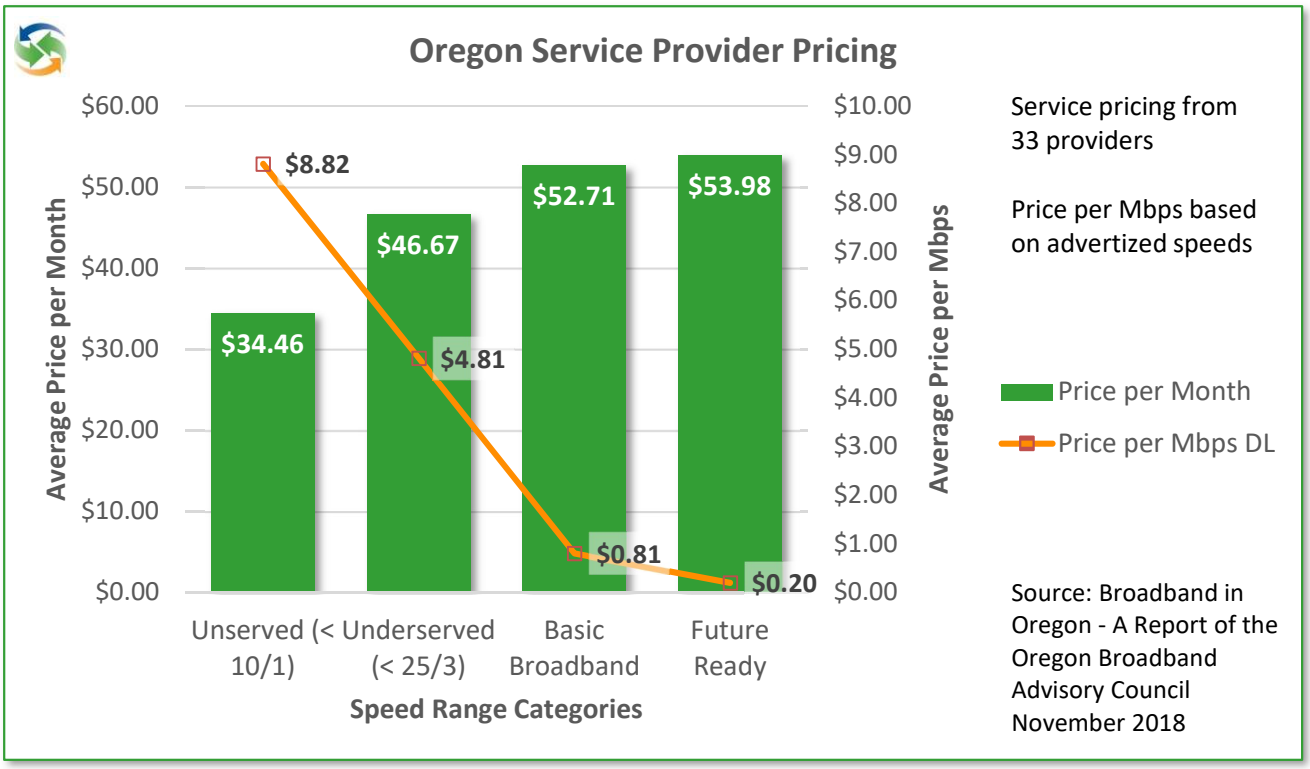
3.4.3 Spending on Internet Service

Broadband service pricing[15] across Oregon averages between $38.00 and $53.00 per month, depending on the technology. The following chart shows the average pricing by technology along with the average cost per Mbps based on the advertised download (DL) speeds. Fiber is the highest cost, while cable, fixed wireless, and DSL are all within five (5) percent of each other. However, all technologies are competitive with each other, and fiber has the lowest cost per Mbps.

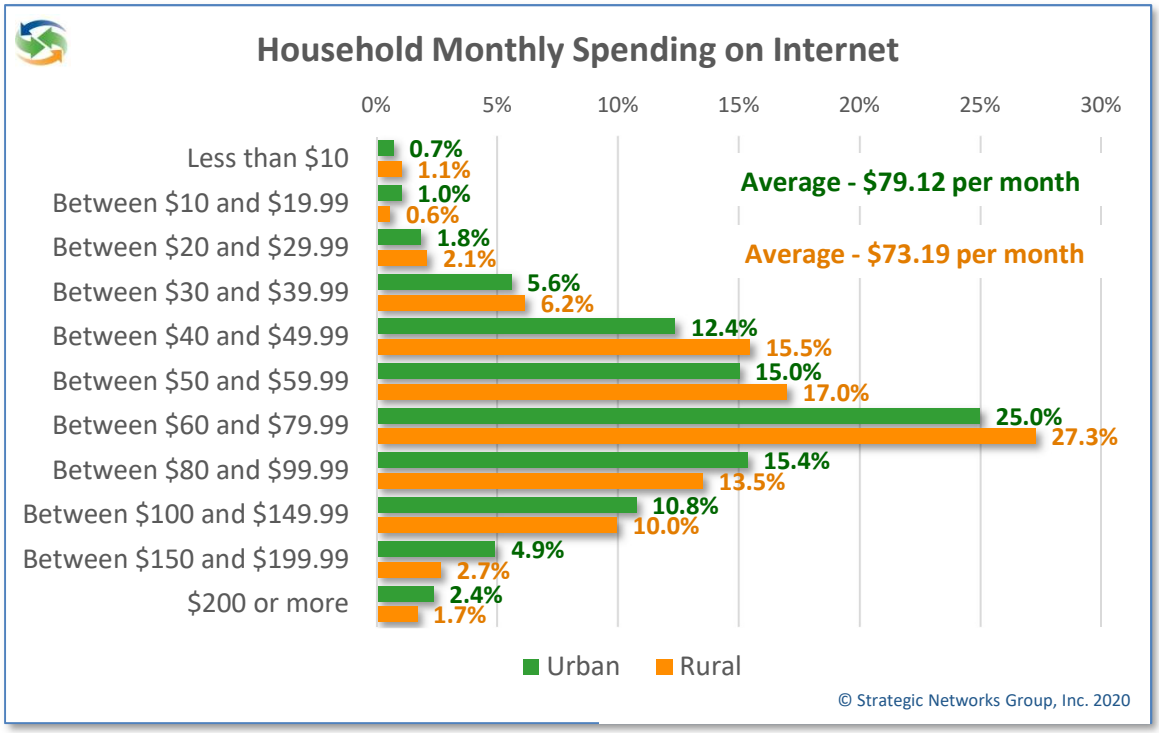


Since different speeds are offered over each technology, all of the technologies appear in the speed block categories used in this report. The following shows the average price per month for service offered in the different speed block categories. While the unserved (< 10/1) category has the lowest average cost, the average costs for Basic Broadband and Future Ready broadband are very close to each other at $52.71 and $53.98 respectively.

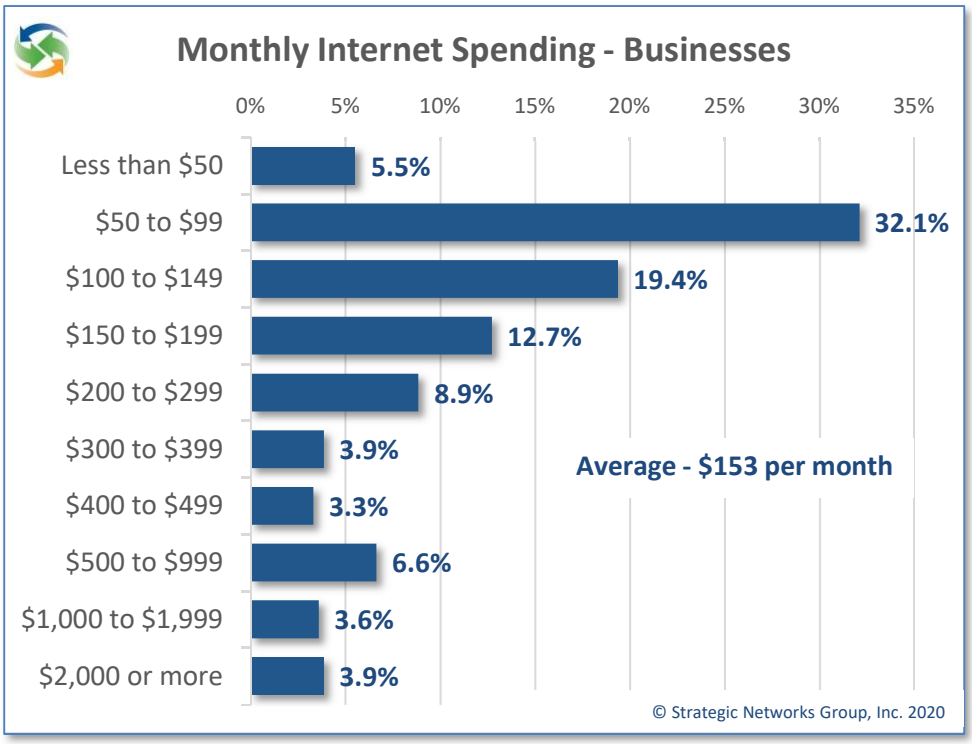
[15] Source: Broadband in Oregon - A Report of the Oregon Broadband Advisory Council, November 2018



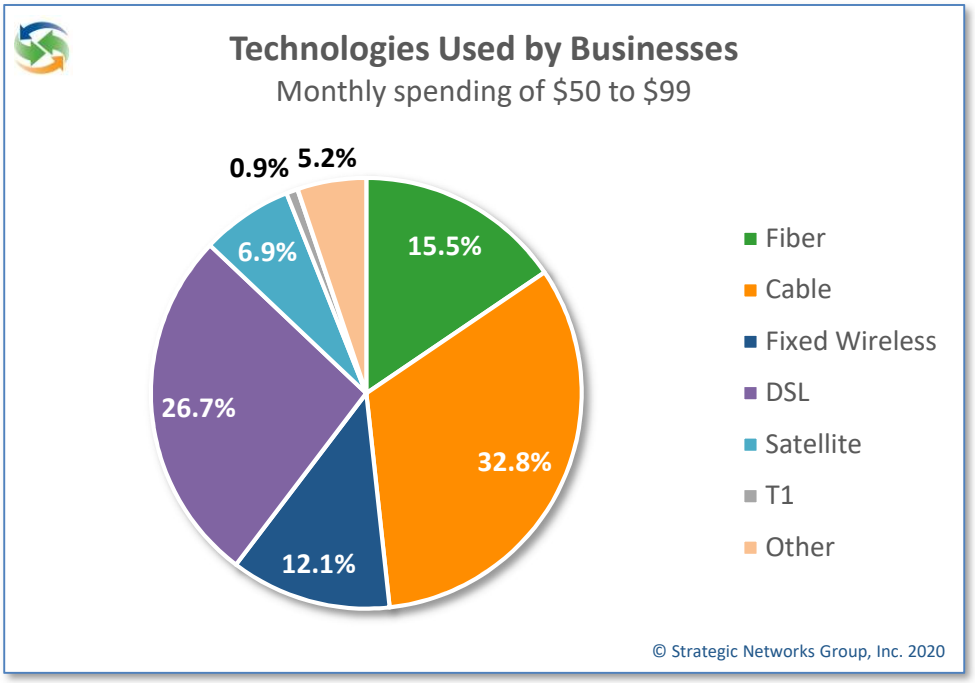
While monthly spending on internet ranges widely from less than $10 to more than $200 per month the majority (55.1%) of households fall in a mid-range of $40-$80. The average household spending on internet service averages at $76.90 per months based on SNG research of Oregon households. Comparison of rural versus urban household monthly spending on internet reveals roughly comparable averages of $73 rural and $79 urban. In part the lower spending by rural households reflects the fact that more expensive fiber is not an available option.



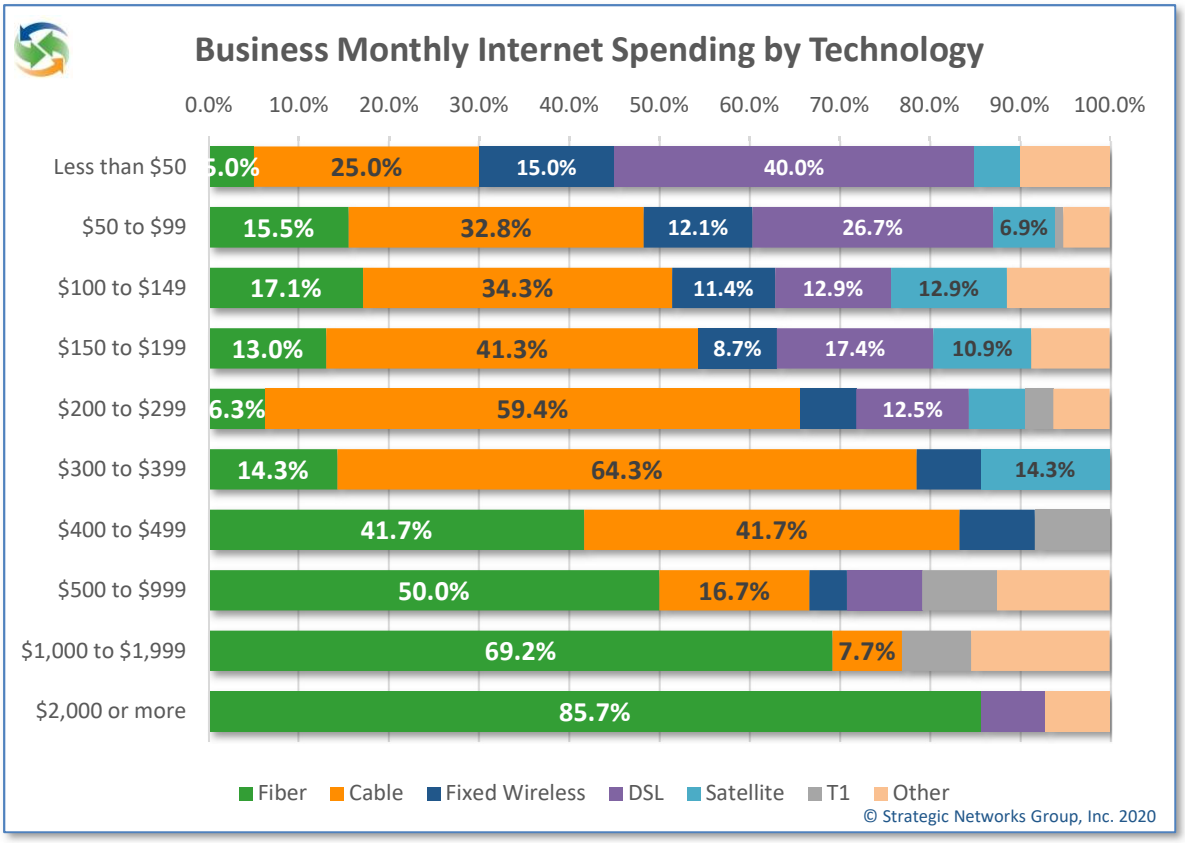
Monthly spending on internet by business varies widely from less than $50 to more than $2000, but averages on the low side at $153 per month. This range reflects a number of factors, including industry sector, firm size, digital readiness and available access and technology types.



The majority of businesses in Oregon (53.1%) spend between $50 -$99 each month for internet access. Within this price range almost 60% of businesses access the internet through either cable (32.8%) or DSL (26.7%) technologies.



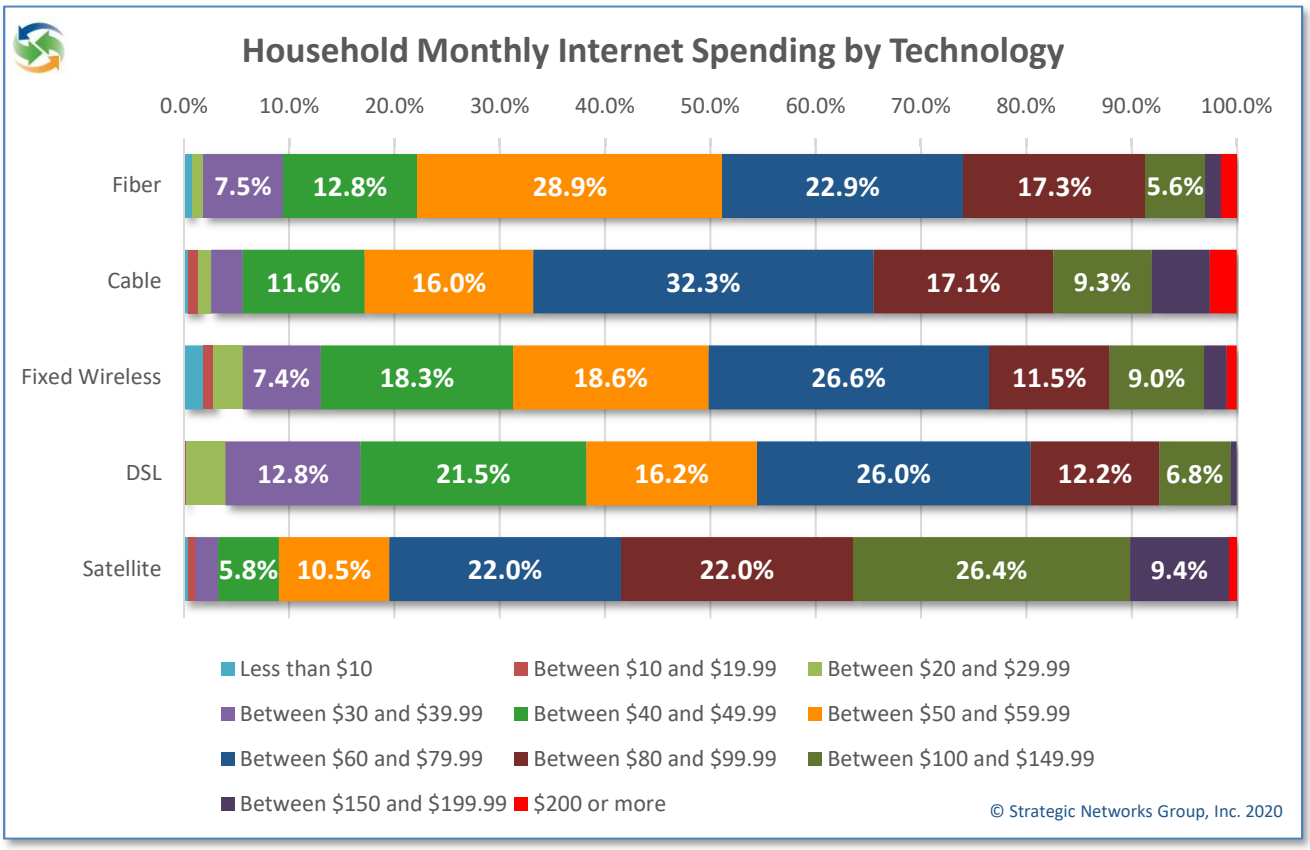
A more nuanced understanding of the wide range of business internet costs among businesses in Oregon can be gained from looking types of technology that characterize each internet spending category. Businesses in the lower monthly cost categories are using a broader variety of technology to access the internet while the higher end of spending range fiber becomes the dominant technology type.



Business spending on internet services is influenced by a number of factors over and above the service subscription rates. Businesses may subscribe to other services in addition to connectivity, such as secure connections and managed services. Larger businesses may have multiple connection, either for redundancy or for user capacity. Therefore, as indicated in the chart above, businesses spending under $200 per month tend to be smaller business that may use a variety of technologies, depending on what is available. The majority of businesses spend between $50 and $150 per month.

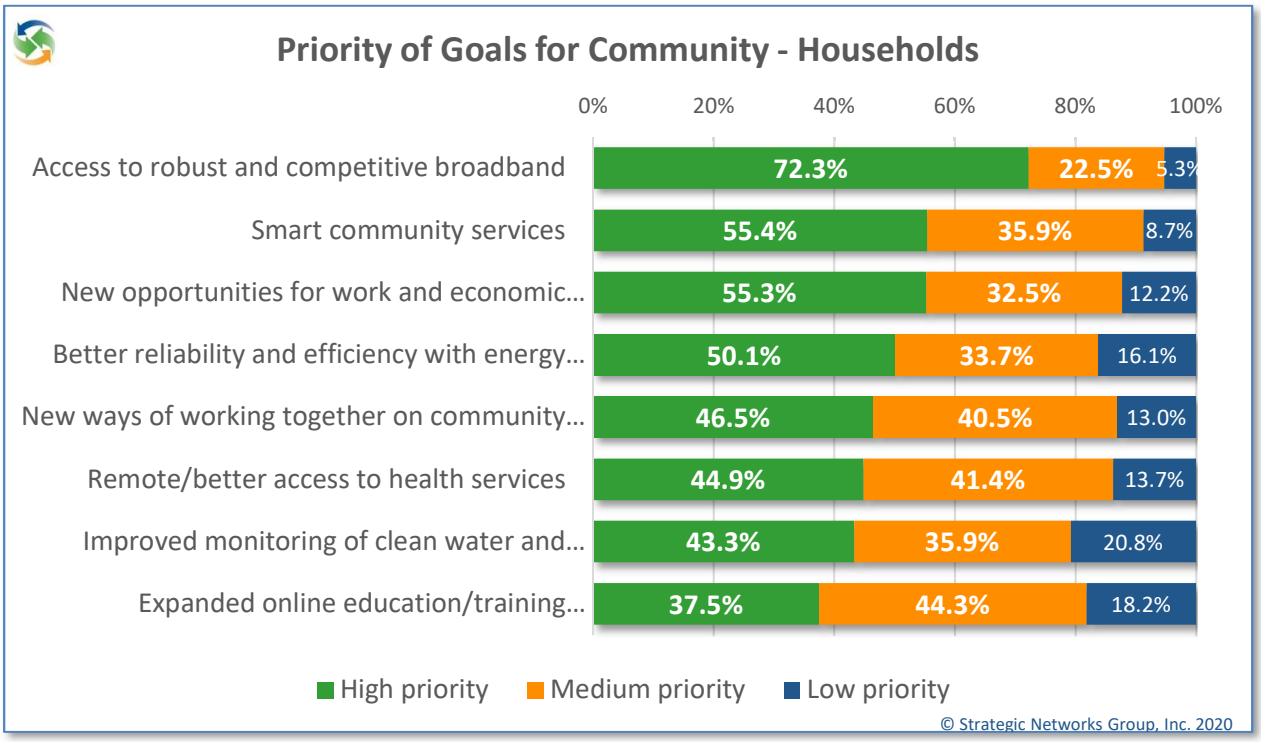
Those businesses that spend more per month on internet services they tend to purchase fiber services where available, both for its capacity and reliability. It is not an accident that larger businesses are often in the vicinity of urban areas and demand high service levels, and providers are also attracted to these localities to serve such customers.

The majority of households spend between $40 and $100 per month on internet services. The proportion of households spending in this range is consistent for all of the fixed terrestrial technologies, at between 75 and 82 percent of households. Of these technologies, cable subscribers are spending the most per month.



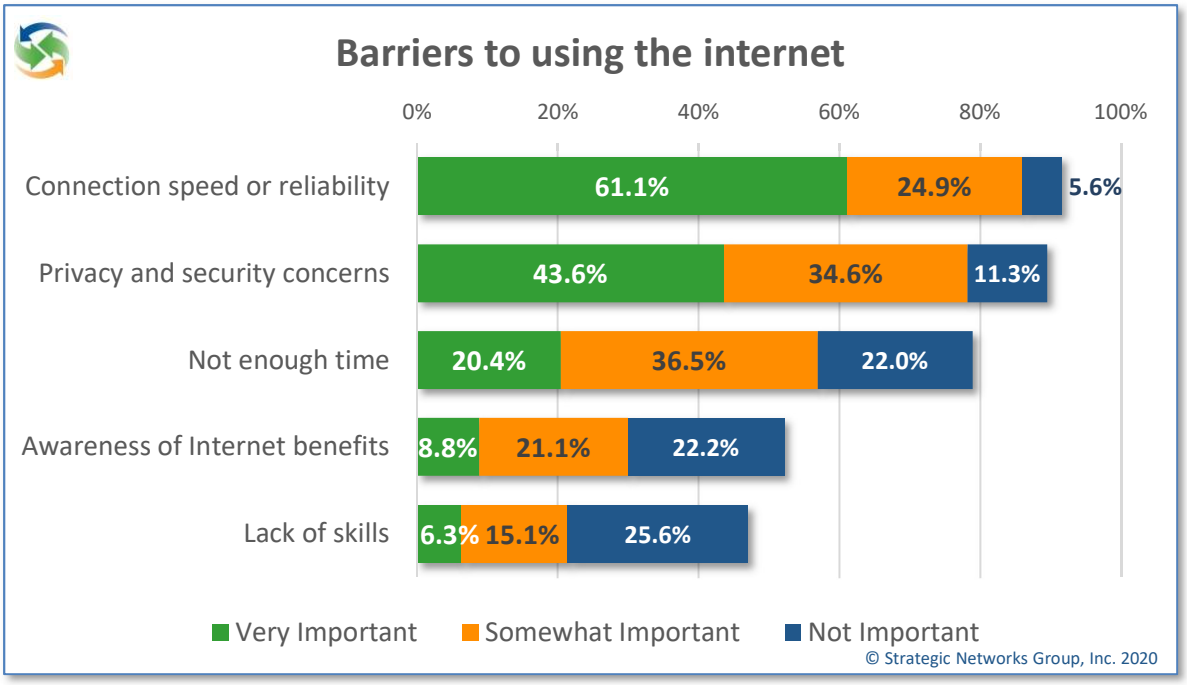
4. Addressing Broadband Gaps in Oregon

Broadband has become essential infrastructure because without sufficient and reliable broadband, communities cannot succeed. They need broadband to be economically vibrant and have the opportunity to expand their local GDP and tax base, as well as attract and grow new businesses with high-paying local jobs. This is reflected in the priorities of households across Oregon for their community goals, which focus on reliable and competitive access to online civic services and new opportunities for work and economic development – all of which are made possible through the digital economy.



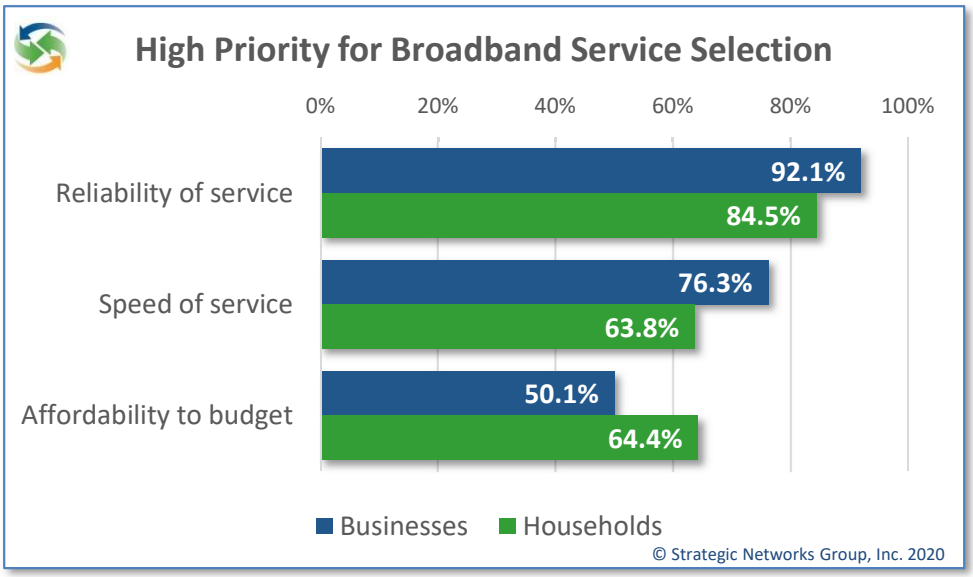
Barriers to realizing the top three community benefits above are connection speeds and reliability of the internet for 86 percent of households (very important and somewhat important). Understanding how to protect and manage their privacy and security is a need for 78 percent of households (very important and somewhat important) – this is a common and significant barrier across all communities and states[16], which has technical components but is mostly based on perception and appropriate training.

[16] Based on SNG's broadband research across nine American states and over 35,000 household respondents.



4.1 What Oregonians are Looking for in Broadband Service

Businesses and households identify reliability as the highest priority in selecting broadband service. Speed is a clear second for businesses while cost and speed are of essentially equivalent concern to households.



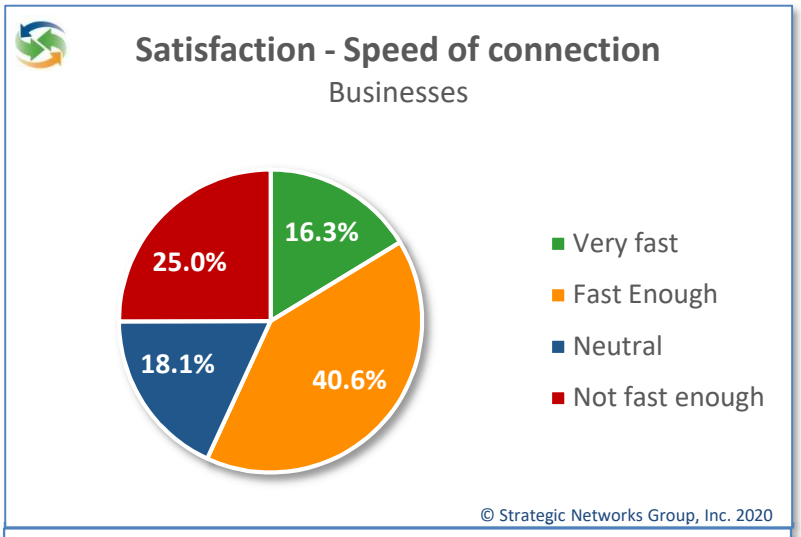
4.1.1 Interest for Better Broadband

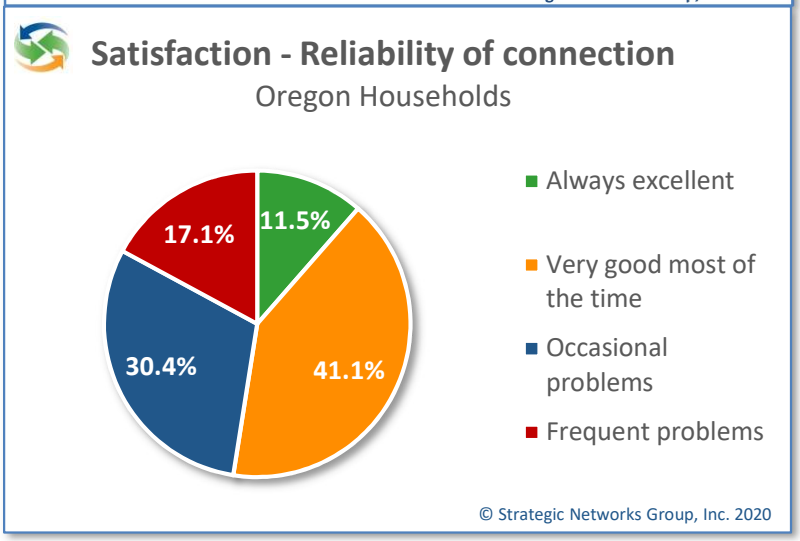
Interest in getting better (faster, more reliable) broadband begins with the satisfaction levels for current service offerings. Satisfaction levels are closely related to the technologies being used. Almost 57 percent of businesses are satisfied with the speeds of their current internet service.

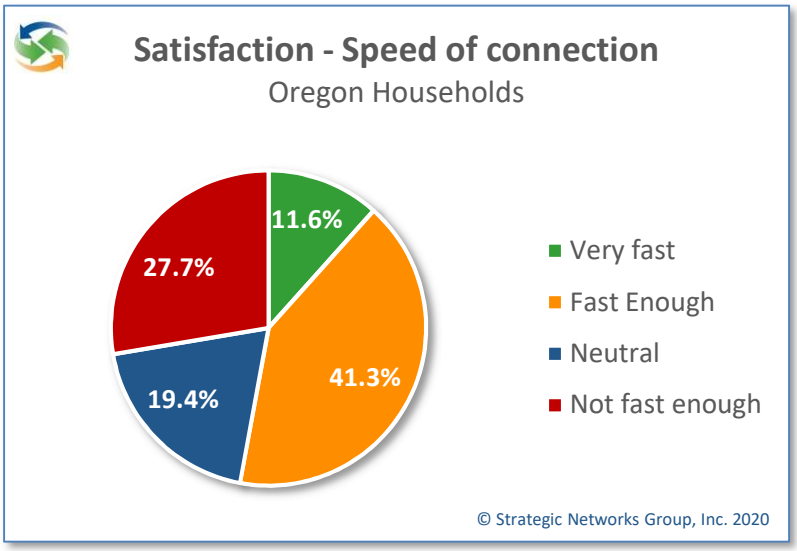
The majority (52.1%) of Oregon households find their current internet speeds adequate but are less satisfied with the reliability of their connection. More than 47 percent of households experience occasional or frequent problems with their service.

Fiber-based services have by far the highest satisfaction ratings for speed and reliability compared to cable, fixed wireless and DSL. More than 79 percent of households rate fiber as very fast or fast enough. Only 29 percent of DSL subscribers say that, while more than 50 percent of DSL users say it is not fast enough.

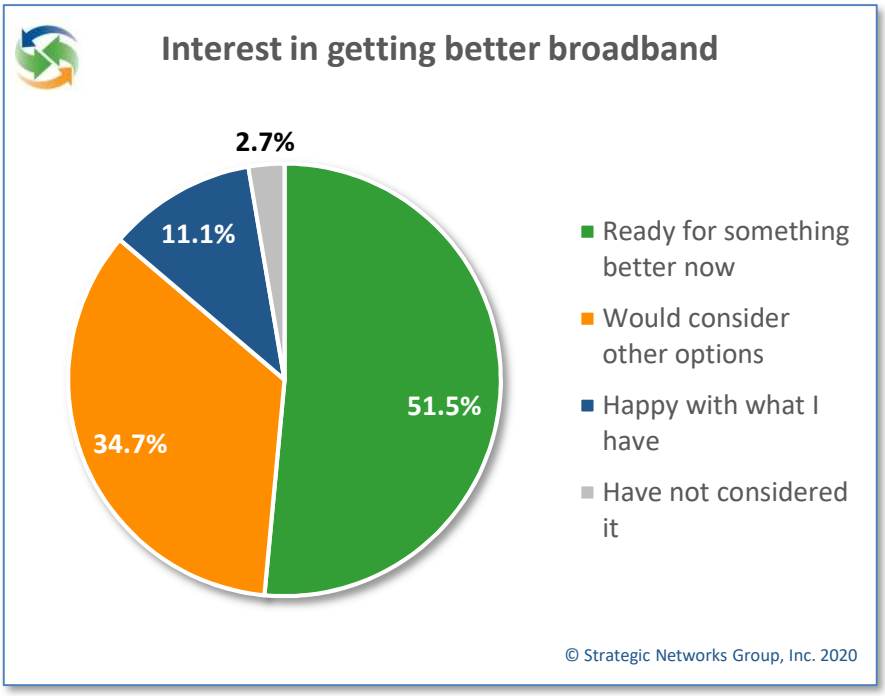
Similarly, reliability of fiber more than twice as good as DSL services, where more than a third of DSL users report frequent problems.

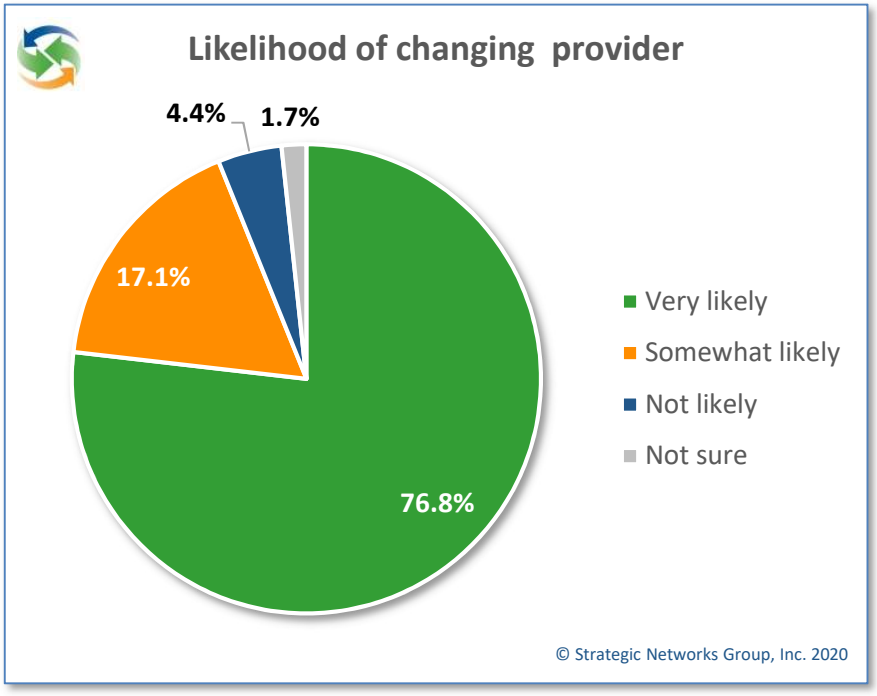


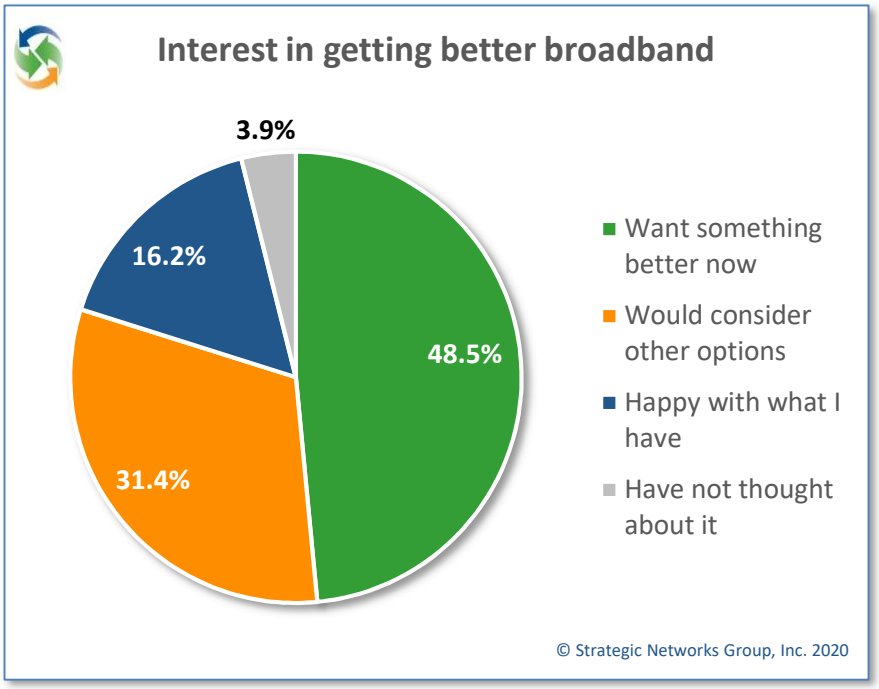




As a result, many households across Oregon are interested in getting better broadband and are ready to switch providers.

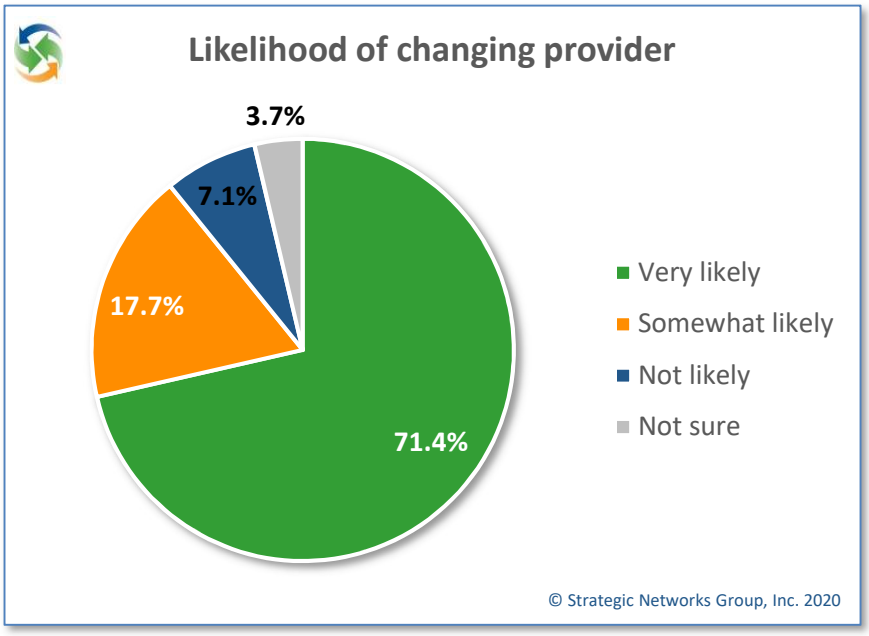






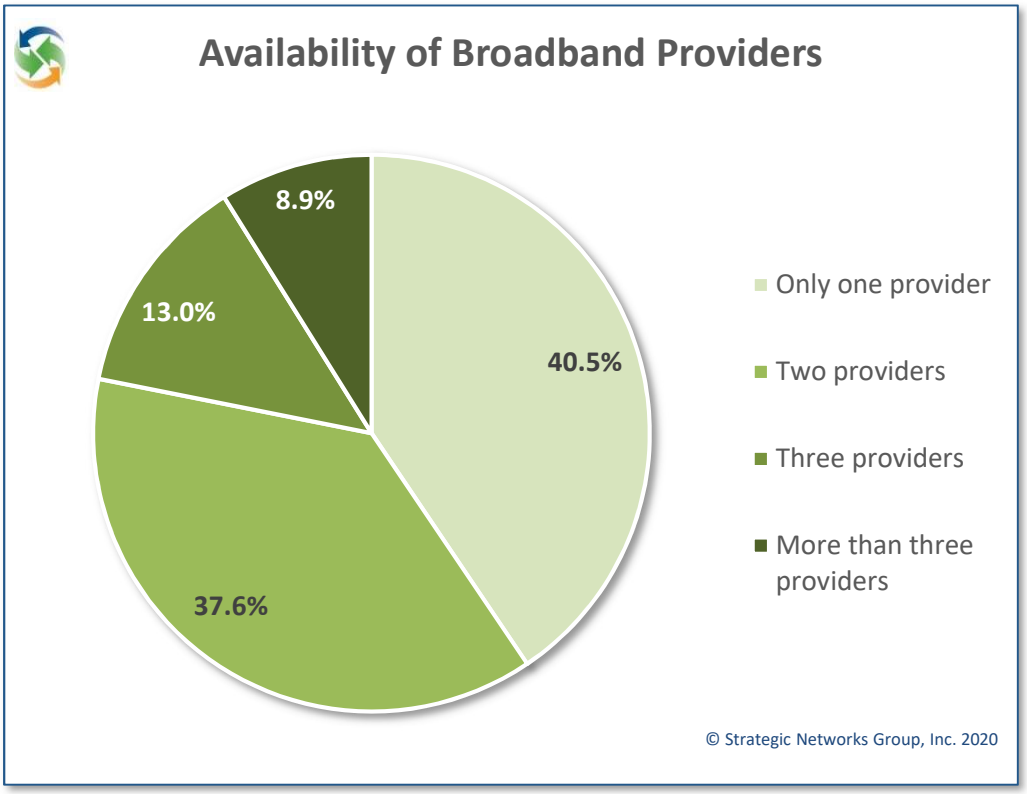
Business interest in Oregon for improved internet service is high with 48.5 percent saying they want something better now, and another 31.4 percent ready to consider other options than their current service.

More than 89 percent of businesses expressed a likelihood of changing service providers to get better service.



The environment is ripe for fulfilling a latent demand for better and faster service across Oregon for households and businesses.

Choice of providers is limited to one provider for 41 percent of businesses and two providers for 38 percent of businesses.



If having competitive markets for internet services requires at least three internet service providers, then 78 percent of businesses find themselves in uncompetitive markets – with 41 percent having only one provider.

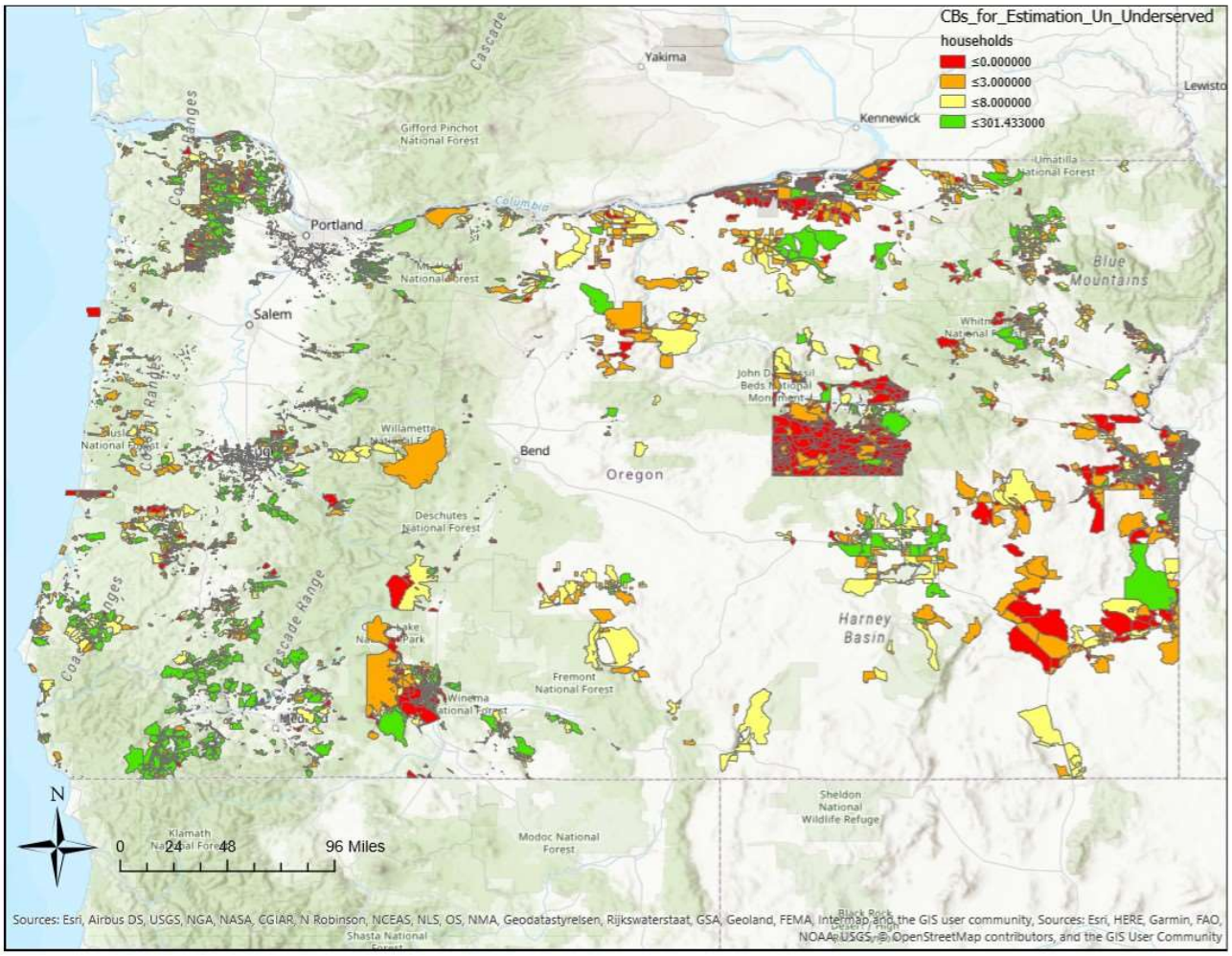
Limited choice in service providers is not surprising in areas of low population density, difficult terrain, low take rates, etc. where the high-cost of building and operating networks makes it difficult for providers to develop a strong business case for network expansions – or for justifying an overbuild where infrastructure and service offerings are already available from other provider(s).

4.2 What will it cost to bridge Oregon's broadband gaps?

Based on the assessment of which census blocks are unserved and underserved, an engineering estimate was undertaken to quantify the potential investment in fiber infrastructure to provide fiber-based service to these areas. These 18,498 census blocks represent a population of approximately 148,000 and 57,000 households. These are primarily in rural, sparsely populated areas, with an average population density of 9.5 people per square mile and 3.6 households per square mile. To put that into context, areas currently served with Basic Broadband have an average population density of 127 people and 51 households per square mile.

Population Densities by Speed Block	Households per sq.mi.	Population per sq.mi.
Unserved (< 10/1)	2.83	7.18
Underserved (< 25/3)	5.50	14.74
Basic Broadband	50.98	127.47
Future Ready	93.85	245.27

Figure 16. Unserved and Underserved Census Blocks considered for Fiber Cost Estimate



The map in Figure 16 shows the census blocks considered in the engineering estimate for broadband costs. The areas are color-coded based on the number of households identified for each census block. All census blocks in the estimate were identified with population, but not every census block had a count of households (indicated in red). Green areas have between eight (8) and approximately 300 households per census block.

The engineering estimate to provision fiber to all households in these unserved and underserved areas is $1.32 billion[17], representing an average cost per home passed of $23,101. The breakdown of fiber estimates by senate district is shown in the table below.

Senate District	Total HHP	Total Plant Miles	Households Passed per Mile	Overhead %	Under Ground %	Total Cost	Cost per Household Passed	Cost Percent of Total
Senate District 1	5,225	1,841.1	2.84	98.2	1.8	$82,671,678	$15,824	6.3%
Senate District 2	5,869	1,172.6	5.00	96.0	4.0	$54,850,966	$9,346	4.1%
Senate District 3	422	258.8	1.63	98.4	1.6	$11,722,057	$27,783	0.9%
Senate District 4	4,186	1,680.0	2.49	98.1	1.9	$75,479,305	$18,031	5.7%
Senate District 5	1,600	1,207.0	1.33	98.4	1.6	$53,896,151	$33,683	4.1%
Senate District 6	2,281	614.8	3.71	96.4	3.6	$28,602,376	$12,541	2.2%
Senate District 7	1,763	122.8	14.35	89.2	10.8	$6,661,899	$3,778	0.5%
Senate District 9	1,480	550.4	2.69	97.2	2.8	$25,227,757	$17,041	1.9%
Senate District 12	683	173.8	3.93	95.6	4.4	$8,333,877	$12,202	0.6%
Senate District 13	486	68.3	7.12	92.1	7.9	$3,588,367	$7,383	0.3%
Senate District 14	169	41.1	4.11	96.1	3.9	$2,106,327	$12,472	0.2%
Senate District 15	196	39.8	4.93	95.0	5.0	$2,092,309	$10,678	0.2%
Senate District 16	8,161	2,615.8	3.12	96.7	3.3	$120,181,086	$14,726	9.1%
Senate District 17	262	67.9	3.85	95.8	4.2	$3,371,032	$12,883	0.3%
Senate District 18	63	30.6	2.07	96.4	3.6	$1,626,169	$25,651	0.1%
Senate District 19	601	71.9	8.36	93.4	6.6	$3,716,263	$6,181	0.3%
Senate District 20	2,270	210.2	10.80	87.4	12.6	$11,395,795	$5,019	0.9%
Senate District 21	46	17.0	2.72	97.1	2.9	$977,842	$21,156	0.1%
Senate District 24	218	28.8	7.56	93.9	6.1	$1,593,018	$7,322	0.1%
Senate District 25	57	5.5	10.34	92.6	7.4	$475,011	$8,351	0.0%
Senate District 26	2,443	370.0	6.60	93.9	6.1	$18,046,342	$7,386	1.4%
Senate District 27	122	94.5	1.29	97.7	2.3	$4,447,487	$36,455	0.3%
Senate District 28	4,751	3,058.8	1.55	97.4	2.6	$138,424,591	$29,134	10.5%
Senate District 29	6,080	4,636.1	1.31	98.3	1.7	$206,806,827	$34,012	15.6%
Senate District 30	7,800	10,378.7	0.75	99.1	0.9	$455,910,602	$58,450	34.5%
TOTALS	**57,235**	**29,356.2**	**1.95**	**97.9**	**2.1**	**$1,322,205,134**	**$23,101**	**100.0%**

These estimates are based on provisioning fiber to 100 percent of the unserved and underserved households. The estimates are based on more than 90 percent overhead (aerial) fiber plant in most

[17] The cost estimate includes both fiber distribution and backbone facitilies.

cases, which is the lowest cost method. The cost per household ranges from approximately $3,800 (District 7) to as high as $58,500 (District 30). In fact, 60 percent of the estimated costs are for the three largest land area districts with the lowest population densities in the eastern half of Oregon – Districts 28, 29, and 30.

Given the required scale of total investment and the high cost per household in some districts, a target of 100 percent fiber coverage is not economically viable.

For private sector investment in fiber, the cost threshold is typically below $2,000 per household, which translates into more than 20 households per mile of fiber construction (aerial). A higher cost per household threshold could be considered where public/private investments are being considered for a public good in providing needed infrastructure. However, realistically, for low density population areas a mixture of fiber and high capacity fixed wireless technologies is going to be the answer. Fiber will be needed for backhaul facilities to fixed wireless towers and can provide fiber to the home where household densities make this economically viable, such as small towns. Fixed wireless should be used to reach out to lower density areas where the terrain topology permits.

Developing engineering estimates for mixed technology solutions requires more in-depth analysis of specific target regions and is beyond the scope of this study. However, fixed wireless technologies are already evolving to be able to provide Future Ready broadband services, so addressing the sparsely populated unserved and underserved areas is within the realm of technical possibility if there is a will for investment.

Additional investments should be considered for some of the Basic Broadband census block areas currently dependent on cable and DSL services. These tend to be better populated areas, based on average densities, but many lack full coverage of even cable or DSL services. Uncovering service gaps within the census block level and estimates for such investments should be carried out, but are outside the scope of this study.

4.3 How can Oregon bridge its broadband gaps?

To bridge broadband gaps in Oregon sustainably, it is fundamental to first understand why these gaps exist – areas are unserved or underserved with broadband because there is not enough of a business case for the private sector to invest.

Private sector investment, driven by profits and a solid business case plays a dominant role in provision of broadband infrastructure and related services throughout the US. Higher deployment costs and reduced revenue from less densely populated and/or lower wealth areas underlies the difficult task of making a compelling business case for investing in universal broadband. Where the private sector fails to invest sufficient funds for universal broadband, public sector investment is usually driven by the economic case for broadband.

Establishing a broadband network in unserved or underserved areas is a significant undertaking and in some cases cost-prohibitive. When there is not enough of a private sector business case to invest in an area, a pivot is needed to look at broadband as an essential-infrastructure investment for the long term. Localities should start by asking, "**Where do we want to be in 10 years, and how does broadband influence this strategy?"** Once a response is clearly defined, communities can tactically develop actionable steps.

The economic case for investing in broadband is based on providing broader benefits to the public. However, the economic case is often not sufficiently developed to mobilize a community and attract the necessary funding. A full accounting that comprehensively quantifies the benefits and specifies the full costs of network operations and maintenance can provide the good information required to make good decisions. This level of understanding will point to the reasons for identified gaps and to solutions that are sufficient and sustainable.

4.4 Key Factors When Addressing Broadband and Gaps

4.4.1 Urgency

In developing strategies to bridge Oregon's gaps in broadband connectivity, the urgency of the issue must be recognized and acted upon. The confluence of economic, demographic and technological forces is putting many rural communities at an existential tipping point. Rural communities are increasingly characterized by dwindling and aging populations and reduced job opportunities. Broadband is a countervailing phenomenon, making it possible to cost effectively bring vital education, health, and public safety services, Broadband support workforce training, entrepreneurial businesses with access to global market and telework, all of which make it possible to retain young adults to energize the economy. Oregon has a short time – 5 years or less – to bring its broadband gaps or risk passing the point where many of its rural areas can remain vital, attractive places for businesses and communities can thrive. States or localities that have 10-year plans to fund broadband deployment are not addressing the imminent threat posed by a lack of broadband. Communities that have to wait 5-10 years to get broadband will increasingly be "hollowed-out" and permanently damaged.

4.4.2 Implications of Competition and Compliance on Scale

Broadband is a platform for digital transformation and the productive use of online practices. As localities and states address their broadband gaps, they must also understand the two main drivers of digital transformation: **competition and compliance**. These two are critical factors for all businesses and public sector organizations if they move beyond survival to be Future Ready and thrive in an online economy. Competition and compliance are strongly felt in non-metro areas where small and medium-sized businesses struggle to compete against larger, often national and global firms.

Competition –The digital economy has brought significant disruption and increased levels of competition, especially to those sectors where digital processes have radically changed traditional processes of production and communication. Within this context, large firms are generally considered to have increased their competitive advantage relative to small and medium-sized businesses through better access and use of the internet to support:

- Access to capital, which is used for developing new digital products, services, and tools, as well as for acquisition of innovative smaller firms
- Capacity for research and development that builds on emergent technologies such as artificial intelligence (AI) and the Internet of Things (IoT) to gain competitive advantage
- Access to large data sets that inform product development, targeted marketing, customized offerings and expanded loyalty programs
- Highly efficient supply chains and logistics that take advantage of technology driven improvements, both nationally and globally

Increased concentration is one hallmark of the digital transformation. The increased competitive advantage of large firms has reduced the market share of small and medium-sized businesses, particularly in the retail and finance sectors – two sectors that play an important role in rural economies (Figure 1). Ironically, increased concentration at the national level often leads to increased price competition at local levels, as large competitors (Amazon and Walmart) push out or shrink local competitors.[18]

Compliance: Over the last two decades increasing emphasis has been placed on risk management by governments and insurers, as well as companies themselves. This has led to a dramatic growth in reporting requirements that show compliance (mandatory or voluntary) with industry-wide standards. The increased requirements for compliance have heavily impacted financial, health, construction, and food sectors (as well as many others) (source).

The need to demonstrate compliance in a timely manner has required companies and organizations to invest heavily in specialized personnel and technology that tracks and communicates large data sets across different users in a secure manner. These investments place a premium on firms having access and ability to use secure broadband connections and online tools to support compliance. The requirements of compliance are usually made on all companies or organizations within a given

[18] https://www.milkenreview.org/articles/the-surprising-thing-about-market-concentration

sector, regardless of size. This has again disadvantaged smaller entities for which compliance costs are disproportionately large and all companies that have limited access to broadband.

Scale

The impact of digital transformation on competition and compliance has a very important shared impact: it rewards scale—the larger an entity is, the more it is able to invest in the personnel, tools and other assets needed to compete and comply. This conclusion has important implications for any statewide, regional, or local initiative to deploy broadband in areas that are considered unserved or underserved.

While investing in Future Ready broadband infrastructure is a necessary step toward maintaining the economic and social vitality of non-metro areas, it is not sufficient to solve the broader challenge of scale confronting most small and non-metro businesses. As these businesses undertake their broadband-enabled digital transformation they can also use one or more of the following strategies to achieve the scale necessary to effectively compete and meet compliance requirements:

- Mergers/amalgamations or acquisition (acquiring or being acquired)
- Cooperatives and buying clubs that share the cost of providing or purchasing services based on shared applications and standards. For example, municipalities often share the costs of a shared GIS service.
- Franchises achieve scale, not only in the retail sector, but also in many other sectors (e.g. automotive, or professional services)

Alternatives that are less compelling but still attractive under some circumstance include:

- Purchasing off-the-shelf services and products, which are increasingly cloud based.
- Outsourcing to a large specialized entity that achieves scale within a narrow niche

The cost of most strategies in achieving scale is to become part of a larger entity, either directly or indirectly, therefore, any broadband investment initiative should include more than just increasing infrastructure and improving internet connectivity. Often, a critical missing piece in strategic planning is implementing efforts to raise awareness and build local capacity to make productive use of online practices. This is critical to achieve the scale needed in order to compete and comply in a digital economy – or risk being left behind. This is part of a larger truth -- that infrastructure is a necessary but insufficient investment. To stop the increasing digital divide and maximize returns on investment (both to investors and the locality) take the necessary steps to ensure citizens and businesses have the awareness, digital skills and capacity to take advantage of the infrastructure.

4.4.3 Broadband as Infrastructure and Open Access

Today high-speed, reliable internet (broadband) is an essential service similar to electricity, and water. For a community to stay relevant and attractive to businesses and residents, they have to make sure sufficient infrastructure is in place.

When areas are unserved or underserved because there is not enough of a business case for the private sector to invest, a pivot is needed to look at broadband as an investment for the long term – as digital infrastructure.

With a long-term investment horizon and experience with building and maintaining other infrastructures (e.g. water systems, roads, bridges), building and maintaining essential digital infrastructure (that enables broadband service delivery) fits within a locality's natural role. It can ensure the entire community has abundant, high-standard and future-ready networks. Private providers are more likely to select the most profitable areas, leaving potentially large parts of the community without a connection, or a patchwork of coverage.

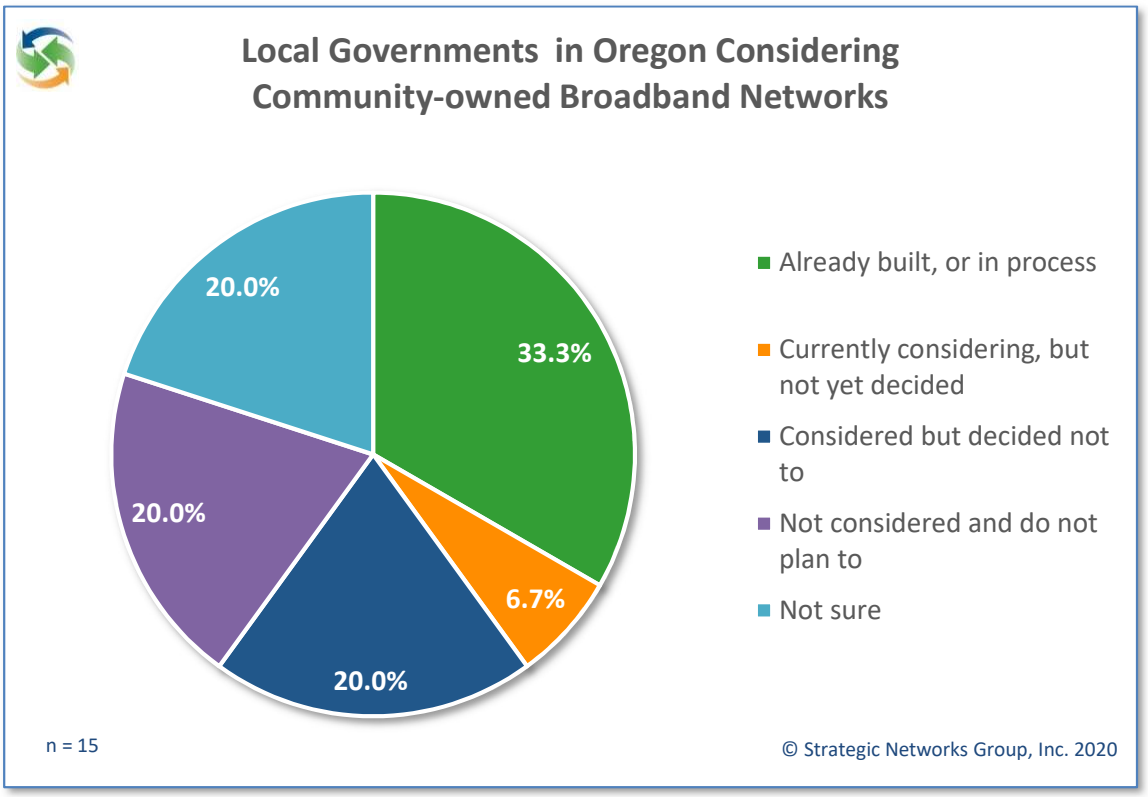
In an open access network, the ownership of the physical network infrastructure (usually fiber) is separated from the delivery of internet services. This is a model where the network owner (e.g. a municipality, electric cooperative) does not want to compete with private service providers; rather the model provides private services with a robust digital infrastructure they can utilize as a platform to sell retail internet services within a competitive environment.

At the core of the model is the neutral nature of the network owner who has invested in digital infrastructure. Since a large investment in networks is not required of service providers, the barrier to market entry and new networks is significantly lowered. This opens up markets for multiple providers even on relatively small networks. With a free market for internet-based service and competition between service providers, prices and lengths of mandatory contracts go down and the quality and affordability of service goes up.

As we look into the future, where smart-city services constitute a large portion of the utilization of a network, it is more important than ever for communities to invest in underserved areas where private sector providers will not. This also allows some control of the infrastructure and the services delivered to the public. If they cannot ensure universal and affordable access, it will be near impossible - or at a minimum, more challenging - to roll-out smart-city services. Also, in offering an open infrastructure, service providers are free to innovate and offer new services to subscribers. Conversely, if there is only a single provider on the network, the sole provider would be challenged with addressing all future service needs – a model highly unlikely to succeed in uncompetitive markets. In such situations the limited choices for business and residential subscribers makes the locality less attractive for those currently located in or planning to relocate to the area.

To that end, 33 percent (five of the fifteen) community respondents in Oregon have already invested in broadband networks. An additional 7 percent are considering a community–owned network while 20 percent (three) have decided against such an investment. Another three localities are not sure about owning and operating an open access fiber network to serve unserved or

underserved areas. Each of these localities may want to consider a digital infrastructure approach where the locality: 1) directly provides connectivity services to government locations and key anchor institutions; and, 2) provides a city-wide platform open to retail internet service providers (ISPs) to provide services to households and businesses.



The benefits of an open-access, locality-owned network strategy is that it offers the following benefits, as compared to a traditional municipal retail ISP approach:

- The locality is not directly competing with commercial retail ISPs.
- Increased retail ISP competition is enabled by an open-access network.
- The network can be self-financed through municipal cost reductions and smart community services without the locality either taking on unsustainable debt or raising taxes.
- The network is built to committed demand[19] thereby eliminating financial risk to the locality by enabling a network that is sustainable upon launch of service offerings.
- Allows the locality to leverage its core strengths in providing infrastructure, rather than operating as a commercial entity.

A digital infrastructure strategy minimizes financial burdens and risks to the locality, as well as offers a future-ready digital infrastructure to private sector service providers who may find it challenging to make a business case to invest in areas presenting a lower ROI.

[19] Committed demand is the level of sign-ups by local property owners to the new open access network.

4.5 Best Practices

4.5.1 Partnerships

Most rural broadband initiatives require partnerships with existing internet providers, as well as with businesses or organizations (e.g. utilities), that have the capacity to design, construct, maintain, and operate broadband infrastructure and related services.
BroadbandUSA, a program of the National Telecommunications Information Administration (NTIA) provides a number of resources, including a best practice guide to such partnerships. These rural broadband partnerships have at least two critical requirements:

1. A sustainable investment case for broadband needs to bring together a compelling economic case and a solid business case.

2. Community readiness to undertake and sustain a broadband initiative. Community Readiness, as the term implies, is the collective set of factors that determine whether a community is ready to undertake a broadband initiative. Community readiness can be broken down into six key criteria:

Community Readiness Criteria

- Leadership: any large-scale initiative is likely to fail without strong leadership. Feedback from rural communities has consistently identified leadership as probably the most important requirement for success. Leadership may come from a variety of sources, elected or not.
- Vision and Plan: a clear sense of direction, together with a feasible operational plan for arriving at the desired outcome.
- Market Profile: an understanding of the need and willingness to pay for broadband services is critical in developing a viable broadband initiative. Demonstrating the financial viability of a broadband initiative is key to attracting leadership, community support, and partners.
- Organizational Stability: often overlooked, organizational stability greatly facilitates the sustainability of any broadband initiative. Sources of organizational stability may differ during the development, implementation and operational phases.

- Community Awareness and Engagement: community support is particularly important when public funds and/or assets are to be used. Community support usually involves increased public understanding of the rationale, substance of the proposal, and tangible benefits.
- Implementation Ability complements organizational stability by ensuring the appropriate skills and resources needed at various stages of the broadband initiative.
- Technology Capacity: an understanding of the availability of existing technologies and assets across the community.

4.5.2 Core Local Strategies to Bridge Broadband Gaps

The core strategies for supporting local and regional broadband initiatives are:

1. Ensuring a legal and policy environment that facilitates rather than blocks local and regional initiatives, whether public, private or a combination thereof.
2. Creating or finding capacity to design, develop and manage a broadband initiative. Specific strategies include:
    - Ensure local governments have the tools and authority to enable local broadband initiatives, including but not limited to establishing borrowing authority, access to dedicated funds for broadband, and access to technical expertise.
    - Identify and facilitate local capacity to lead or participate in a broadband initiative.
    - Proactively identify potential broadband providers or partners, including: broadband providers with assets at, or near the target region or community; and, local or regional electrical or telecommunications entities with assets in the area.
3. Making a clear and positive case for investment in a broadband initiative:
    - Demonstrate effective demand for broadband services, including identification of anchor customers (public or private). This task should also actively explore the potential for aggregating demand as part of creating a reliable source of demand and income for the new service. In addition, aggregating demand also can often result in negotiating better terms when purchasing broadband services (e.g. backhaul).
    - Create an inventory of local assets that could be used in a broadband build, or to incentivize construction or expansion of broadband networks by making public assets available to private providers through IRU, lease, in kind contribution as part of private public partnership, or use in a public initiative.
4. Making sure a community or region actively facilitates a broadband initiative. Municipal departments need to be on board to smooth the regulatory and permitting process, and to minimize time-consuming and costly burdens (e.g. seeing any broadband initiative as a cash generator for local departments). Potential partners in a broadband initiative often have multiple opportunities from which to choose. In this context, communities need to be seen as providing a supportive environment. For public officials hoping to secure public funds and/or assets, they need to demonstrate that they are balancing prudent and appropriate use of public assets with the need to make an initiative attractive to participating partners.

4.5.3 Assess Economic Case for Investing in Broadband

Another best practice is to assess up-front whether community benefits outweigh the costs of investing in broadband and digital infrastructure. This is critical when unserved and underserved areas do not represent enough of a business case for private sector investment in broadband (where revenues exceed capital and operational costs). Like other infrastructure investments, the significant long-term community benefits from broadband are drivers that can make an economic case for public investment in broadband, as local leaders decided in Ammon, Idaho, and in Custer County, Colorado.

By quantifying the community benefits from broadband investments, a **community return on investment** (i.e. economic case for investing in digital infrastructure and smart community services) can be assessed and compared to the expected costs to build the network. Local property owners, ratepayers and incumbent broadband providers can see where community benefits outweigh the costs and why this is essential local infrastructure.

With empirical evidence on broadband access and use, communities and regions have the data points to build buy-in and start a process that plans for outcomes. It is also a **holistic approach** that engages the community and its providers to address their broadband gaps and future needs.

An economic case assessment includes:

- Municipal/county broadband cost reductions compared to current costs for existing and planned municipal/county facilities
- Cost reductions to community anchor institutions, such as schools and libraries
- Cost savings for households, making broadband more affordable and creating consumer surplus for local spending
- Economic growth from increased business competitiveness and productivity
- Smart-neighborhood service benefits and cost savings

Any locality considering taking their digital future into its own hands needs to understand and quantify these community benefits listed above. If they outweigh the costs, then there is an economic case for making an investment in broadband, digital infrastructure and transformation.

4.6 Private, Non-government and Emerging Funding Sources for Broadband

As broadband becomes an ever-increasing critical asset, too many smaller, rural and less affluent localities confront a confluence of geographic, economic and cultural barriers to adequate broadband. Cost is chief among these impediments - planning, designing, and constructing a broadband networks requires significant resources up front as well as an ongoing infusion of capital to operate, maintain and upgrade. For areas with low population densities the cost problem is particularly onerous, in some cases requiring 3x or more the amount of investment per square mile as assessed by the Federal Reserve Bank of Richmond.

More than two decades of efforts to address broadband gaps at every level—federal, state, and local—point to this single reality: ***there is no silver bullet solution to addressing problematic broadband gaps***. The solution inevitably needs to be location specific and involve the efforts and resources of multiple parties including funders, developers and operators and stakeholders (Figure 17) whose investments and interests are layered to optimize the approach and outcome for broadband development and utilization.

Figure 17. Elements of Broadband Development Projects

Funders	Developer and Operators	Stakeholders
Institutional Investors	Local Governments	Residents
Venture Capitalists	Internet Service Providers	Educational Institutions
Angel Investors	Non profit Consortia	Healthcare Providers
Business	Cooperatives	Businesses
Opportunity Zone Funds		Non Profits
Financial Institutions		
Philanthropy		

Leveraging Federal Funds

The federal government sets policies and regulations that directly impact broadband development, deployment and utilization. The federal government also provides billions of dollars for grants, loans and technical assistance through 50 federal broadband support programs spanning a dozen agencies. The situation is very fluid with pending changes to rules and regulations and the recent uptick in the level of funding requires regular monitoring. Oregon is fortunate in being one of 20 states with a state broadband office that stays on top of developments.
Another valuable resource recently released by the National Telecommunications and Information Administration (NTIA) is a user-friendly online tool that inventories various federal funding and assistance programs. In addition, the System for Award Management (SAM) - published annually by the General Services Administration - is a free, comprehensive resource for monitoring federal funding, including funding for broadband initiatives.

Recent sizable federal awards for previously-unserved and underserved areas of Oregon will significantly expand the State's broadband footprint and create opportunities for lower-cost expansions into contiguous areas. These include: 1) a $6 million award from **USDA's ReConnect Program** to Oregon Telephone Corporation for a fiber network for residents and businesses rural Wheeler and Grant counties; and, 2) and a $67.6 million direct appropriation from the FCC's **Connect America Fund** (CAF) that together will be expanding broadband in 12 counties. Prospects are bright for additional federal broadband funds that could be used as incentives to secure matching investments from other sources and service providers, including (1) the FCC's reverse-auction **Rural Digital Opportunities Fund (RDOF**), which will make $20.4 billion available to subsidize service costs to households and businesses in areas that do not meet the minimal standard of 25 Mbps download and 3 Mbps upload. Ninety-two thousand (92,000) bid-eligible locations have been identified in Oregon; and (2) a second round of ReConnect funding in summer 2020 (followed by a third round of funding in 2021) may bring more additional funding for broadband projects in Oregon.

Non-Federal Funds

As noted in the 2016 Rural Broadband study of the Oregon Business Development Department, there are many strategies being developed and implemented across the US to address the challenge of rural broadband deployment. Strategies include private sector solutions, public sector solutions, non-profit organization solutions, cooperative model solutions, and public-private partnership solutions, all of which may be facilitated by supportive public policies. Newly emerging options in the private, non-profit and state government arenas are very encouraging as modifications to existing community development programs, novel investment structures and proposed new state revenue programs targeting broadband development create opportunities to catalyze partnerships to provide the investment needed to close Oregon's broadband gaps.

Leveraging Local Assets and Partnerships

Funding broadband in the most challenged communities can become a creative exercise of connecting the connected dots. In even the most challenged communities there may be assets that can be the basis for reducing the external investment needed with positive impact on the ROI for broadband deployment. This can take the form of permitting/exchanging use of vertical assets (utility poles, water towers, building rooftops, etc.) or aggregating the demand of community anchor institutions (CAI), e.g., hospitals, schools, public safety, and local government facilities. Many CAI receive subsidies from the FCC's Universal Services that might be tapped for additional funding to improve connectivity. For example, more than 200 Oregon rural healthcare providers and school health centers through the Oregon Community Health Information Network (OCHIN) are accessing the FCC's Rural Health Program for funds for infrastructure capable of supporting telehealth applications and and the Rural Utilities Service (RUS) Distance Learning and Telemedicine Programfor telemedicine software, equipment and training.

External Community Development

The **Community Reinvestment Act** (CRA) of 1977[20] encourages banks to meet the credit needs of the neighborhoods in which they operate. The Federal Reserve, the Federal Deposit Insurance

[20] The CRA was enacted by Congress in 1977 (12 U.S.C. 2901) and is implemented by Regulation BB (12 CFR 228)

Corporation (FDIC), and the Office of the Comptroller of the Currency (OCC) regularly evaluate how banks are fulfilling the objectives of the CRA. Allowable bank support can include loans, financial services, grants, and/or bank employees volunteering their professional experience to a community organization. Updated CRA guidelines (July 2016) recognized investment in new or rehabilitated broadband infrastructure as consistent with CRA regulatory definitions. This change can help expand financing for essential infrastructure to provide high-speed connectivity to underserved communities for health services, education, public safety, public services, industrial parks, or affordable housing. Support for computer access and digital literacy/job skill training initiatives is also allowed. A grant, investment or loan applied to broadband infrastructure must serve low and middle income (LMI) individuals and/or geographies or revitalizing a non-metro middle-income geography. The Dallas office of the Federal Reserve has published a detailed guide to using CRA for closing the Digital Divide.

Novel Investment Structures

Qualified **Opportunity Zones** (OZ) were created by the 2017 Tax Cuts and Jobs Act to spur economic development and job creation in distressed communities throughout the country by providing tax benefits to investors who invest eligible capital into these communities through Qualified Opportunity Funds. Oregon has 86 qualified OZ, each of which encompasses one low-income census block. Qualified Opportunity Funds represent an exciting option in that 1) investments have to be in low-income census blocks which tend to coincide with the most broadband challenged; 2) significant investor tax benefits that are only fully realized if held for 10 years can offset the usual ROI business case impediments to broadband investments; and 3) OZ offer local individuals, angel investors, foundations, etc. an attractive investment vehicle to support broadband for economic and community development.

Foundations and Program-Related Investments

Beyond direct grants, foundations might be engaged in solving broadband gaps through Program Related Investments (PRI) that require repayment but generally over a longer period of time and at below market rates, making it the sort of "patient capital" needed to fund broadband in communities where the standard business case is not met. Broadband PRIs represent an outside-the-box action but as broadband becomes ever-more integral to the success of other traditional foundation interests it becomes more mission relevant and acceptable.

Creative Grassroots Funding Models- Cooperatives

Electric and telephone cooperatives (co-ops) have a long history of building and maintaining essential infrastructure and services in rural communities where they are accountable and controlled by their members. A natural extension of their mission to include broadband provision is underway, with accompanying changes to state and local laws and to eligibility requirements of a growing number of federal and state funding programs to encourage their participation in addressing rural broadband gaps. In Oregon electric and telephone co-ops are free to pursue broadband provision as a stand-alone venture or in partnership with local governments or other co-ops and 10 electric and telephone co-ops provide next generation giga-bit speeds to their members. Beyond established companies a new model of start-up broadband co-ops is emerging as an instrument for local communities banding together to solve their broadband challenges.

Municipal or Local-Funding Options

Unlike many states, Oregon does not place legal restrictions that prevent or restrict local communities from undertaking broadband development projects. A number of options exist for securing the necessary funds and for the level of involvement of the local community in the planning, deployment, management and ownership of the network. The Benton Foundation and others offer detailed evaluations of the form and merits of different local funding and partnership options.

See also Oregon Broadband Advisory Council reports and resources.

5. Summary and Recommended Next Steps

5.1 Summary

There is a rural urban digital divide in Oregon. Furthermore, there are gaps in quality of broadband service as many areas of the State are not Future Ready with digital infrastructure.

Oregon has a choice between having communities and regions across the State continue to fall behind, or incentivizing and funding investments in digital infrastructure and digital transformation (i.e. driving the productive use of online practices).

State of Broadband in Oregon

As in most states, Oregon's broadband landscape has distinct splits between urban and rural areas, with Oregon's challenges further complicated by its geographic distances and features. Areas with low population density and difficult terrain still remain underserved, or even unconnected. While much of Oregon's geography in urban areas is well-served by terrestrial broadband, however there are areas that show lesser coverage. In reviewing these areas, lower household income is a factor.

Areas that are unserved and underserved[21] with broadband are generally the result of insufficient returns on investment (ROI) that would incentivize private sector internet providers to serve those areas with high-speed, reliable and affordable terrestrial internet[22] (broadband). Lower household density per square mile often correlates with less coverage in the Future Ready (100/100 Mbps)[23] or Basic Broadband (25/3 Mbps)[24] categories.

In terms of geographic coverage across Oregon, a total of 54 percent of all census blocks are capable of providing Basic Broadband (21.8 percent) or Future Ready broadband (32.2 percent)[25]. The census blocks with Basic Broadband cover 27.6 percent of the Oregon population and Future Ready census blocks cover 67.4 percent of the population. The unserved, underserved, and unconnected areas in Oregon comprise 46 percent of census blocks and 5 percent of the population, mostly in rural areas.

- **95 percent of Oregonians are in areas with at least Basic Broadband**
- **67 percent are Future Ready**
- **5 percent are unserved or underserved**

In total, 95 percent of Oregon's population live in areas that have

[21] Unserved - internet service where the fastest advertised service is capable of speeds less than 10 Mbps download and 1 Mbps upload (10/1). Underserved - internet service where the fastest advertised service is capable of speeds greater than or equal to 10/1, but less than 25 Mbps download and 3 Mbps upload (25/3).
[22] Terrestrial internet - fixed terrestrial services which are, for this report, fiber, cable, fixed wireless, and DSL.
[23] Future Ready – internet service where the fastest advertised service is capable of speeds greater than or equal to 100 Mbps download and 100 Mbps upload (100/100).
[24] Basic Broadband – internet service where the fastest advertised service is capable of speeds greater than or equal to 25/3, but less than 100 Mbps download and 100 Mbps upload (100/100, or 100 symmetrical).
[25] According to Federal Communications Commission (FCC) Form 477 data which is the data of record used by the US for decision-making at a census block level

at a minimum Basic Broadband service level. However, it must be noted that it is unknown how comprehensively each census block is serviced with Future Ready or Basic Broadband as a census block is reported as "served" by service providers if there is at least one subscriber that is served, or able to be served in that census block. Service to others in that census block may not be available. As a result, the actual availability of broadband in a census block can be overstated – whether rural or urban. SNG's research with businesses and households across Oregon show that access to broadband is a significant issue, even in urban areas (see Section 6.4 – Open Text Responses from Businesses and Households).

A mechanism is needed to understand how comprehensive coverage is within localities and census blocks – such as assessing broadband market demand as was done for this Oregon Broadband Study. Otherwise, Oregon risks having overstated broadband coverage – which affects potential investments to ensure that universal, reliable, and affordable broadband is available across Oregon.

That 95 percent of the Oregon population has access to at least Basic Broadband is a good news story when viewed at a statewide level. However, in addition to the issue of broadband coverage potentially being overstated in both urban and rural areas, across Oregon there are significant areas – mostly rural – that are at risk of being left behind because they do not have the quality of broadband they need. This has negative local economic and community impacts. Furthermore, when examined more deeply, a large proportion of the Basic Broadband areas will also become at risk due to a reliance on technologies that cannot evolve to be Future Ready broadband service.

Although 27.6 percent of the Oregon population (approximately 1.14 million people) have access to Basic Broadband, there are issues with their broadband:

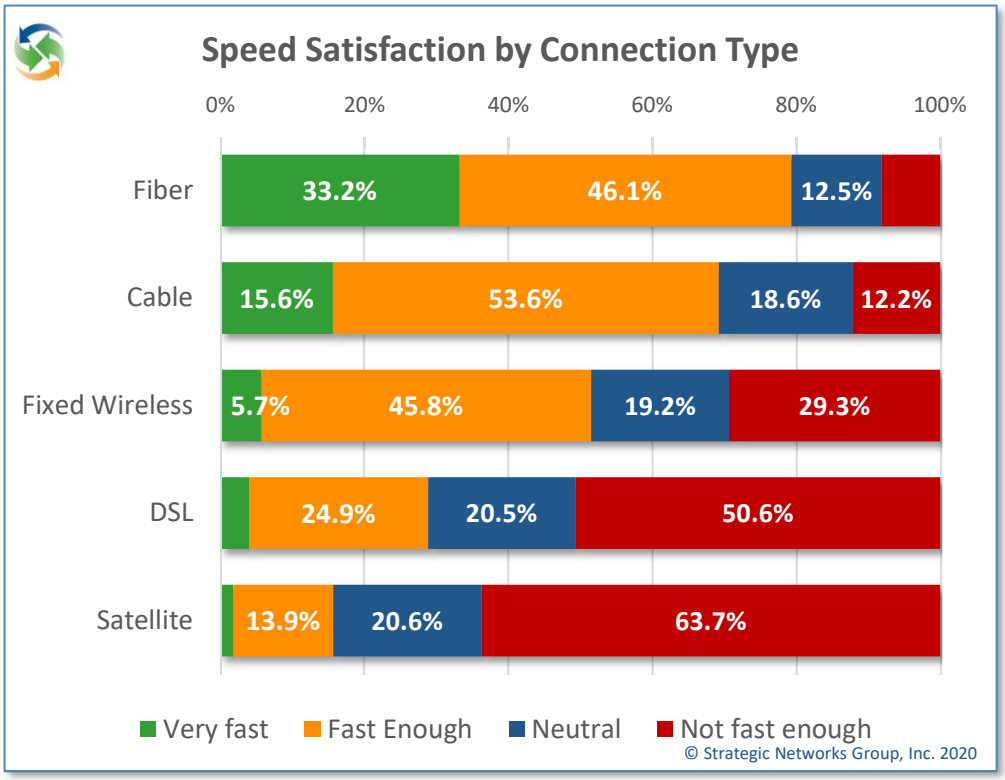
- There are 33,152 census blocks where cable service is the best available and another 2,199 census blocks where DSL is the best service available. Combined, these census blocks represent a population of approximately 962,000 Oregonians living in Basic Broadband areas with technologies that are not Future Ready..
- 25 Mbps download and 3 Mbps upload is a minimum standard – like having a high school diploma. To be Future Ready, Oregonians need more than the minimum digital infrastructure and digital literacy to effectively participate in an increasingly digital economy.
- 28 percent of households report that their internet connection speed is not fast enough, with 38 percent reporting occasional or frequent problems.
- 49 percent of Oregon household would definitely or very likely relocate in order to get a better level of broadband service. This likelihood increases with younger age groups and higher incomes, putting broadband-deficient communities at risk.

- **1.14 million Oregonians live in areas with Basic Broadband**
- **962,000 of those do not have access to Future Ready technologies**

- Three quarters of households and businesses across Oregon are very likely to change service providers to get better broadband services, another strong indication of dissatisfaction with current services in many areas.

While at a state level it may appear that Oregon is in good shape for broadband availability, there are many areas where businesses and households are clamoring for better service with approximately 1.17 million Oregonians living in areas that are unconnected, unserved, underserved, or have older technologies providing Basic Broadband. This implies that approximately 28 percent of the Oregon population has **no** access to Future Ready broadband services and this manifests itself as a broadband quality issue in terms of speed of actual service and reliability for subscribers.

"Not fast enough" is how 50.6 percent of DSL subscribers and 63.7 percent of satellite subscribers report their internet service based on findings from SNG's research across Oregon for this study. Similar low satisfaction with reliability is reported by subscribers to satellite and DSL. A similar pattern exists for satisfaction with reliability for the different technologies, with fiber coming out far ahead of DSL.



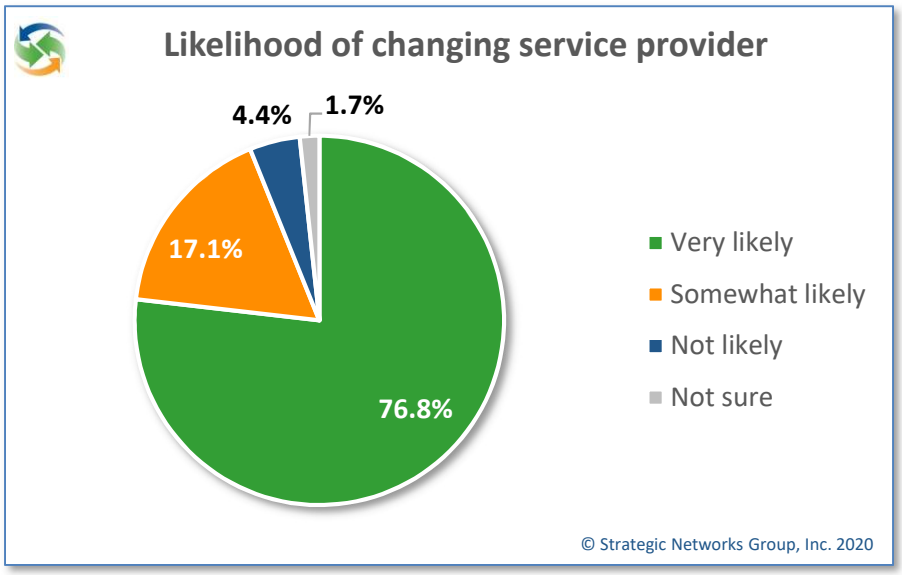
To illustrate some of the issues businesses across Oregon are facing regarding their quality of internet service, below is a selection of feedback from SNG's statewide research:

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	**Industry**	**City**	
Business	Construction	Hubbard	We are experiencing service interruptions and slowdowns almost on a daily basis, due to poor internet connection. CenturyLink considers our area a low priority for upgrade to fiber optic, and without access to any other provider, we are stymied. I have contacted other providers in the area, but they all say that they can't help us.

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	**Industry**	**City**	
Business	Professional & Technical Services	Corvallis	Waste less time waiting for uploads/downloads of files and information.
Business	Accommodation & Food Services	Camp Sherman	Provide a better experience for our customers. At this point, most of our guests are used to a reliable, fast broadband experience and we need to be able to provide that
Business	Finance & Insurance	Portland	When our internet is down, our business comes to a halt.
Government entity	Transportation & Warehousing	Spray	State programs that our slow internet will not allow us to be a part of at this time.
Business	Real Estate	Portland	We have broadband; it's expensive & sometimes unreliable.
Nonprofit	Health Care & Social Assistance	Monmouth	Better reliability. Internet going down is always a problem, and all business and work stops.
Business	Educational Services	Gold Beach	Our internet is so slow and frustrating; we can hardly use it for business purposes.
Business	Accommodation & Food Services	Corvallis	Pay less for service on par with the rest of the developed world.

* See Section 6.4 for full set of business and household responses.

Changing service provider is very likely or somewhat likely for 89 percent of households and 94 percent of businesses – which implies dissatisfaction with their current quality of service.



Aspirational digital infrastructure and transformation targets need to be set, funded, and implemented if Oregon is to be a place where people choose to work and live. Oregon has a short time – 5 years or less – to solve its broadband gaps, or risk passing the point where many of its rural areas can remain vital, attractive places where businesses and communities can thrive.

Based on the 18,498 populated census blocks identified as unserved and underserved for this Oregon Broadband Study is estimated at $1,322 million to build Future Ready broadband. Approximately 60 percent ($801 million) of this amount would be required for three expansive and rural senate districts in the eastern half of Oregon (Senate Districts 28, 29, and 30).

The $1.3 billion cost estimate to build fiber to unserved and underserved census blocks across Oregon is cost prohibitive for private sector investors as they are reluctant to invest over $2K per household. Where the market has left areas unserved or underserved with broadband, three approaches need to be brought together to ensure a minimum of Basic Broadband across Oregon – different technology solutions, patient public investment, and digital transformation:

- Mixed fiber and fixed wireless solutions need to be investigated at a locality by locality basis to find locally economically viable solutions – especially where there are large distances between pockets of population. Because the design of cable is asymmetric, it's not clear that further investment in cable-only systems will sufficiently prepare areas for future demands. Further investment in DSL systems will not enable areas to be Future Ready (minimum 100/100 Mbps).
- Patient capital and/or public investment for longer term investments (15-30 years) with steady rates of return. Funding programs can be part of the solution, but the sustainability of broadband initiatives cannot rely on government funding. Therefore each locality needs to assess the extent to which benefits outweigh the costs from investments in digital infrastructure.
- Broadband infrastructure is a necessary but insufficient investment. Any broadband investment initiative should include more than just infrastructure and internet connectivity, but also include digital transformation – which is raising awareness and building local capacity to make productive use of online practices (utilization).

The private sector cannot be expected to solve this problem alone as the community benefits are largely off-balance sheet to them. The rural-urban digital divide in Oregon is not likely to decrease unless public investments are made in digital infrastructure and transformation. Policies, strategies, and programs in Oregon should therefore be developed to:

- Assist localities with the necessary planning, economic case development, and demand aggregation without massive State funding of infrastructure.
- Help localities find the mixed technology solutions that work for them, along with funding sources to "kick-start" the process and guidance before the fact. This includes best practices in planning, developing an economic case for investing in digital infrastructure, aggregating and driving demand to build a sustainable network business case, new business and operating models (e.g. open access) with public ownership of the physical network infrastructure (usually fiber) separated from the delivery of internet services by private sector providers
- Leverage State resources while enabling localities to address their own unique needs, along with coordination and collaboration among interested and motivated localities during the

process to find and implement the right solutions, with support and guidance and learning from each other. The Oregon Broadband Office has a critical enabling role here.

In summary, to maximize returns on investments from broadband so that it drives competitiveness of businesses and quality of life for households across Oregon, attention and investment must also be made to ensuring all citizens and businesses have affordable access to broadband – along with the awareness, digital skills and capacity to take advantage of that digital infrastructure. Digital infrastructure is foundational for universal, reliable, and affordable broadband so that people choose to work and live across Oregon – rather than just in the urban centers. Digital transformation is raising awareness and training on the productive use of online practices so that Oregon:

- Businesses are competitive, can reach new markets, and offer new products and services – which allows them to stay and grow.
- Residents can benefit from online health, education, and civic services no matter where they live – enabling them to choose where they work and live.
- Network investors and internet service providers are incentivized as digital transformation programming drives market growth across Oregon.
- Business, local governments, and institutions can achieve the scale needed in order to compete and comply in a digital economy – or risk being left behind.

Although technology continues to evolve at unprecedented rates, it is no surprise that less-populated localities have still not reaped the same benefits of broadband accessibility and affordability as urban areas. This disparity has far too long been rationalized and generally accepted that "there always has been and always will be a gap in the quantity and quality of services available in rural vs urban localities."

With the release of data and recommendations presented in this Oregon Statewide Broadband Assessment and Best Practices Study, legislators and other elected officials across the State are equipped to better address Oregon's digital divides. The State has a choice between placing this critical issue on the back burner, or directing attention and incentives for investments in digital infrastructure and digital transformation. Bridging the digital divide will allow Oregonians the option of living and working in the locality of their choosing, rather than limiting their options to certain segments of urban centers. Universal, reliable, and affordable broadband is critical for Oregon as a whole to be competitive, as well as to retain and grow both businesses and population.

5.2 Recommended Next Steps

This report integrates a comprehensive and rigorous analysis of existing infrastructure availability, technology types and costs found throughout Oregon with detailed primary data from citizens and businesses on their interests and priorities for accessing and using broadband.

The gaps and opportunities, best practices and models described in this report are intended to provide an foundation for actionable strategies to move unserved and underserved communities in Oregon forward to a more connected and competitive future. The following recommendations are offered as recommendations for next steps to ensure that all of Oregon can be part of that vision for a better future:

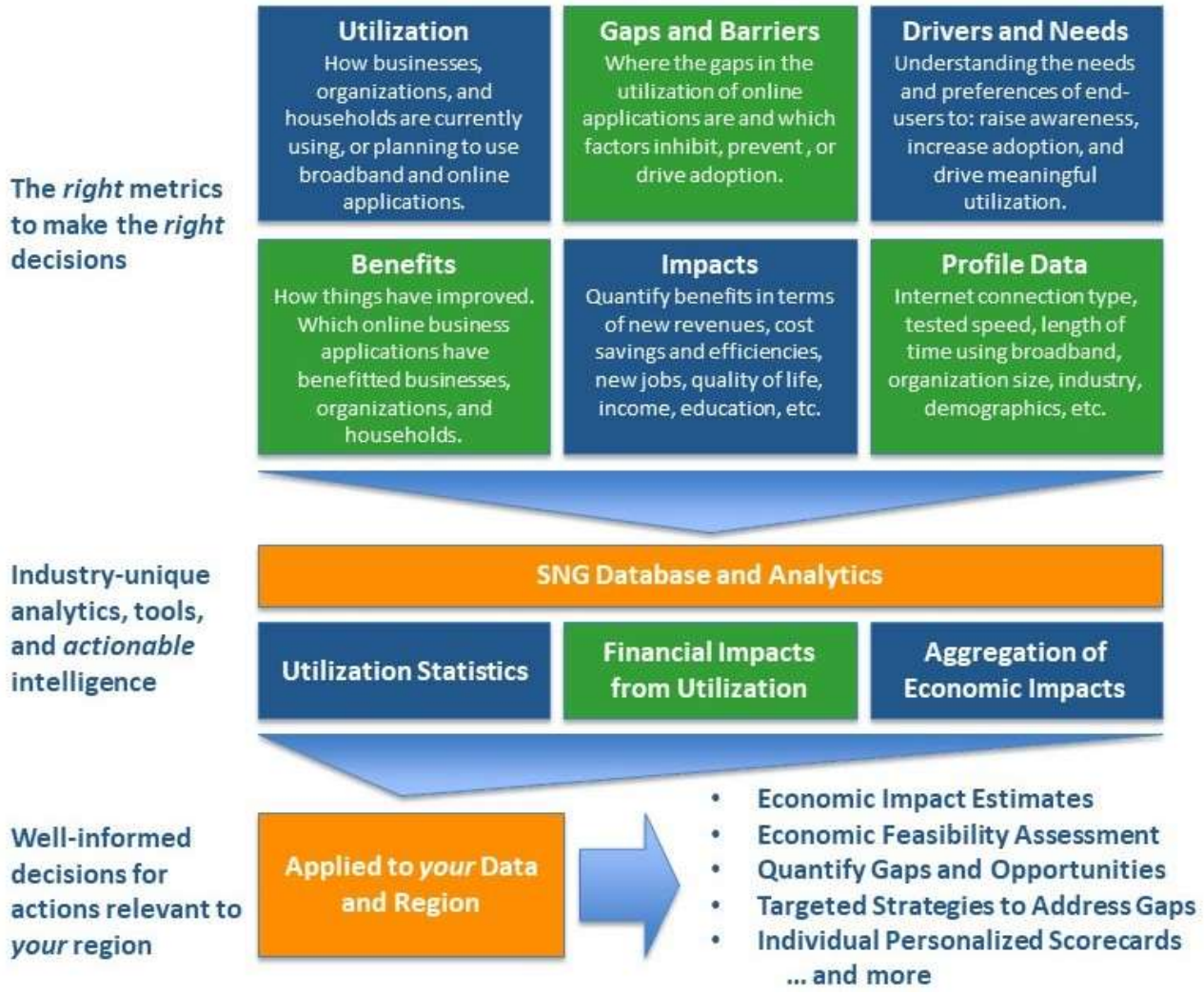
- Approach broadband as an essential service and ensure sufficient digital infrastructure to enable universal, affordable, and reliable broadband
- Disseminate findings from this study to legislators, community leaders and broadband advocates– for example, by hosting webinars on how findings apply to their local situations. This information sharing, along with providing a vendor neutral and technology agnostic advisory role are important functions for the Oregon Broadband Office which can take 25-35 percent of staff time as SNG's research with other state broadband offices has shown.
- Inform Oregon broadband policy and strategy with findings from this Oregon Broadband Study to address identified gaps and issues
- Build capacity for vendor and technology-neutral broadband advice so that localities across Oregon can make better-informed decisions on expertise and contractors they hire to address their specific needs; for example, standard templates to facilitate development of RFPs for broadband planning and deployment and checklists for vendor qualifications.
- Build awareness and capacity among communities to identify and pursue innovative and emerging strategies for funding broadband; for example engage Oregon's banking, philanthropic and investment communities as part of the solution through joint creation of models for CRA and/or Opportunity Zone and Impact Investment Funds.
- With limited funds, underwrite local planning and demand aggregation that can build a case for broadband investment to get 10x more broadband coverage for every tax dollar invested. Focus public investments in digital infrastructure where there are critical and significant community benefits, but not enough of a case for private investment – see https://sngroup.com/get-ten-times-more-broadband-coverage/
- To realize economic benefits from broadband infrastructure, maximize its productive use through meaningful use of online practices apply best practices from Section 4.6 to leverage existing local resources and maximize local benefits from broadband investments. Deployed correctly, with the right strategies, best practices, and tools, broadband networks recover costs by increasing local competitiveness, productivity, and revenues – which in turn improves job retention, creation, and local quality of life.

6. APPENDIX – SNG Research Methodology

For more than two decades SNG has focused our research efforts on identifying and quantifying the uses, benefits, and economic impacts of broadband on users and the communities in which they live and work. The goals of the research have varied from project to project, but the underlying questions of how people use and benefit from broadband, as well as what are barriers and challenges, remain at the core of our research methodology. This has allowed SNG to standardize on a set of core questions to provide a consistent dataset over time.

While this consistency provides a basis for ongoing benchmarking, we also recognize the need to adapt and evolve over time. With each client come different goals and objectives that we accommodate in our research design, as well as evolving our research design to align with the changing market tends and information needs. Our research and analysis methods have been successfully demonstrated in statewide market research projects in nine (9) states and numerous regions across seventeen (17) states.

Figure 18. SNG's Practical Approach to Putting Your Data to Use



6.1 Research Methodology for Oregon Broadband Study

Goals and Methods

A key goal of the Oregon Broadband Study was to identify the "geographic areas of the State that are unserved and underserved. "Underserved" means data published by the Federal Communications Commission, other federal agencies or the State of Oregon, a geographic area within one or more census blocks, within which there is no terrestrial service provider offering residential wireline or wireless broadband service at a speed of at least ten (10) megabits per second for downloads and one (1) megabit per second for uploads."

The State of Oregon already has an online interactive broadband map that uses published FCC Form 477 data ("FCC data"). Due to the known limitations of using FCC data[26], this study sought to find and use other data sources in addition to, and in conjunction with, FCC data in order to provide a more reliable base for identifying unserved and underserved areas across the State.

The analysis of the available data sources focused on clearly defining the unserved and underserved areas of the State by census block for reporting, as well as to provide equivalent mappable data that can be used by the Oregon Broadband Office in its online interactive broadband map.

Broadband Parameters

The parameters of broadband service and speed levels were defined through discussion and agreement with the Oregon Broadband Office, as follows:

- **Speed blocks** – speed ranges defining categories of broadband for mapping and analysis purposes, especially at the census block (CB) level
    - **Unconnected** – no evidence of broadband connections within a CB
    - **Unserved** – CBs where the fastest service available is less than 10 Mbps download and 1 Mbps upload speed (10/1)
    - **Underserved** – CBs where the fastest service is greater than or equal to 10/1, but less than 25 Mbps download and 3 Mbps upload speed (25/3)
    - **Basic Broadband** - CBs where the fastest service is greater than or equal to 25/3, but less than 100 Mbps download and 100 Mbps upload speed (100/100, or 100 symmetrical)
    - **Future Ready** - CBs where the fastest service is greater than or equal to 100 Mbps download and 100 Mbps upload speed (100/100)

In creating this report, the project team integrated data from SNG's eSolutions Benchmarking (eSB), GeoTel Communications, LLC, SpeedupAmerica, and the FCC 477 Fixed data, all current as of December 2018. We then focused on four widespread terrestrial technologies: DSL, Fixed Wireless,

[26] FCC Form 477 data is data reported by internet service providers using Form 477 to identify broadband service availability, defined as census blocks with at least one customer able to receive, or actually receiving, a broadband service at advertised speeds. No information is provided to indicate how well served the census block is beyond one customer.

Cable, and Fiber. By combining the various data sources, each Census Block (CB) was assigned a Speed Block category, a primary technology for each Census Block with its speed block, and a Fiber Presence category.

Four data sets were combined to make the speed block assignment, beginning with the FCC 477 data, then looking at the presence of fiber-lit premises, actual responses to the eSB, and the speed test results from SpeedUpAmerica. The algorithm assigned the fastest speed block possible consistent with all of the data

- **Technologies** – terrestrial technologies used for wireline or wireless residential services:
  - Fiber
  - Cable
  - Fixed Wireless
  - DSL

In identifying a technology for each census block, the "best" technology of those available is chosen based on the order of "best" being fiber, then cable, then fixed wireless, then DSL. While many CBs will have more than one technology available, only the best of those four is designated for the CB. Showing a CB as "fiber" does not preclude the presence of cable, fixed wireless, or DSL. However, showing a CB as "fixed wireless" means that neither fiber nor cable are available at the speed-category achieved by fixed-wireless. In a few cases, census blocks with very low-speed fiber offerings were assigned a non-fiber technology that boosted the CB to a higher speed block category.

It is understood that mobile wireless and satellite services are available for residential customers and such services can be acquired in areas where terrestrial services are unavailable. However, these services are not considered fully equivalent or substitutes for terrestrial broadband services and are not included in this study. We note, however, that for higher speeds (100 Mbps and up), many Fixed Wireless offerings stated upload speeds comparable to, or symmetric with, their download speeds.

An additional parameter was proposed to show the presence of fiber infrastructure by CB to indicate where fiber may be utilized or extended to provide Future Ready services. This is particularly useful to know for geographical areas that do not currently have significant fiber-based services.

The fiber presence assignment (see table) looks at the presence of fiber infrastructure within a Census block based on data from GeoTel. The category is derived from the number of miles of fiber-routes and the ratio of the fiber route mileage to the tot street mileage.

This parameter is defined as:

- **Fiber Presence** – the existence and relative amount of fiber infrastructure within a CB based on a combination of fiber route miles and ratio of fiber route miles to street miles.

- **Trace** of fiber – less than one route-mile of fiber and less than one route-mile per street-mile.
- **Moderate** fiber presence - less than one route-mile of fiber and greater than one route-mile per street-mile; between one and five route miles and less than 2 route-miles per street-mile; between five and ten route-miles and less than one route-mile per street-mile.
- **Abundant** fiber - between one and five route miles and more than 2 route-miles per street-mile; between five and ten route-miles and between one and two route-mile per street-mile; more than 10 route-miles, but less than one route-mile per street-mile.
- Fiber **Rich** - between five and ten route-miles and between more than two route-miles per street-mile; more than 10 route-miles and more than one route-mile per street-mile.

A combination of fiber route-miles and the ratio of route-miles to street-miles was considered a more useful definition than either alone, since the size of census blocks can vary considerably based on population density. The ratio gives an indication of "fiber density".

Fiber Presence	**Fiber Route-Miles/Street-Miles Ratio**		
Fiber Route-Miles	**Less than 1**	**Between 1 and 2**	**Greater than or equal to 2**
Less than 1	**Trace**	**Moderate**	**Moderate**
Between 1 and 5	**Moderate**	**Moderate**	**Abundant**
Between 5 and 10	**Moderate**	**Abundant**	**Rich**
Greater than or equal to 10	**Abundant**	**Rich**	**Rich**

Data Sources

This study made use of the latest version (data as of 12/18/2,018, released on 1/8/2020) of the FCC Form 477 Wireline data as a basis and starting point for analysis. The FCC data is the only publicly available data source for broadband speeds and technologies that provides comprehensive coverage across the State. The FCC data provides advertised speeds of available broadband services, the technologies used, and the number of carriers at the census block (CB) level. Other **broadband data sources** were sought and considered for analysis at the CB level, including:

- MLab speed test data

- Speedupamaeric.com (SUA) crowdsourcing speed test data
- GeoTel fiber route infrastructure data
- GeoTel fiber-lit building database
- SNG Connectivity Data

Of these data sources, it was determined that all except the MLab speed test data would not be suitable for analysis at the CB level. While the MLab dataset is extensive, the geolocation of the data is not sufficiently accurate to reliably associate the data to CBs. The data is increasing reliable, however, for larger areas such as Counties, and State Senate Districts.

In order to supplement the FCC data and other data sources, SNG also undertook a statewide data collection initiative to gather connectivity and speed data, as well as other data on broadband usage to inform broadband strategies and planning for the Oregon Broadband Office. The data collection methodology is described in the data collection section below.

In addition to the broadband data sources, other data was used for various aspects of analysis, including:

- Data from US Census American Community Survey, 5-year data, 2014-2018, released 12/19/2019
- FCC Staff Block-level population estimates, dated 2017.

Target Outputs for Oregon Broadband Study

In addition to the Oregon Broadband Study Report, the primary target outputs of the study are:

- Geographic “heat maps” to visually show where broadband related data, such as the speed blocks, existing technologies, and fiber presence at the CB level. These are color-coded static maps that include:
    - Speed blocks by CB
    - Technology by CB
    - Fiber presence by CB
- Mappable data files to be used by the OBO for the interactive broadband map to show relevant broadband data at the CB level
    - Speed blocks by CB
    - Technology by CB
    - Fiber presence by CB
    - Fiber-lit Buildings by CB
    - Number of fiber carriers by CB

The heat maps are intended to provide overall visual representations of the key broadband parameters described above in a geographic perspective and including State senate district boundaries.

Additional outputs used in this report include bar charts that show the speed block and technology coverage as percentages of CBs or population, broken down by State senate districts and by county. These charts provide another visual aid to quickly see where populations have better or worse broadband service available.

Data Collection

In the absence of any comprehensive data sources on broadband availability independent of the FCC Form 477 Data, it was agreed that an independent statewide data collection effort be conducted to gather as much data as possible from households and businesses across the State. SNG applied its proven tools and methods used in nine previous statewide data collections and numerous other regional projects.

SNG's primary data collection method is to use online tools using Qualtrics, a world-class online survey platform. This method provides the most expansive and economical method for data collection and is well suited for gathering data related to internet and broadband use. SNG has developed two separate online tools for gathering data from households and from businesses and organizations, the eHousehold Assessment and eBusiness Assessment respectively. These assessments were customized with additional questions for the Oregon study as well as to focus on broadband availability data.

In order to complete the data collection in a compressed four-week timeframe to meet the project schedule, SNG acquired email contact lists for 115,000 households and 30,000 businesses and organizations. These lists were used to send direct email invitations requesting Oregon residents and businesses to participate in the study research. In addition, SNG created a custom web page to direct Oregon residents and businesses to the online assessments.

The Oregon Broadband Office was also instrumental in reaching out to other organizations across the State to help promote the study and direct people to the web page, as well as reaching out to State employees through intermediaries and using social media to promote the initiative.

Through these combined efforts responses were received from 3,605 households and 539 businesses and organizations. This is a good response for data collection within a 4-week time period and with no advance publicity. Responses were received from all counties and senate districts across the State and provided additional connectivity data for 2,623 census blocks.

The SNG dataset was cleaned and processed for use in this report as well as for use in the analysis of speed blocks and technologies at the CB level. As part of the data collection, respondents were requested to take a speed test and the resulting measure speeds were used to establish the speed blocks for each respondent.

Fiber Data Collection (GeoTel Communications)

Analyses of spatial telecommunications data (including fiber routes, fiber-lit buildings, and additional data sets) was conducted by GeoTel Communications. GeoTel has been collecting data and building relationships in the telecom space for nearly 20 years. The quantity and reliability of

their data has led to a client base that includes some of the largest and most well-known companies/organizations across the globe. Numerous Federal, State, and Local Governments utilize GeoTel data for gaining the insight necessary to make intelligent, location-based business decisions. Their primary sources comprise (a) telecom data provided directly from carriers with (2) secondary support methods (including third-party vendors, as well as drones and other field collection methods). These diverse sources, along with internet research and Freedom of Information Act (FOIA) requests for assets on public rights of way (ROW), collectively go into evolving their expansive data sets. Data is assimilated into a digital format, then digitized in GIS to high-quality, streets-based maps. Attributes are appended to the data, resulting in unparalleled and well-researched databases consisting of more than fifteen (15) telecommunications data sets. The data sets include fiber network maps, over 4.2 million fiber route miles, 16.7 million fiber-lit buildings, nearly half-a-million cell towers, thousands of additional vertical assets, 9,000 data centers, and much more.

Although GeoTel's data includes fiber routes from ~35 individual carriers in Oregon (nearly 900 nationwide), the fiber footprint data is further enhanced by the inclusion of carrier-lit buildings from far more carriers than are represented in the fiber routes themselves. This expanded data results in thousands of additional data points identifying fiber-lit buildings. Yet, with carriers and their fiber routes ever-evolving, it's impossible for such data to be 100% complete. We recognize that additional carriers and their fiber routes have yet to be collected; therefore areas of the State may not reflect all existing fiber routes or lit-buildings. Carriers who are not represented in the maps will find partnering and revenue benefits by being included. Anyone who has an interest in learning more about the data, how to participate, or how to license access to the proprietary data, are welcome to contact GeoTel directly. Contact information is available on the website (https://www.geo-tel.com/).

Analysis Methodology

The analysis of the broadband data from multiple sources toward achieving the target outputs was done at the census block (CB) level as much as possible. Working at the CB level allows for creating the mappable data at the CB level while also being able to aggregate data at the county and State senate district level. Some other data sources used for secondary analysis, such as US Census Bureau (USCB) demographics and populations, are not available at the CB level.

The analysis of service availability focused on populated census blocks. For Oregon, 115,937 out of 196,621 CBs are populated (59%). Since USCB does not provide population estimates at the CB level, the analysis used population estimates provided through the FCC data to identify populated CBs.

The analysis used the latest (Dec 2018) FCC Form 477 data as a starting point for identifying service availability and technologies for populated CBs. Independent data from other sources were then used to evaluate the CB status based on FCC data. Where differences were observed in the speed block, technology, or populated status, those differences were evaluated toward potentially changing the status of the CB.

- Where there is evidence of a faster speed block, the CB is "promoted" to the higher speed block level.
- Where there is evidence of a better technology, the CB is "promoted" to the better technology level.
- Where there is evidence of broadband service in an unpopulated CB, the CB status is changed to populated.

The basic steps in the analysis methodology are outlines below:

SNG Analysis Step	Purpose	Outcome
1. Use FCC data to establish baseline of speed blocks and technologies per CB	• Create a comprehensive baseline for all populated CBs against which to analyse data from other sources • All CBs receive an initial speed block designation based on FCC data	• 124,694 CBs with connectivity and speed blocks identified
2. Identify CBs with fiber-lit buildings (FLBs)	• FLBs provide evidence of fiber service availability • FLBs provide evidence of possible population in unpopulated CBs	• 28,704 CBs have FLBs • 1,474 "unpopulated" CBs have FLBs
3. Identify CBs with fiber carriers and fiber route infrastructure. This does not necessarily mean that fiber service is offered.	• Identifies those CBs that may have fiber but that FCC data showed as unconnected, unserved, and underserved • Flags those CBs that need review of status	• 39,688 CBs have fiber routes and carriers • 19,534 CBs flagged for review – 15.7% of FCC baseline CBs
4. Derive speed block and technology status for CBs covered by SNG data	• Additional speed block and technology data for comparison with FCC data	• 2,623 CBs with SNG speed blocks • 1,962 CBs with SNG technology data
5. Derive speed block status for CBs covered by SpeedUpAmerica data (Technology type data not available)	• Additional speed block data for comparison with FCC data	• 735 CBs with SUA speed blocks

SNG Analysis Step	Purpose	Outcome
6. Revise the speed block and technology designations for each CB as required based on previous steps	• Some CBs "promoted" to higher speed blocks and/or technologies as applicable	• 641 CBs updated from SNG data • 30 CBs updated from SUA data • 588 CBs updated from FLB data
7. Derive fiber route-mile to street-mile ratios per CB and develop criteria for fiber presence	• Creation of categories of fiber presence that shows relative availability of fiber infrastructure	• 26,281 CBs with fiber route miles and ratios
8. Assign fiber presence categories to all CBs	• CBs have fiber presence level identified, independent of service availability data	• 26,381 CBs assigned fiber presence categories
9. Create final file of mappable data derived from analysis of the data sources	• Final designations of speed blocks, technologies, and fiber presence for all CBs	• 304 CBs changes speed block category • 400 CBs changed technology category

The final CB data file was used to create the heat maps and mappable data files for the OBO, as well as other aggregated charts and statistics used in the Oregon Broadband Study Report.

Independent of the analysis described above, additional analysis was conducted for community anchor institutions (CAIs) to augment the Oregon Broadband Map. While there was no available source of information about service connectivity for the CAIs, the CAI locations were identified with respect to proximity to existing fiber routes.

For the CAIs, the study team:

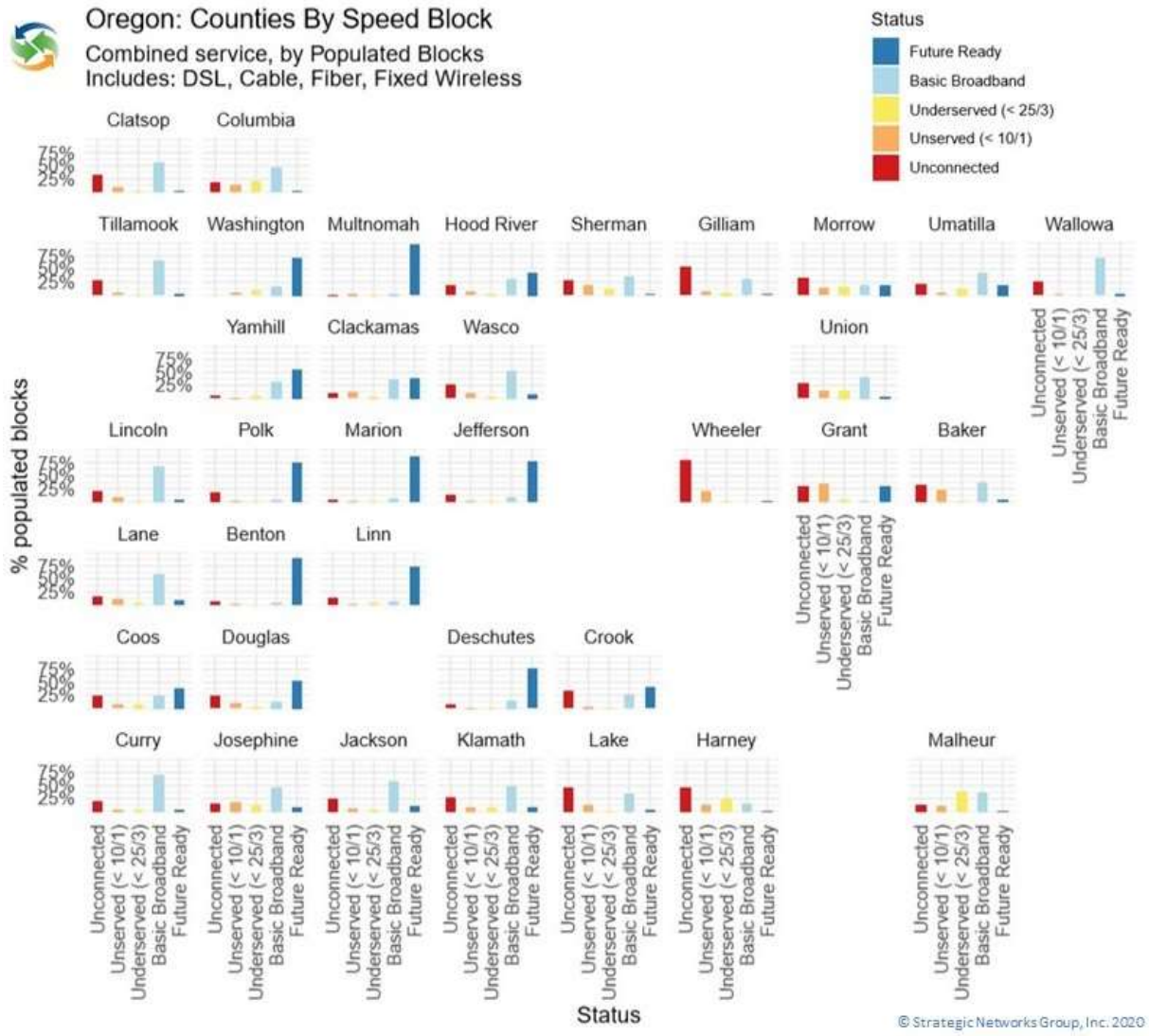
1. Obtained from OBO the list of CAIs currently mapped in the Oregon Broadband Map.
2. Using available location data for the CAIs, identified which CAIs are within 200 feet of fiber infrastructure, using geospatial analysis.
3. Updated the OBO CAI file with a flag indicating if a CAI is near fiber (within 200 feet).

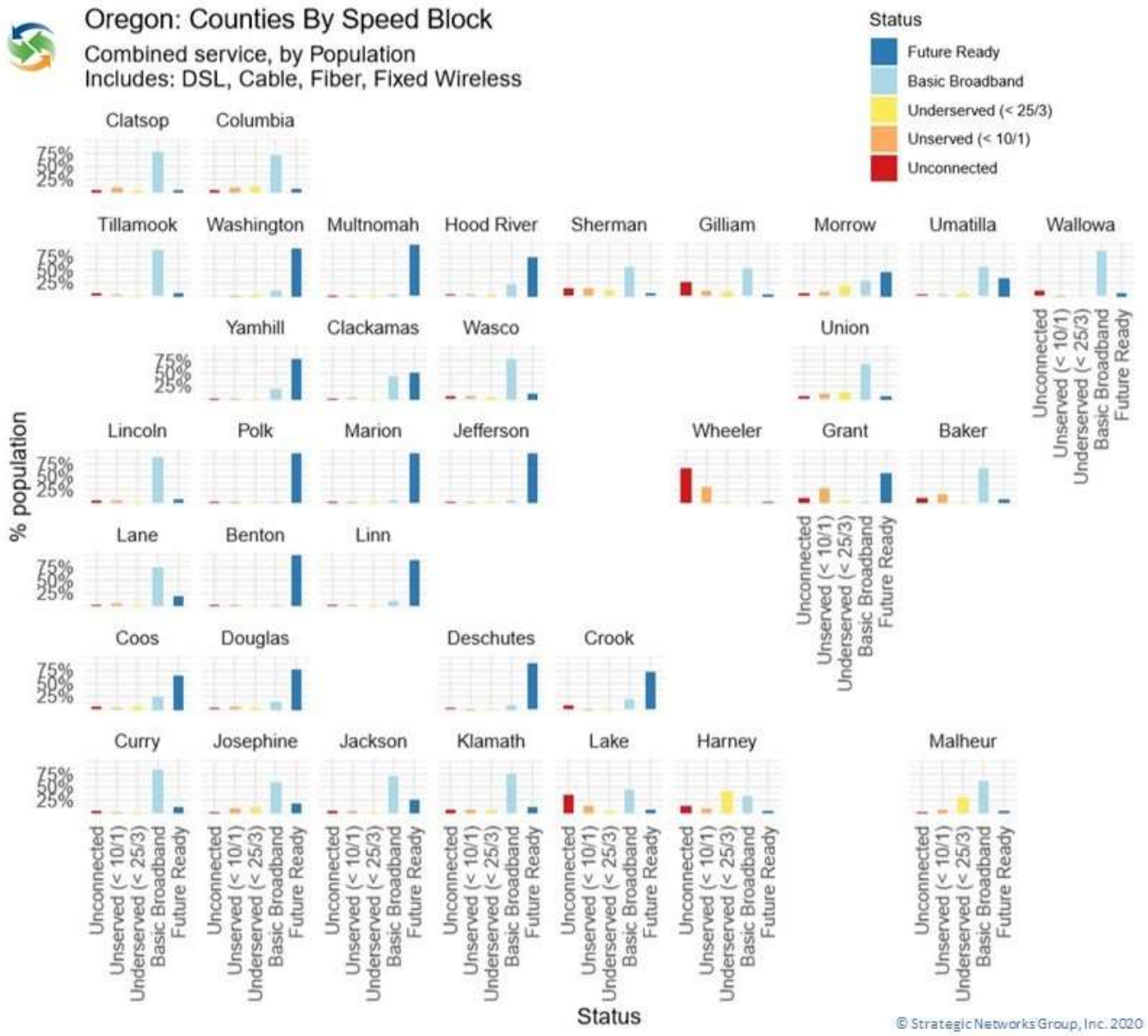
A distance of 200 feet was chosen as a reasonable distance for which fiber connections could easily be provide, if fiber service is being offered. This does not mean that fiber service is being offered in that location. The analysis also does not identify if a CAI is already receiving fiber service.

caicat	CAI Category	# of CAI	# Near Fiber	Percent
1	K-12 Schools	1,615	526	32.6%
2	Libraries	191	79	41.4%
3	Health care	342	124	36.3%
4	Public Safety	1,136	447	39.3%
5	Colleges	69	46	66.7%
6	Local Government	227	84	37.0%
7	Economic Development	19	13	68.4%
	Totals	**3,599**	**1,319**	**36.6%**
	Near Fiber = within 200 feet of fiber facilities			

6.2 Block Charts and Tables

6.2.1 Block charts for Oregon counties




Oregon: Counties By Speed Block
Combined service, by Population
Includes: DSL, Cable, Fiber, Fixed Wireless
Status
Future Ready
Basic Broadband
Underserved (< 25/3)
Unserved (< 10/1)
Unconnected
% population
75%
50%
25%
Clatsop
Columbia
Tillamook
Washington
Multnomah
Hood River
Sherman
Gilliam
Morrow
Umatilla
Wallowa
Yamhill
Clackamas
Wasco
Union
Lincoln
Polk
Marion
Jefferson
Wheeler
Grant
Baker
Lane
Benton
Linn
Coos
Douglas
Deschutes
Crook
Curry
Josephine
Jackson
Klamath
Lake
Harney
Malheur
Unconnected
Unserved (< 10/1)
Underserved (< 25/3)
Basic Broadband
Future Ready
Status
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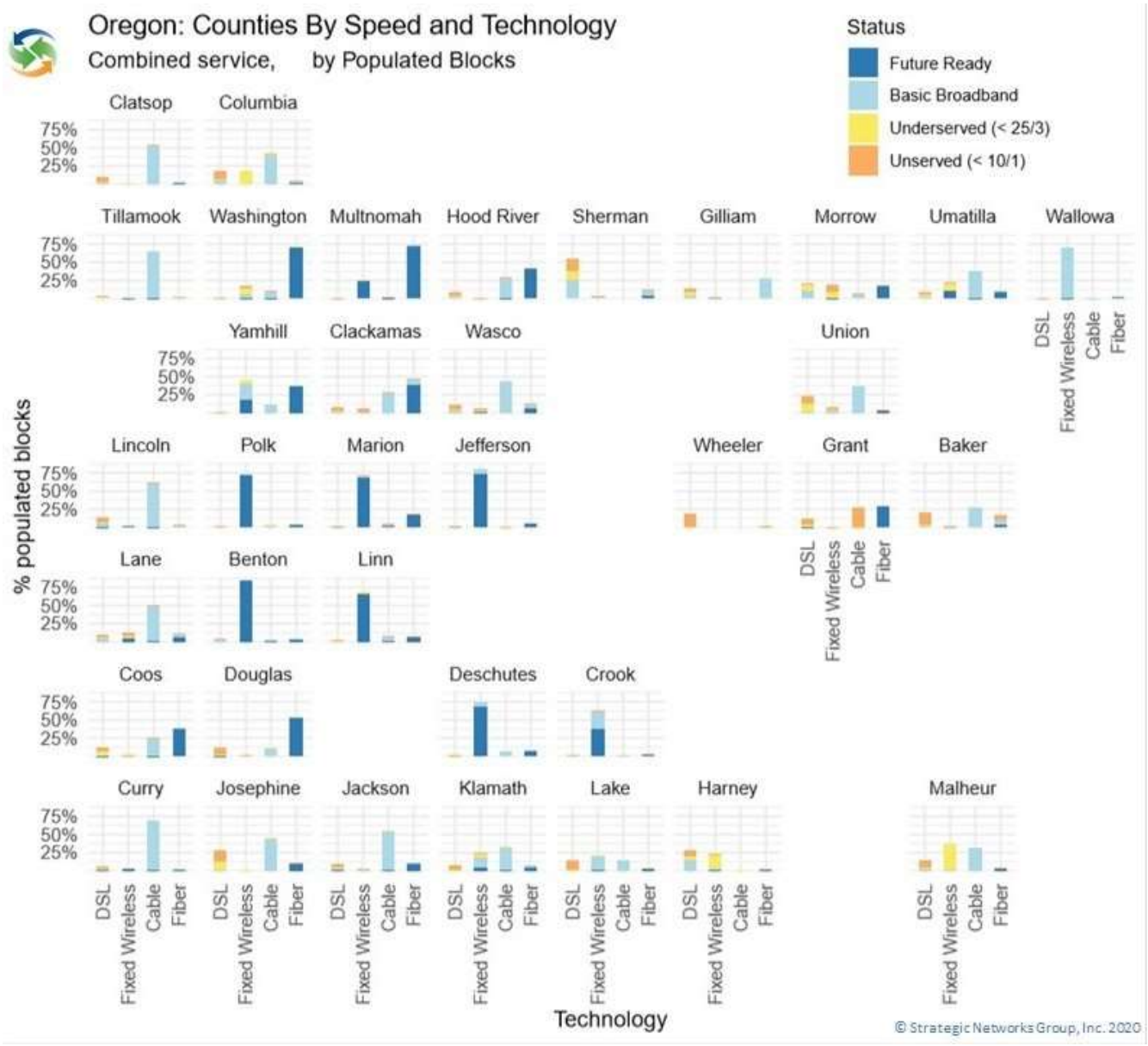
Oregon: Counties By Speed and Technology
Combined service, by Populated Blocks
Status
Future Ready
Basic Broadband
Underserved (< 25/3)
Unserved (< 10/1)
% populated blocks
75%
50%
25%
Clatsop
Columbia
Tillamook
Washington
Multnomah
Hood River
Sherman
Gilliam
Morrow
Umatilla
Wallowa
Yamhill
Clackamas
Wasco
Union
Lincoln
Polk
Marion
Jefferson
Wheeler
Grant
Baker
Lane
Benton
Linn
Coos
Douglas
Deschutes
Crook
Curry
Josephine
Jackson
Klamath
Lake
Harney
Malheur
DSL
Fixed Wireless
Cable
Fiber
Technology
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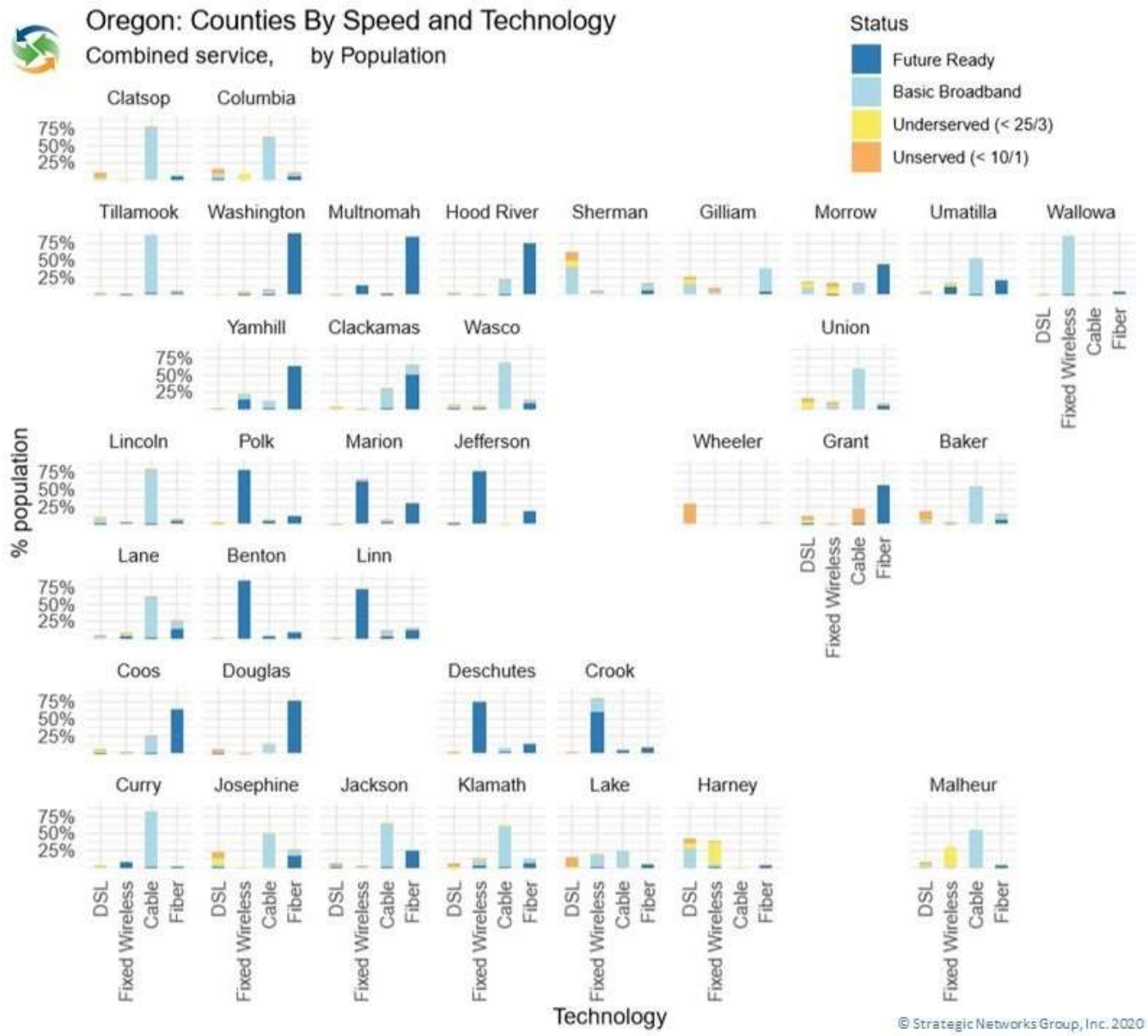
Oregon: Counties By Speed and Technology
Combined service, by Population
Status
Future Ready
Basic Broadband
Underserved (< 25/3)
Unserved (< 10/1)
% population
75%
50%
25%
Clatsop
Columbia
Tillamook
Washington
Multnomah
Hood River
Sherman
Gilliam
Morrow
Umatilla
Wallowa
Yamhill
Clackamas
Wasco
Union
Lincoln
Polk
Marion
Jefferson
Wheeler
Grant
Baker
Lane
Benton
Linn
Coos
Douglas
Deschutes
Crook
Curry
Josephine
Jackson
Klamath
Lake
Harney
Malheur
DSL
Fixed Wireless
Cable
Fiber
Technology
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6.2.2 Tables for Block Charts by Senate District and County

Oregon Senate Districts - Percentages of Census Blocks by Speed Category

Senate District	Total Census Blocks	Unconnected	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 1	6,595	28.2%	8.5%	5.9%	24.6%	32.8%
Senate District 2	3,686	8.3%	10.2%	6.6%	64.4%	10.4%
Senate District 3	3,498	17.9%	2.7%	0.1%	66.0%	13.4%
Senate District 4	5,875	30.9%	11.6%	2.1%	33.6%	21.7%
Senate District 5	7,036	25.7%	5.4%	1.4%	47.1%	20.5%
Senate District 6	3,298	3.8%	14.3%	3.2%	52.9%	25.8%
Senate District 7	2,725	0.1%	8.9%	2.2%	67.2%	21.7%
Senate District 8	2,560	NA	NA	NA	NA	100.0%
Senate District 9	6,189	24.5%	2.2%	3.0%	13.4%	57.0%
Senate District 10	2,137	NA	NA	NA	NA	100.0%
Senate District 11	2,184	NA	NA	NA	NA	100.0%
Senate District 12	5,222	5.9%	0.8%	3.9%	23.2%	66.3%
Senate District 13	2,304	NA	3.9%	3.3%	16.7%	76.2%
Senate District 14	1,495	NA	3.7%	0.6%	8.9%	86.8%
Senate District 15	2,027	NA	0.6%	2.7%	15.3%	81.5%
Senate District 16	6,653	22.5%	6.0%	16.1%	49.6%	5.7%
Senate District 17	2,131	NA	7.3%	1.2%	7.0%	84.5%
Senate District 18	2,243	NA	2.1%	0.7%	2.8%	94.5%
Senate District 19	2,209	NA	6.3%	0.8%	30.2%	62.7%
Senate District 20	2,698	6.4%	13.5%	1.3%	41.5%	37.4%
Senate District 21	3,136	NA	1.7%	0.0%	8.1%	90.1%
Senate District 22	3,973	NA	NA	NA	NA	100.0%
Senate District 23	2,738	NA	NA	NA	NA	100.0%
Senate District 24	1,544	NA	2.8%	NA	8.8%	88.3%
Senate District 25	1,602	0.7%	0.1%	0.2%	0.1%	98.8%
Senate District 26	2,856	14.5%	10.1%	4.2%	30.6%	40.5%
Senate District 27	3,592	1.0%	0.4%	0.1%	10.8%	87.7%
Senate District 28	8,168	35.2%	6.6%	4.5%	35.3%	18.4%
Senate District 29	7,258	27.7%	8.6%	11.0%	41.1%	11.5%
Senate District 30	9,005	23.9%	12.4%	11.4%	27.5%	24.8%
TOTALS	**116,637**	**15.0%**	**5.9%**	**4.3%**	**28.6%**	**46.1%**

Oregon Senate Districts - Percentages of Population by Speed Category

Senate District	Total Population	Unconnected	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 1	130,440	4.8%	4.7%	4.7%	28.7%	57.1%
Senate District 2	135,278	0.9%	5.0%	5.5%	70.0%	18.6%
Senate District 3	134,099	2.0%	0.7%	0.0%	69.5%	27.7%
Senate District 4	136,695	4.5%	5.9%	1.9%	61.9%	25.9%
Senate District 5	137,054	3.9%	1.9%	0.8%	57.5%	35.9%
Senate District 6	132,880	0.2%	3.7%	1.7%	70.0%	24.4%
Senate District 7	133,308	0.0%	2.5%	0.4%	69.4%	27.6%
Senate District 8	131,118	NA	NA	NA	NA	100.0%
Senate District 9	146,930	3.7%	1.9%	0.9%	18.1%	75.5%
Senate District 10	137,619	NA	NA	NA	NA	100.0%
Senate District 11	135,876	NA	NA	NA	NA	100.0%

Senate District	Total Population	Unconnected	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 12	143,786	0.4%	0.2%	0.8%	17.1%	81.5%
Senate District 13	140,741	NA	0.5%	0.6%	6.8%	92.2%
Senate District 14	141,522	NA	0.2%	0.1%	4.4%	95.2%
Senate District 15	142,703	NA	0.0%	0.3%	5.1%	94.6%
Senate District 16	140,804	3.5%	5.2%	10.8%	66.5%	14.0%
Senate District 17	143,432	NA	0.5%	0.1%	6.1%	93.3%
Senate District 18	142,753	NA	0.1%	0.0%	1.8%	98.1%
Senate District 19	141,519	NA	0.7%	0.2%	27.3%	71.8%
Senate District 20	140,691	0.4%	4.2%	0.4%	52.0%	43.1%
Senate District 21	139,409	NA	0.1%	0.0%	11.8%	88.1%
Senate District 22	142,539	NA	NA	NA	NA	100.0%
Senate District 23	137,423	NA	NA	NA	NA	100.0%
Senate District 24	134,971	NA	0.4%	NA	9.3%	90.3%
Senate District 25	136,714	0.0%	0.0%	0.1%	0.0%	99.9%
Senate District 26	139,271	1.0%	3.3%	1.6%	28.5%	65.6%
Senate District 27	148,079	0.2%	0.2%	0.1%	5.3%	94.3%
Senate District 28	137,146	8.8%	4.8%	3.6%	51.5%	31.3%
Senate District 29	127,869	5.4%	4.3%	7.8%	57.3%	25.2%
Senate District 30	132,334	5.2%	6.0%	10.1%	42.3%	36.4%
TOTALS	**4,145,003**	**1.5%**	**1.9%**	**1.7%**	**27.5%**	**67.4%**

Oregon Senate Districts - Percentages of Census Blocks by Technology

Senate District	Technology	Total Census Blocks	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 1	DSL	6,595	8.3%	5.8%	0.5%	0.1%
Senate District 1	Fixed Wireless	6,595	0.2%	0.0%	0.0%	0.4%
Senate District 1	Cable	6,595	0.0%	0.0%	23.9%	0.2%
Senate District 1	Fiber	6,595	NA	0.0%	0.1%	32.1%
Senate District 2	DSL	3,686	10.1%	6.3%	0.9%	0.1%
Senate District 2	Fixed Wireless	3,686	0.1%	0.1%	0.4%	0.0%
Senate District 2	Fiber	3,686	0.1%	0.1%	1.4%	10.2%
Senate District 2	Cable	3,686	NA	0.1%	61.7%	0.1%
Senate District 3	DSL	3,498	2.6%	0.1%	0.2%	NA
Senate District 3	Fixed Wireless	3,498	0.1%	NA	1.2%	NA
Senate District 3	Cable	3,498	NA	0.0%	64.2%	0.1%
Senate District 3	Fiber	3,498	NA	NA	0.3%	13.2%
Senate District 4	DSL	5,875	10.0%	1.8%	3.1%	0.0%
Senate District 4	Fixed Wireless	5,875	1.3%	0.2%	1.7%	0.6%
Senate District 4	Cable	5,875	0.2%	0.0%	27.1%	0.0%
Senate District 4	Fiber	5,875	0.1%	NA	1.7%	21.1%
Senate District 5	DSL	7,036	4.7%	1.2%	3.4%	0.0%
Senate District 5	Fixed Wireless	7,036	0.2%	NA	1.9%	8.2%
Senate District 5	Cable	7,036	0.1%	0.0%	41.3%	0.2%
Senate District 5	Fiber	7,036	0.4%	0.1%	0.5%	12.0%
Senate District 6	DSL	3,298	1.4%	1.5%	3.5%	NA
Senate District 6	Fixed Wireless	3,298	12.0%	1.7%	0.6%	19.6%
Senate District 6	Cable	3,298	0.8%	0.0%	44.1%	0.1%
Senate District 6	Fiber	3,298	0.1%	NA	4.6%	6.1%
Senate District 7	DSL	2,725	0.0%	0.2%	0.7%	NA

Senate District	Technology	Total Census Blocks	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 7	Fixed Wireless	2,725	6.0%	1.8%	0.2%	11.5%
Senate District 7	Cable	2,725	2.8%	0.0%	59.6%	0.4%
Senate District 7	Fiber	2,725	0.1%	0.1%	6.7%	9.7%
Senate District 8	Fixed Wireless	2,560	NA	NA	NA	92.4%
Senate District 8	Cable	2,560	NA	NA	NA	1.3%
Senate District 8	Fiber	2,560	NA	NA	NA	6.3%
Senate District 9	DSL	6,189	1.5%	1.2%	0.2%	NA
Senate District 9	Fixed Wireless	6,189	0.3%	1.7%	2.0%	43.6%
Senate District 9	Cable	6,189	0.1%	NA	8.1%	0.3%
Senate District 9	Fiber	6,189	0.3%	0.0%	3.1%	13.0%
Senate District 10	Fixed Wireless	2,137	NA	NA	NA	87.8%
Senate District 10	Cable	2,137	NA	NA	NA	2.3%
Senate District 10	Fiber	2,137	NA	NA	NA	9.8%
Senate District 11	Fixed Wireless	2,184	NA	NA	NA	62.0%
Senate District 11	Cable	2,184	NA	NA	NA	0.7%
Senate District 11	Fiber	2,184	NA	NA	NA	37.3%
Senate District 12	DSL	5,222	0.8%	NA	1.1%	NA
Senate District 12	Fixed Wireless	5,222	NA	3.8%	14.8%	46.3%
Senate District 12	Cable	5,222	NA	0.0%	7.2%	0.3%
Senate District 12	Fiber	5,222	NA	NA	0.0%	19.6%
Senate District 13	Fixed Wireless	2,304	3.7%	1.3%	9.3%	20.1%
Senate District 13	Cable	2,304	0.2%	NA	7.2%	0.5%
Senate District 13	DSL	2,304	NA	2.0%	NA	NA
Senate District 13	Fiber	2,304	NA	NA	0.1%	55.6%
Senate District 14	Fixed Wireless	1,495	3.3%	0.1%	NA	3.7%
Senate District 14	Cable	1,495	0.4%	NA	8.3%	0.1%
Senate District 14	DSL	1,495	NA	0.5%	0.4%	NA
Senate District 14	Fiber	1,495	NA	NA	0.2%	83.0%
Senate District 15	Fixed Wireless	2,027	0.5%	2.6%	7.3%	0.0%
Senate District 15	Cable	2,027	0.0%	NA	7.9%	NA
Senate District 15	DSL	2,027	NA	0.0%	0.1%	NA
Senate District 15	Fiber	2,027	NA	NA	0.0%	81.4%
Senate District 16	DSL	6,653	5.6%	1.4%	1.7%	0.1%
Senate District 16	Cable	6,653	0.3%	0.0%	45.5%	0.1%
Senate District 16	Fiber	6,653	0.1%	0.0%	0.6%	3.5%
Senate District 16	Fixed Wireless	6,653	NA	14.5%	1.9%	2.0%
Senate District 17	Fixed Wireless	2,131	6.6%	0.1%	NA	17.3%
Senate District 17	Cable	2,131	0.8%	NA	6.9%	0.2%
Senate District 17	DSL	2,131	NA	1.0%	NA	NA
Senate District 17	Fiber	2,131	NA	0.0%	0.1%	67.0%
Senate District 18	Fixed Wireless	2,243	1.9%	NA	NA	27.2%
Senate District 18	Cable	2,243	0.1%	NA	2.7%	0.3%
Senate District 18	DSL	2,243	NA	0.7%	0.0%	NA
Senate District 18	Fiber	2,243	NA	NA	0.0%	67.1%
Senate District 19	Fixed Wireless	2,209	5.8%	NA	NA	8.7%
Senate District 19	Cable	2,209	0.4%	NA	25.6%	0.0%
Senate District 19	Fiber	2,209	0.0%	NA	4.2%	53.9%
Senate District 19	DSL	2,209	NA	0.8%	0.5%	NA
Senate District 20	DSL	2,698	5.9%	1.2%	1.0%	NA
Senate District 20	Fixed Wireless	2,698	6.4%	0.0%	1.0%	0.6%

Senate District	Technology	Total Census Blocks	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 20	Cable	2,698	1.0%	0.0%	28.9%	0.1%
Senate District 20	Fiber	2,698	0.1%	NA	10.6%	36.7%
Senate District 21	Fixed Wireless	3,136	1.3%	NA	NA	15.2%
Senate District 21	Cable	3,136	0.4%	NA	5.9%	0.2%
Senate District 21	Fiber	3,136	0.0%	NA	2.1%	74.7%
Senate District 21	DSL	3,136	NA	0.0%	0.2%	NA
Senate District 22	Fixed Wireless	3,973	NA	NA	NA	25.2%
Senate District 22	Cable	3,973	NA	NA	NA	0.0%
Senate District 22	Fiber	3,973	NA	NA	NA	74.7%
Senate District 23	Fixed Wireless	2,738	NA	NA	NA	12.3%
Senate District 23	Cable	2,738	NA	NA	NA	0.1%
Senate District 23	Fiber	2,738	NA	NA	NA	87.6%
Senate District 24	Fixed Wireless	1,544	2.6%	NA	NA	19.5%
Senate District 24	Cable	1,544	0.3%	NA	6.2%	0.3%
Senate District 24	DSL	1,544	NA	NA	0.3%	NA
Senate District 24	Fiber	1,544	NA	NA	2.4%	68.6%
Senate District 25	DSL	1,602	0.1%	0.2%	NA	NA
Senate District 25	Cable	1,602	NA	NA	0.1%	NA
Senate District 25	Fixed Wireless	1,602	NA	NA	NA	12.8%
Senate District 25	Fiber	1,602	NA	NA	NA	86.0%
Senate District 26	DSL	2,856	9.0%	4.1%	0.8%	NA
Senate District 26	Fixed Wireless	2,856	0.9%	NA	0.0%	8.0%
Senate District 26	Cable	2,856	0.2%	NA	28.1%	0.2%
Senate District 26	Fiber	2,856	NA	0.0%	1.7%	32.3%
Senate District 27	DSL	3,592	0.4%	0.1%	0.1%	NA
Senate District 27	Fixed Wireless	3,592	NA	NA	4.9%	75.9%
Senate District 27	Cable	3,592	NA	NA	5.2%	0.9%
Senate District 27	Fiber	3,592	NA	NA	0.7%	10.9%
Senate District 28	DSL	8,168	6.5%	1.4%	1.6%	0.1%
Senate District 28	Fixed Wireless	8,168	0.1%	3.0%	14.1%	14.1%
Senate District 28	Fiber	8,168	0.0%	0.0%	1.4%	4.1%
Senate District 28	Cable	8,168	NA	0.0%	18.1%	0.1%
Senate District 29	DSL	7,258	5.9%	5.5%	3.4%	NA
Senate District 29	Fixed Wireless	7,258	2.6%	5.4%	8.6%	4.6%
Senate District 29	Cable	7,258	0.0%	NA	26.1%	0.0%
Senate District 29	Fiber	7,258	0.0%	0.0%	2.9%	6.8%
Senate District 30	DSL	9,005	7.8%	1.6%	2.8%	0.1%
Senate District 30	Fixed Wireless	9,005	0.8%	9.7%	2.5%	18.8%
Senate District 30	Cable	9,005	2.4%	0.0%	20.3%	0.1%
Senate District 30	Fiber	9,005	1.3%	0.1%	1.8%	5.9%

Oregon Senate Districts - Percentages of Population by Technology

Senate District	Technology	Total Population	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 1	DSL	130,440	4.4%	4.2%	0.5%	0.1%
Senate District 1	Fixed Wireless	130,440	0.3%	0.3%	0.0%	1.5%
Senate District 1	Cable	130,440	0.0%	0.0%	27.9%	0.4%
Senate District 1	Fiber	130,440	NA	0.1%	0.2%	54.9%
Senate District 2	DSL	135,278	4.9%	4.8%	1.9%	0.7%

Senate District	Technology	Total Population	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 2	Fixed Wireless	135,278	0.0%	0.2%	0.5%	0.0%
Senate District 2	Fiber	135,278	0.0%	0.2%	4.7%	17.7%
Senate District 2	Cable	135,278	NA	0.3%	63.0%	0.1%
Senate District 3	DSL	134,099	0.7%	0.0%	0.1%	NA
Senate District 3	Fixed Wireless	134,099	0.0%	NA	0.9%	NA
Senate District 3	Cable	134,099	NA	0.0%	67.7%	0.3%
Senate District 3	Fiber	134,099	NA	NA	0.8%	27.4%
Senate District 4	DSL	136,695	5.0%	1.7%	3.4%	0.0%
Senate District 4	Fixed Wireless	136,695	0.8%	0.0%	5.1%	0.9%
Senate District 4	Cable	136,695	0.1%	0.0%	50.0%	0.4%
Senate District 4	Fiber	136,695	0.0%	NA	3.3%	24.5%
Senate District 5	DSL	137,054	1.7%	0.7%	3.4%	0.1%
Senate District 5	Fixed Wireless	137,054	0.0%	NA	0.7%	7.2%
Senate District 5	Cable	137,054	0.0%	0.0%	52.1%	0.8%
Senate District 5	Fiber	137,054	0.1%	0.1%	1.3%	27.9%
Senate District 6	DSL	132,880	0.5%	0.9%	3.1%	NA
Senate District 6	Fixed Wireless	132,880	2.8%	0.5%	0.9%	11.8%
Senate District 6	Cable	132,880	0.5%	0.3%	53.7%	0.2%
Senate District 6	Fiber	132,880	0.0%	NA	12.3%	12.4%
Senate District 7	DSL	133,308	0.0%	0.1%	0.1%	NA
Senate District 7	Fixed Wireless	133,308	2.1%	0.3%	0.1%	7.0%
Senate District 7	Cable	133,308	0.4%	0.0%	54.6%	0.9%
Senate District 7	Fiber	133,308	0.0%	0.0%	14.7%	19.7%
Senate District 8	Fixed Wireless	131,118	NA	NA	NA	82.1%
Senate District 8	Cable	131,118	NA	NA	NA	3.7%
Senate District 8	Fiber	131,118	NA	NA	NA	14.2%
Senate District 9	DSL	146,930	1.6%	0.4%	0.2%	NA
Senate District 9	Fixed Wireless	146,930	0.1%	0.4%	1.4%	51.5%
Senate District 9	Cable	146,930	0.0%	NA	12.4%	1.2%
Senate District 9	Fiber	146,930	0.2%	0.0%	4.0%	22.8%
Senate District 10	Fixed Wireless	137,619	NA	NA	NA	72.0%
Senate District 10	Cable	137,619	NA	NA	NA	5.2%
Senate District 10	Fiber	137,619	NA	NA	NA	22.8%
Senate District 11	Fixed Wireless	135,876	NA	NA	NA	53.7%
Senate District 11	Cable	135,876	NA	NA	NA	2.4%
Senate District 11	Fiber	135,876	NA	NA	NA	43.9%
Senate District 12	DSL	143,786	0.2%	NA	0.5%	NA
Senate District 12	Fixed Wireless	143,786	NA	0.8%	7.5%	41.1%
Senate District 12	Cable	143,786	NA	0.0%	9.1%	1.3%
Senate District 12	Fiber	143,786	NA	NA	0.0%	39.1%
Senate District 13	Fixed Wireless	140,741	0.4%	0.2%	2.1%	21.4%
Senate District 13	Cable	140,741	0.1%	NA	4.6%	1.0%
Senate District 13	DSL	140,741	NA	0.3%	NA	NA
Senate District 13	Fiber	140,741	NA	NA	0.1%	69.7%
Senate District 14	Fixed Wireless	141,522	0.2%	0.0%	NA	1.2%
Senate District 14	Cable	141,522	0.0%	NA	4.1%	0.1%
Senate District 14	DSL	141,522	NA	0.1%	0.0%	NA
Senate District 14	Fiber	141,522	NA	NA	0.3%	93.9%
Senate District 15	Fixed Wireless	142,703	0.0%	0.3%	1.4%	0.0%
Senate District 15	Cable	142,703	0.0%	NA	3.5%	NA

Senate District	Technology	Total Population	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 15	DSL	142,703	NA	0.0%	0.1%	NA
Senate District 15	Fiber	142,703	NA	NA	0.1%	94.5%
Senate District 16	DSL	140,804	4.8%	1.6%	2.2%	0.5%
Senate District 16	Cable	140,804	0.2%	0.1%	60.0%	1.0%
Senate District 16	Fiber	140,804	0.1%	0.1%	2.4%	10.1%
Senate District 16	Fixed Wireless	140,804	NA	8.9%	1.8%	2.4%
Senate District 17	Fixed Wireless	143,432	0.5%	0.0%	NA	6.0%
Senate District 17	Cable	143,432	0.0%	NA	6.0%	0.3%
Senate District 17	DSL	143,432	NA	0.1%	NA	NA
Senate District 17	Fiber	143,432	NA	0.0%	0.0%	87.0%
Senate District 18	Fixed Wireless	142,753	0.1%	NA	NA	15.7%
Senate District 18	Cable	142,753	0.0%	NA	1.7%	0.4%
Senate District 18	DSL	142,753	NA	0.0%	0.0%	NA
Senate District 18	Fiber	142,753	NA	NA	0.0%	82.0%
Senate District 19	Fixed Wireless	141,519	0.3%	NA	NA	5.8%
Senate District 19	Cable	141,519	0.4%	NA	19.2%	0.1%
Senate District 19	Fiber	141,519	0.0%	NA	8.1%	65.9%
Senate District 19	DSL	141,519	NA	0.2%	0.1%	NA
Senate District 20	DSL	140,691	3.5%	0.4%	0.2%	NA
Senate District 20	Fixed Wireless	140,691	0.6%	0.0%	0.1%	0.1%
Senate District 20	Cable	140,691	0.1%	0.0%	35.2%	0.4%
Senate District 20	Fiber	140,691	0.0%	NA	16.5%	42.6%
Senate District 21	Fixed Wireless	139,409	0.1%	NA	NA	3.9%
Senate District 21	Cable	139,409	0.0%	NA	6.7%	0.1%
Senate District 21	Fiber	139,409	0.0%	NA	5.1%	84.1%
Senate District 21	DSL	139,409	NA	0.0%	0.0%	NA
Senate District 22	Fixed Wireless	142,539	NA	NA	NA	10.5%
Senate District 22	Cable	142,539	NA	NA	NA	0.0%
Senate District 22	Fiber	142,539	NA	NA	NA	89.5%
Senate District 23	Fixed Wireless	137,423	NA	NA	NA	6.0%
Senate District 23	Cable	137,423	NA	NA	NA	0.2%
Senate District 23	Fiber	137,423	NA	NA	NA	93.8%
Senate District 24	Fixed Wireless	134,971	0.3%	NA	NA	13.3%
Senate District 24	Cable	134,971	0.1%	NA	3.8%	0.4%
Senate District 24	DSL	134,971	NA	NA	0.1%	NA
Senate District 24	Fiber	134,971	NA	NA	5.4%	76.6%
Senate District 25	DSL	136,714	0.0%	0.1%	NA	NA
Senate District 25	Cable	136,714	NA	NA	0.0%	NA
Senate District 25	Fixed Wireless	136,714	NA	NA	NA	5.4%
Senate District 25	Fiber	136,714	NA	NA	NA	94.5%
Senate District 26	DSL	139,271	3.2%	1.5%	0.1%	NA
Senate District 26	Fixed Wireless	139,271	0.1%	NA	0.0%	9.0%
Senate District 26	Cable	139,271	0.0%	NA	26.8%	0.5%
Senate District 26	Fiber	139,271	NA	0.1%	1.6%	56.2%
Senate District 27	DSL	148,079	0.2%	0.1%	0.0%	NA
Senate District 27	Fixed Wireless	148,079	NA	NA	1.8%	75.2%
Senate District 27	Cable	148,079	NA	NA	2.9%	2.7%
Senate District 27	Fiber	148,079	NA	NA	0.5%	16.5%
Senate District 28	DSL	137,146	4.8%	1.7%	3.3%	0.2%
Senate District 28	Fixed Wireless	137,146	0.0%	1.8%	9.7%	20.5%

Senate District	Technology	Total Population	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Senate District 28	Fiber	137,146	0.0%	0.0%	3.5%	9.4%
Senate District 28	Cable	137,146	NA	0.0%	35.0%	1.2%
Senate District 29	DSL	127,869	2.9%	3.6%	3.0%	NA
Senate District 29	Fixed Wireless	127,869	1.4%	4.0%	5.8%	7.5%
Senate District 29	Cable	127,869	0.0%	NA	45.6%	0.0%
Senate District 29	Fiber	127,869	0.0%	0.0%	3.0%	17.6%
Senate District 30	DSL	132,334	3.8%	1.2%	3.7%	0.2%
Senate District 30	Fixed Wireless	132,334	0.6%	8.7%	1.4%	25.4%
Senate District 30	Cable	132,334	1.2%	0.1%	35.7%	0.1%
Senate District 30	Fiber	132,334	0.5%	0.1%	1.5%	10.7%

Oregon Counties - Percentages of Census Blocks by Speed Category

County	Total Census Blocks	Unconnected	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Baker	1,529	33.7%	23.3%	1.1%	38.3%	3.6%
Benton	2,294	7.3%	1.0%	NA	2.6%	89.1%
Clackamas	8,006	10.4%	10.8%	2.0%	37.0%	39.7%
Clatsop	2,107	33.5%	7.4%	1.7%	54.9%	2.5%
Columbia	1,903	19.3%	11.9%	20.9%	45.7%	2.1%
Coos	2,627	24.3%	5.6%	6.5%	24.3%	39.2%
Crook	1,353	32.8%	0.8%	0.1%	24.8%	41.4%
Curry	1,270	21.6%	2.7%	3.1%	69.1%	3.5%
Deschutes	5,355	8.0%	0.4%	0.0%	14.4%	77.1%
Douglas	5,606	23.4%	10.1%	2.1%	11.7%	52.7%
Gilliam	320	54.4%	6.9%	5.6%	31.6%	1.6%
Grant	813	31.0%	35.1%	2.8%	0.9%	30.3%
Harney	755	46.0%	11.9%	25.3%	15.5%	1.3%
Hood River	739	19.4%	5.5%	2.3%	30.0%	42.8%
Jackson	6,613	24.0%	5.4%	1.6%	58.2%	10.7%
Jefferson	1,618	13.2%	1.7%	0.2%	7.2%	77.8%
Josephine	2,603	16.6%	15.8%	11.7%	46.8%	9.2%
Klamath	3,748	27.9%	7.1%	7.0%	48.9%	9.1%
Lake	848	46.8%	13.0%	1.3%	34.4%	4.5%
Lane	10,157	16.7%	11.8%	2.8%	58.6%	10.2%
Lincoln	2,527	20.7%	6.5%	1.3%	68.2%	3.3%
Linn	4,682	15.3%	1.0%	3.7%	6.9%	73.2%
Malheur	1,971	13.0%	10.9%	38.8%	34.9%	2.5%
Marion	6,833	5.1%	0.8%	0.7%	5.4%	87.9%
Morrow	688	33.7%	13.4%	16.7%	17.7%	18.5%
Multnomah	15,605	0.5%	0.3%	0.3%	0.6%	98.3%
Polk	2,582	18.2%	1.5%	0.6%	3.3%	76.3%
Sherman	248	29.8%	18.1%	12.5%	36.3%	3.2%
Tillamook	2,233	28.4%	3.4%	0.4%	65.7%	2.0%
Umatilla	3,005	21.9%	4.9%	12.1%	41.0%	20.1%
Union	1,795	28.5%	13.0%	15.0%	40.3%	3.1%
Wallowa	840	27.0%	0.7%	NA	69.5%	2.7%
Wasco	1,529	26.4%	9.7%	2.0%	53.6%	8.2%
Washington	8,033	NA	4.2%	9.4%	15.5%	70.9%
Wheeler	264	79.9%	18.9%	0.8%	NA	0.4%

County	Total Census Blocks	Unconnected	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Yamhill	3,426	5.8%	0.1%	5.8%	32.5%	55.7%
TOTALS	**116,525**	**15.0%**	**5.9%**	**4.3%**	**28.6%**	**46.1%**

Oregon Counties - Percentages of Population by Speed Category

County	Total Population	Unconnected	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Baker	16,054	9.6%	16.2%	1.9%	66.6%	5.7%
Benton	90,947	0.3%	0.1%	NA	0.8%	98.8%
Clackamas	412,657	0.8%	3.3%	0.7%	43.5%	51.9%
Clatsop	39,179	5.0%	8.7%	2.6%	78.3%	5.3%
Columbia	51,782	3.9%	7.2%	11.3%	70.9%	6.7%
Coos	63,888	4.5%	2.0%	4.1%	24.5%	64.9%
Crook	23,119	6.8%	0.4%	0.1%	18.9%	73.7%
Curry	22,669	3.5%	0.9%	1.6%	82.1%	11.9%
Deschutes	186,867	1.7%	0.2%	0.0%	7.6%	90.5%
Douglas	109,404	2.8%	4.1%	1.4%	15.1%	76.6%
Gilliam	1,855	25.8%	9.8%	6.5%	54.3%	3.7%
Grant	7,190	9.9%	27.1%	3.5%	2.0%	57.6%
Harney	7,289	13.5%	8.2%	42.3%	32.0%	4.0%
Hood River	23,377	0.9%	0.8%	1.3%	21.7%	75.3%
Jackson	217,478	2.8%	2.3%	1.1%	69.3%	24.6%
Jefferson	23,754	1.9%	0.8%	0.2%	1.7%	95.3%
Josephine	86,351	1.9%	8.6%	10.4%	59.9%	19.2%
Klamath	66,933	5.2%	5.2%	3.9%	75.5%	10.2%
Lake	7,863	35.0%	14.2%	1.5%	43.4%	5.9%
Lane	374,743	1.8%	3.9%	1.4%	74.8%	18.2%
Lincoln	48,919	2.9%	2.6%	0.8%	88.0%	5.7%
Linn	125,045	1.5%	0.4%	1.0%	9.3%	87.7%
Malheur	30,480	1.2%	4.3%	30.3%	60.6%	3.6%
Marion	341,286	0.5%	0.2%	0.1%	2.7%	96.4%
Morrow	11,166	5.5%	5.7%	17.1%	26.9%	44.8%
Multnomah	807,538	0.0%	0.1%	0.1%	0.4%	99.3%
Polk	83,696	1.4%	0.3%	0.3%	2.1%	95.9%
Sherman	1,758	14.8%	15.0%	9.6%	54.8%	5.7%
Tillamook	26,688	5.2%	2.1%	0.2%	87.4%	5.1%
Umatilla	76,985	3.7%	1.9%	5.6%	56.1%	32.8%
Union	26,222	6.3%	8.6%	13.2%	67.1%	4.8%
Wallowa	7,051	8.8%	0.4%	NA	86.6%	4.2%
Wasco	26,436	5.4%	5.5%	1.4%	77.2%	10.6%
Washington	588,947	NA	0.2%	1.5%	7.6%	90.6%
Wheeler	1,357	67.5%	30.6%	1.5%	NA	0.4%
Yamhill	105,720	0.4%	0.0%	1.0%	20.0%	78.6%
TOTALS	**4,142,693**	**1.5%**	**1.9%**	**1.7%**	**27.5%**	**67.4%**

Oregon Counties - Percentages of Census Blocks by Technology

County	Technology	Total Census Blocks	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Baker	DSL	1,529	17.1%	1.1%	2.5%	NA
Baker	Fixed Wireless	1,529	0.6%	NA	0.1%	NA
Baker	Fiber	1,529	5.7%	NA	7.5%	3.6%
Baker	Cable	1,529	NA	NA	28.1%	NA
Benton	DSL	2,294	1.0%	NA	2.5%	NA
Benton	Cable	2,294	NA	NA	0.0%	1.0%
Benton	Fiber	2,294	NA	NA	0.0%	3.3%
Benton	Fixed Wireless	2,294	NA	NA	NA	84.8%
Clackamas	DSL	8,006	4.8%	2.0%	0.7%	NA
Clackamas	Fixed Wireless	8,006	5.2%	0.0%	1.0%	0.6%
Clackamas	Cable	8,006	0.7%	0.0%	27.2%	0.1%
Clackamas	Fiber	8,006	0.1%	NA	8.1%	39.0%
Clatsop	DSL	2,107	7.4%	1.6%	0.6%	0.0%
Clatsop	Cable	2,107	0.0%	0.0%	53.7%	0.1%
Clatsop	Fixed Wireless	2,107	NA	0.0%	NA	NA
Clatsop	Fiber	2,107	NA	NA	0.6%	2.4%
Columbia	DSL	1,903	10.6%	2.9%	3.9%	0.3%
Columbia	Cable	1,903	1.1%	0.1%	40.4%	0.1%
Columbia	Fiber	1,903	0.3%	0.1%	1.3%	1.7%
Columbia	Fixed Wireless	1,903	NA	17.7%	NA	0.1%
Coos	DSL	2,627	5.1%	6.4%	0.1%	0.1%
Coos	Fixed Wireless	2,627	0.4%	0.0%	0.0%	0.0%
Coos	Cable	2,627	0.0%	NA	24.0%	0.1%
Coos	Fiber	2,627	NA	NA	0.0%	39.0%
Crook	DSL	1,353	0.3%	NA	NA	NA
Crook	Fixed Wireless	1,353	0.4%	NA	24.5%	38.4%
Crook	Fiber	1,353	0.1%	NA	NA	2.8%
Crook	Cable	1,353	NA	NA	0.3%	0.2%
Curry	DSL	1,270	2.7%	3.1%	NA	0.1%
Curry	Cable	1,270	NA	NA	68.5%	0.6%
Curry	Fiber	1,270	NA	NA	0.5%	0.8%
Curry	Fixed Wireless	1,270	NA	NA	NA	2.0%
Deschutes	DSL	5,355	0.4%	0.0%	0.1%	NA
Deschutes	Fixed Wireless	5,355	NA	NA	7.2%	68.6%
Deschutes	Cable	5,355	NA	NA	6.6%	0.7%
Deschutes	Fiber	5,355	NA	NA	0.7%	7.9%
Douglas	DSL	5,606	9.8%	2.1%	0.3%	0.0%
Douglas	Fixed Wireless	5,606	0.3%	NA	NA	NA
Douglas	Cable	5,606	NA	0.0%	10.5%	NA
Douglas	Fiber	5,606	NA	0.0%	0.8%	52.6%
Gilliam	DSL	320	4.4%	5.3%	4.1%	NA
Gilliam	Fixed Wireless	320	2.5%	NA	0.3%	NA
Gilliam	Fiber	320	NA	NA	26.6%	0.9%
Grant	DSL	813	8.0%	2.6%	0.9%	0.1%
Grant	Fixed Wireless	813	0.1%	0.1%	NA	NA
Grant	Cable	813	26.9%	0.1%	NA	0.1%
Grant	Fiber	813	NA	NA	NA	29.9%
Harney	DSL	755	8.9%	5.8%	13.9%	NA

County	Technology	Total Census Blocks	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Harney	Fixed Wireless	755	2.9%	19.2%	1.2%	0.5%
Harney	Fiber	755	0.1%	NA	0.4%	0.8%
Harney	Cable	755	NA	0.3%	NA	NA
Hood River	DSL	739	5.1%	2.0%	1.8%	NA
Hood River	Fixed Wireless	739	0.1%	NA	NA	NA
Hood River	Cable	739	0.3%	NA	28.3%	0.1%
Hood River	Fiber	739	NA	0.1%	NA	42.6%
Jackson	DSL	6,613	5.4%	1.5%	2.2%	0.1%
Jackson	Fixed Wireless	6,613	0.1%	0.0%	1.1%	0.0%
Jackson	Cable	6,613	NA	0.0%	54.6%	0.1%
Jackson	Fiber	6,613	NA	NA	0.3%	10.5%
Jefferson	DSL	1,618	1.7%	0.1%	0.1%	0.1%
Jefferson	Cable	1,618	NA	0.1%	0.1%	0.2%
Jefferson	Fixed Wireless	1,618	NA	NA	7.0%	72.9%
Jefferson	Fiber	1,618	NA	NA	NA	4.5%
Josephine	DSL	2,603	15.7%	11.3%	1.4%	0.1%
Josephine	Fiber	2,603	0.1%	0.2%	1.7%	9.0%
Josephine	Fixed Wireless	2,603	NA	0.1%	0.0%	0.0%
Josephine	Cable	2,603	NA	0.1%	43.7%	NA
Klamath	DSL	3,748	7.1%	0.8%	0.1%	NA
Klamath	Fixed Wireless	3,748	0.0%	6.2%	13.8%	4.3%
Klamath	Cable	3,748	NA	0.0%	32.2%	0.0%
Klamath	Fiber	3,748	NA	NA	2.8%	4.7%
Lake	DSL	848	13.0%	0.1%	0.2%	0.5%
Lake	Fixed Wireless	848	NA	0.9%	18.9%	0.5%
Lake	Fiber	848	NA	0.1%	0.2%	3.5%
Lake	Cable	848	NA	NA	15.1%	NA
Lane	DSL	10,157	4.3%	1.8%	3.8%	0.0%
Lane	Fixed Wireless	10,157	6.3%	0.7%	2.1%	4.4%
Lane	Cable	10,157	1.1%	0.0%	48.7%	0.2%
Lane	Fiber	10,157	0.1%	0.1%	4.0%	5.6%
Lincoln	DSL	2,527	6.2%	1.3%	6.3%	0.0%
Lincoln	Cable	2,527	0.2%	0.0%	61.3%	0.1%
Lincoln	Fiber	2,527	0.1%	NA	0.6%	1.3%
Lincoln	Fixed Wireless	2,527	NA	NA	NA	1.8%
Linn	DSL	4,682	0.9%	0.6%	0.0%	NA
Linn	Cable	4,682	0.0%	NA	6.3%	0.4%
Linn	Fiber	4,682	0.1%	0.0%	0.5%	7.2%
Linn	Fixed Wireless	4,682	NA	3.1%	NA	65.5%
Malheur	DSL	1,971	9.6%	2.3%	2.8%	NA
Malheur	Fiber	1,971	1.2%	0.2%	0.3%	2.5%
Malheur	Fixed Wireless	1,971	NA	36.3%	0.3%	NA
Malheur	Cable	1,971	NA	NA	31.5%	NA
Marion	DSL	6,833	0.1%	0.7%	0.1%	NA
Marion	Fixed Wireless	6,833	0.5%	NA	2.1%	68.7%
Marion	Cable	6,833	0.0%	NA	2.8%	1.1%
Marion	Fiber	6,833	0.2%	0.0%	0.4%	18.2%
Morrow	DSL	688	2.8%	7.3%	11.2%	NA
Morrow	Fixed Wireless	688	10.5%	9.3%	NA	0.1%
Morrow	Cable	688	0.1%	NA	6.4%	NA

County	Technology	Total Census Blocks	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Morrow	Fiber	688	NA	0.1%	0.1%	18.2%
Multnomah	DSL	15,605	0.3%	0.0%	0.0%	NA
Multnomah	Cable	15,605	0.0%	NA	0.4%	0.2%
Multnomah	Fixed Wireless	15,605	NA	0.3%	NA	25.0%
Multnomah	Fiber	15,605	NA	NA	0.1%	73.1%
Polk	DSL	2,582	1.5%	0.6%	NA	NA
Polk	Cable	2,582	NA	0.0%	1.5%	0.9%
Polk	Fixed Wireless	2,582	NA	NA	1.8%	71.7%
Polk	Fiber	2,582	NA	NA	NA	3.8%
Sherman	DSL	248	16.9%	12.5%	25.4%	NA
Sherman	Fixed Wireless	248	0.8%	NA	2.8%	NA
Sherman	Fiber	248	0.4%	NA	7.7%	3.2%
Tillamook	DSL	2,233	2.2%	0.4%	0.9%	NA
Tillamook	Fiber	2,233	1.2%	NA	0.1%	1.2%
Tillamook	Cable	2,233	NA	NA	64.8%	0.3%
Tillamook	Fixed Wireless	2,233	NA	NA	NA	0.5%
Umatilla	DSL	3,005	3.8%	2.3%	2.7%	NA
Umatilla	Fixed Wireless	3,005	1.1%	9.8%	NA	10.7%
Umatilla	Cable	3,005	NA	NA	37.9%	0.0%
Umatilla	Fiber	3,005	NA	NA	0.4%	9.4%
Union	DSL	1,795	9.8%	13.0%	0.9%	NA
Union	Fixed Wireless	1,795	3.2%	2.0%	2.0%	NA
Union	Fiber	1,795	0.1%	NA	1.0%	3.0%
Union	Cable	1,795	NA	NA	36.3%	0.1%
Wallowa	DSL	840	0.7%	NA	NA	NA
Wallowa	Fixed Wireless	840	NA	NA	69.4%	0.1%
Wallowa	Cable	840	NA	NA	0.1%	NA
Wallowa	Fiber	840	NA	NA	NA	2.6%
Wasco	DSL	1,529	5.8%	1.2%	3.3%	0.2%
Wasco	Fixed Wireless	1,529	3.7%	0.7%	0.3%	2.2%
Wasco	Fiber	1,529	0.1%	NA	6.6%	5.8%
Wasco	Cable	1,529	NA	NA	43.3%	0.1%
Washington	Fixed Wireless	8,033	3.8%	8.3%	5.7%	0.0%
Washington	Cable	8,033	0.4%	NA	9.5%	0.0%
Washington	DSL	8,033	NA	1.1%	0.2%	NA
Washington	Fiber	8,033	NA	0.0%	0.2%	70.8%
Wheeler	DSL	264	18.6%	NA	NA	NA
Wheeler	Fiber	264	0.4%	0.4%	NA	NA
Yamhill	DSL	3,426	0.1%	NA	0.1%	0.0%
Yamhill	Fixed Wireless	3,426	NA	5.8%	21.3%	18.7%
Yamhill	Cable	3,426	NA	NA	11.2%	0.2%
Yamhill	Fiber	3,426	NA	NA	NA	36.8%

Oregon Counties - Percentages of Population by Technology

County	Technology	Total Population	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Baker	DSL	16,054	12.5%	1.9%	4.4%	NA
Baker	Fixed Wireless	16,054	0.7%	NA	0.4%	NA
Baker	Fiber	16,054	3.0%	NA	6.9%	5.7%
Baker	Cable	16,054	NA	NA	54.9%	NA
Benton	DSL	90,947	0.1%	NA	0.8%	NA
Benton	Cable	90,947	NA	NA	0.0%	3.7%
Benton	Fiber	90,947	NA	NA	0.0%	9.5%
Benton	Fixed Wireless	90,947	NA	NA	NA	85.5%
Clackamas	DSL	412,657	2.5%	0.7%	0.2%	NA
Clackamas	Fixed Wireless	412,657	0.5%	0.0%	0.2%	0.3%
Clackamas	Cable	412,657	0.2%	0.0%	29.6%	0.3%
Clackamas	Fiber	412,657	0.0%	NA	13.4%	51.2%
Clatsop	DSL	39,179	8.3%	1.8%	0.4%	0.2%
Clatsop	Cable	39,179	0.3%	0.2%	76.4%	0.4%
Clatsop	Fixed Wireless	39,179	NA	0.5%	NA	NA
Clatsop	Fiber	39,179	NA	NA	1.6%	4.7%
Columbia	DSL	51,782	6.5%	3.0%	5.0%	1.3%
Columbia	Cable	51,782	0.3%	0.2%	61.4%	0.2%
Columbia	Fiber	51,782	0.4%	0.3%	4.4%	5.1%
Columbia	Fixed Wireless	51,782	NA	7.7%	NA	0.1%
Coos	DSL	63,888	1.5%	3.4%	0.1%	0.1%
Coos	Fixed Wireless	63,888	0.4%	0.6%	0.0%	0.0%
Coos	Cable	63,888	0.0%	NA	23.8%	0.0%
Coos	Fiber	63,888	NA	NA	0.5%	64.4%
Crook	DSL	23,119	0.3%	NA	NA	NA
Crook	Fixed Wireless	23,119	0.0%	NA	18.7%	60.2%
Crook	Fiber	23,119	0.1%	NA	NA	8.7%
Crook	Cable	23,119	NA	NA	0.2%	4.8%
Curry	DSL	22,669	0.9%	1.6%	NA	0.1%
Curry	Cable	22,669	NA	NA	80.8%	1.8%
Curry	Fiber	22,669	NA	NA	1.3%	1.7%
Curry	Fixed Wireless	22,669	NA	NA	NA	8.4%
Deschutes	DSL	186,867	0.2%	0.0%	0.0%	NA
Deschutes	Fixed Wireless	186,867	NA	NA	2.5%	74.3%
Deschutes	Cable	186,867	NA	NA	4.3%	2.3%
Deschutes	Fiber	186,867	NA	NA	0.8%	13.9%
Douglas	DSL	109,404	4.1%	1.3%	0.2%	0.1%
Douglas	Fixed Wireless	109,404	0.0%	NA	NA	NA
Douglas	Cable	109,404	NA	0.0%	14.4%	NA
Douglas	Fiber	109,404	NA	0.0%	0.5%	76.5%
Gilliam	DSL	1,855	4.3%	6.5%	15.4%	NA
Gilliam	Fixed Wireless	1,855	5.5%	NA	3.7%	NA
Gilliam	Fiber	1,855	NA	NA	34.6%	3.2%
Grant	DSL	7,190	5.7%	3.0%	2.0%	0.2%
Grant	Fixed Wireless	7,190	0.0%	0.2%	NA	NA
Grant	Cable	7,190	21.3%	0.4%	NA	0.2%
Grant	Fiber	7,190	NA	NA	NA	57.2%
Harney	DSL	7,289	5.8%	7.6%	28.8%	NA

County	Technology	Total Population	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Harney	Fixed Wireless	7,289	2.3%	33.3%	2.6%	1.2%
Harney	Fiber	7,289	0.1%	NA	0.5%	2.8%
Harney	Cable	7,289	NA	1.5%	NA	NA
Hood River	DSL	23,377	0.7%	0.7%	0.3%	NA
Hood River	Fixed Wireless	23,377	0.0%	NA	NA	NA
Hood River	Cable	23,377	0.0%	NA	21.4%	0.4%
Hood River	Fiber	23,377	NA	0.5%	NA	75.0%
Jackson	DSL	217,478	2.2%	1.0%	2.2%	0.1%
Jackson	Fixed Wireless	217,478	0.1%	0.0%	1.6%	0.0%
Jackson	Cable	217,478	NA	0.0%	64.5%	0.3%
Jackson	Fiber	217,478	NA	NA	1.0%	24.1%
Jefferson	DSL	23,754	0.8%	0.2%	0.0%	0.3%
Jefferson	Cable	23,754	NA	0.0%	0.0%	0.1%
Jefferson	Fixed Wireless	23,754	NA	NA	1.7%	76.4%
Jefferson	Fiber	23,754	NA	NA	NA	18.6%
Josephine	DSL	86,351	8.5%	9.3%	3.2%	1.2%
Josephine	Fiber	86,351	0.0%	0.4%	6.4%	18.0%
Josephine	Fixed Wireless	86,351	NA	0.2%	0.1%	0.0%
Josephine	Cable	86,351	NA	0.4%	50.2%	NA
Klamath	DSL	66,933	5.2%	0.4%	0.2%	NA
Klamath	Fixed Wireless	66,933	0.0%	3.4%	7.1%	2.7%
Klamath	Cable	66,933	NA	0.1%	61.9%	0.3%
Klamath	Fiber	66,933	NA	NA	6.2%	7.2%
Lake	DSL	7,863	14.2%	0.2%	0.2%	0.4%
Lake	Fixed Wireless	7,863	NA	1.0%	18.0%	0.6%
Lake	Fiber	7,863	NA	0.0%	0.6%	4.9%
Lake	Cable	7,863	NA	NA	24.6%	NA
Lane	DSL	374,743	1.5%	1.1%	2.7%	0.0%
Lane	Fixed Wireless	374,743	2.0%	0.2%	2.4%	3.5%
Lane	Cable	374,743	0.3%	0.1%	58.9%	0.5%
Lane	Fiber	374,743	0.0%	0.0%	10.7%	14.1%
Lincoln	DSL	48,919	2.4%	0.8%	6.4%	0.1%
Lincoln	Cable	48,919	0.1%	0.0%	79.4%	0.1%
Lincoln	Fiber	48,919	0.1%	NA	2.2%	4.5%
Lincoln	Fixed Wireless	48,919	NA	NA	NA	0.9%
Linn	DSL	125,045	0.3%	0.1%	0.0%	NA
Linn	Cable	125,045	0.0%	NA	8.9%	2.4%
Linn	Fiber	125,045	0.0%	0.0%	0.4%	13.6%
Linn	Fixed Wireless	125,045	NA	0.9%	NA	71.7%
Malheur	DSL	30,480	4.0%	1.0%	3.6%	NA
Malheur	Fiber	30,480	0.3%	0.2%	0.2%	3.6%
Malheur	Fixed Wireless	30,480	NA	29.1%	0.5%	NA
Malheur	Cable	30,480	NA	NA	56.4%	NA
Marion	DSL	341,286	0.0%	0.1%	0.0%	NA
Marion	Fixed Wireless	341,286	0.2%	NA	0.6%	63.5%
Marion	Cable	341,286	0.0%	NA	1.9%	3.0%
Marion	Fiber	341,286	0.0%	0.0%	0.2%	30.0%
Morrow	DSL	11,166	1.5%	6.0%	10.2%	NA
Morrow	Fixed Wireless	11,166	4.3%	11.1%	NA	0.6%
Morrow	Cable	11,166	0.0%	NA	16.4%	NA

County	Technology	Total Population	Unserved (< 10/1)	Underserved (< 25/3)	Basic Broadband	Future Ready
Morrow	Fiber	11,166	NA	0.0%	0.3%	44.1%
Multnomah	DSL	807,538	0.1%	0.0%	0.0%	NA
Multnomah	Cable	807,538	0.0%	NA	0.3%	0.3%
Multnomah	Fixed Wireless	807,538	NA	0.1%	NA	13.6%
Multnomah	Fiber	807,538	NA	NA	0.1%	85.4%
Polk	DSL	83,696	0.3%	0.2%	NA	NA
Polk	Cable	83,696	NA	0.0%	1.8%	4.0%
Polk	Fixed Wireless	83,696	NA	NA	0.2%	80.3%
Polk	Fiber	83,696	NA	NA	NA	11.6%
Sherman	DSL	1,758	13.3%	9.6%	40.0%	NA
Sherman	Fixed Wireless	1,758	0.8%	NA	4.5%	NA
Sherman	Fiber	1,758	0.9%	NA	10.0%	5.7%
Tillamook	DSL	26,688	1.7%	0.2%	0.8%	NA
Tillamook	Fiber	26,688	0.4%	NA	0.2%	3.7%
Tillamook	Cable	26,688	NA	NA	86.4%	1.4%
Tillamook	Fixed Wireless	26,688	NA	NA	NA	0.0%
Umatilla	DSL	76,985	1.6%	1.2%	1.9%	NA
Umatilla	Fixed Wireless	76,985	0.3%	4.1%	NA	12.1%
Umatilla	Cable	76,985	NA	NA	52.4%	0.1%
Umatilla	Fiber	76,985	NA	NA	1.8%	20.5%
Union	DSL	26,222	5.5%	10.2%	0.7%	NA
Union	Fixed Wireless	26,222	3.0%	2.7%	4.3%	NA
Union	Fiber	26,222	0.1%	NA	3.0%	4.8%
Union	Cable	26,222	NA	NA	59.1%	0.0%
Wallowa	DSL	7,051	0.4%	NA	NA	NA
Wallowa	Fixed Wireless	7,051	NA	NA	86.5%	0.1%
Wallowa	Cable	7,051	NA	NA	0.1%	NA
Wallowa	Fiber	7,051	NA	NA	NA	4.1%
Wasco	DSL	26,436	2.8%	0.6%	3.3%	0.8%
Wasco	Fixed Wireless	26,436	2.7%	0.7%	0.7%	1.2%
Wasco	Fiber	26,436	0.1%	NA	4.4%	8.3%
Wasco	Cable	26,436	NA	NA	68.8%	0.3%
Washington	Fixed Wireless	588,947	0.2%	1.4%	1.4%	0.1%
Washington	Cable	588,947	0.0%	NA	6.0%	0.2%
Washington	DSL	588,947	NA	0.1%	0.1%	NA
Washington	Fiber	588,947	NA	0.0%	0.2%	90.3%
Wheeler	DSL	1,357	29.0%	NA	NA	NA
Wheeler	Fiber	1,357	1.5%	0.8%	NA	NA
Yamhill	DSL	105,720	0.0%	NA	0.0%	0.0%
Yamhill	Fixed Wireless	105,720	NA	1.0%	9.0%	13.5%
Yamhill	Cable	105,720	NA	NA	11.0%	1.1%
Yamhill	Fiber	105,720	NA	NA	NA	64.0%

6.3 Open Text Responses from Businesses and Households

The following is a complete set of the open text feedback that businesses and organizations across Oregon provided to SNG's eBusiness Checkup between October to December 2019. Personal identifiers have been removed to protect respondent confidentiality.

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	**Industry**	**City**	
Business	Accommodation & Food Services	Camp Sherman	Provide a better experience for our customers. At this point, most of our guests are used to a reliable, fast broadband experience, and we need to be able to provide that.
Government entity	Utilities	Condon	Connecting our water system with broadband to access our meters, reservoirs and wastewater systems to streamline some of the functions and have emergency functions too.
Business	Professional & Technical Services	Otis	Better directed advertising.
Business	Retail Trade	Rainier	Customer on-line material reporting
Nonprofit	Educational Services	Neskowin	Provide online classes.
Business	Manufacturing / Processing	Portland	Increase marketing activities; improve ordering with higher upload and download speeds
Business	Real Estate	Portland	We have broadband, it's expensive & sometimes unreliable.
Business	Construction	Eugene	We have no need for additional broadband access beyond what we have now.
Business	Wholesale Trade	Bend	We still have on premise servers, and our data backups are internal, so it would be nice to have external backups as well, but we have too much data. Although we have two connections, it would take too long to back up everything.
Business	Professional & Technical Services	Portland	We are not likely to use broadband services due to security issues
Business	Other services (exc. public admin)	Salem	I would expect lower rates through competition (there is no competition now) plus a greater emphasis on privacy (to which our current vendor gives lip service at best).
Business	Retail Trade	Cornelius	More productive work cycle.
Business	Professional & Technical Services	Yachats	More speed for newer integrations.
Business	Retail Trade	Ashland	access information from the cloud and our company's servers faster and easier
Business	Other services (exc. public admin)	Hermiston	better access to suppliers and online payment options
Business	Manufacturing / Processing	Milwaukie	offer online ordering to clients
Business	Health Care & Social Assistance	Oregon City	Online seminars
Business	Finance & Insurance	Beaverton	Set up website for more client interaction.
Business	Professional &	Troutdale	Nothing. But would use higher speeds and lower monthly

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
	Technical Services		cost.
Business	Retail Trade	Salem	Market to customers.
Business	Retail Trade	Sandy	I currently have such terrible internet my business is closed because I don't have the internet to run them. I have to drive into town to use my cell phone & the landline connection it's terrible. It's festering my business & I wish I'd never moved from my other location in a different state. When my lease is up I'd the internet service doesn't change I'll be moving out of the state
Business	Professional & Technical Services	Portland	Increase efficiency by reducing lag time.
Nonprofit	Health Care & Social Assistance	Monmouth	Better reliability. Internet going down is always a problem, and all business and work stops.
Nonprofit	Information	Portland	Ongoing remote backups, avoiding cloud services (with its privacy issues) by being able to host operations and services in-house. I would also like to have service providers that have real service obligations with some regulatory oversite, which is missing today. I would like to see less monopoly power exploited by service providers. I would like to see service providers not acting like rent-seeking and to receive service closer to actual cost.
Business	Arts, Entertainment & Recreation	Junction City	Improved sales revenue and marketing of business by having consistent internet connection. Ability to complete tasks and not have to restart when internet connection is lost or bandwidth speeds reduced.
Business	Other services (exc. public admin)	Portland	We have broadband access, so nothing will change.
Government entity	Public Administration	Halsey	We have broadband access. Having the high upload speed enables us to design and publish our own website in-house, which saves the city about $9-13,000 in set up costs and annual maintenance fees. Before we had fiber, we did this in house but were starting to hit major technical difficulties as our upload speed couldn't meet the demands of modern software.
Government entity	Agriculture / Forestry / Fishing	Eagle Point	Work in a more efficient manner. Our internet is down about 20% of the time, and slow when it is working.
Business	Retail Trade	Newport	remote desktop control
Business	Retail Trade	Bandon	Online sales
Business	Retail Trade	Astoria	It seems like every market is moving in the direction of activity online. Everything that we do is affected by broadband so online sales through cloud services will be slowed and be a challenge without proper access to broadband.

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
Nonprofit	Construction	Newport	VOIP - we would like to do this now but our bandwidth is too narrow and the cost of changing to a new service with sufficient bandwidth is too high - would cost $10,000 to run the lines for cable and the ROI isn't high enough to justify Cloud-based CRM Volunteer coordination via online system
Business	Unclassified Establishments	Portland	More dependable connection and conferencing.
Business	Professional & Technical Services	Portland	Hire even more people to work remotely.
Business	Educational Services	Gold Beach	Our internet is so slow and frustrating; we can hardly use it for business purposes.
Business	Other services (exc. public admin)	La Grande	Faster internet, better service
Business	Wholesale Trade	Portland	On-line operating manuals and videos. improved product descriptions.
Business	Construction	Hubbard	We are experiencing service interruptions and slowdowns almost on a daily basis, due to poor internet connection. CenturyLink considers our area a low priority for upgrade to fiber optic, and without access to any other provider, we are stymied. I have contacted other providers in the area, but they all say that they can't help us, that CenturyLink is the only authorized provider for our area. This in spite of the fact that we are less than 1/2 mile from Canby Telephone service area, and only a couple miles from other service providers who are putting in fiber optic on their entire area of service! The smaller private companies all around us are putting in fiber optic cable continuously, but CenturyLink refuses to do so.
Business	Professional & Technical Services	Corvallis	Waste less time waiting for uploads/downloads of files and information.
Business	Retail Trade	Medford	Do things faster
Business	Health Care & Social Assistance	Hillsboro	more video
Business	Accommodation & Food Services	Corvallis	Pay less for service on par with the rest of the developed world.
Business	Manufacturing / Processing	Dundee	greater, faster, and easier communication.
Nonprofit	Professional & Technical Services	Eugene	Nothing, the internet is involved in everything.
Nonprofit	Other services (exc. public admin)	Redmond	Upload Content Online quicker.
Business	Professional & Technical Services	Mosier	Nothing, but it would be faster
Business	Finance & Insurance	Portland	When our internet is down. our business comes to a halt.
Business	Health Care &	Grants Pass	Provider services faster and use better data for

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
	Social Assistance		improvement efforts. Offer new services.
Business	Retail Trade	Portland	Broadband is too vague a term. The most important characteristic for productivity in my business is latency, i. e. the time to respond to a request sent over the Internet. Bandwidth is secondary. A 1 gig connection with high latency is less useful than a 10 meg with low latency.
Business	Professional & Technical Services	Portland	Further market and sell services outside of the region, increase revenues by 20-40% and reduce operating expenses and training costs
Government entity	Other services (exc. public admin)	Portland	Give us the ability to upload information needed to apply for online grant applications and entering required information into online grant management systems in order to qualify for continued funding. Improve operation of GIS mapping systems for tracking of activities and invasive species.
Business	Administrative & Support Services	Portland	I am currently relegated to using DSL as broadband is not available in my area. It is very difficult to rely on the DSL. If broadband were available and reliable, I would be able to do more teaching online, streaming live videos for marketing, make more efficient use of my time in answering emails, social media advertising, web development, and just about anything that I do on the computer. Currently any time I access the internet, my speeds are affected by slowdowns and variable speeds, outages, frustrations and time inefficiencies.
Business	Professional & Technical Services	Bend	sharing very large files with clients.
Business	Health Care & Social Assistance	Portland	share/review cases with other doctors remotely
Nonprofit	Arts, Entertainment & Recreation	Eugene	We would like to offer internet services to our guests. This would help us become more of a destination to local audiences and hopefully, increase visits and memberships.
Business	Other services (exc. public admin)	Condon	Use software without crashing issues; reliably save on the Cloud and access all content remotely; offer products online
Business	Manufacturing / Processing	Hillsboro	support of traveling employees with data services accessing data from home office at reasonable speeds and efficiency
Nonprofit	Other services (exc. public admin)	Prineville	Support workforce training in a digital era, provide reliable internet in residential areas for population retention and growth, increase attendance at local college campuses, provide better support and redundancy for local data centers
Business	Professional & Technical Services	Sisters	Need bulletproof reliability. Frequent service slow-downs, occasional outages absolutely shut off my consulting work.
Business	Professional & Technical Services	Astoria	Video calls, online education
Business	Manufacturing /	Clackamas	Faster, more efficiency.

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
	Processing		
Nonprofit	Other services (exc. public admin)	Portland	Create online exhibits, offer access to museum collections
Nonprofit	Professional & Technical Services	Portland	More on-line webinars and website content. More video conferencing.
Nonprofit	Arts, Entertainment & Recreation	Portland	Video conference calling that works easily, reliably, and with clarity is important.
Business	Professional & Technical Services	Eugene	Online sales and configuration of cutting instructions for beef orders
Business	Retail Trade	Hood River	We would be able to rely on more cloud based services.
Business	Public Administration	Sandy	We have Gig fiber up and down. It is awesome.
Business	Professional & Technical Services	Sisters	we currently don't have broadband access. Having it would increase our connection speed, providing greater efficiency.
Business	Real Estate	Lakeview	be able to use the internet. current service is so slow, it take hours to complete a single task
Business	Professional & Technical Services	Portland	Work anywhere, anytime with faster reliable secure service.
Business	Utilities	Eugene	Secure data access to remote sites
Business	Agriculture / Forestry / Fishing	Plush	Paying bills online, online training, saving time within existing online activity
Business	Wholesale Trade	Beaverton	Higher work efficiency through increased bandwidth and reliability.
Business	Construction	Astoria	contracts, online payments
Business	Professional & Technical Services	Scappoose	more social media networking
Government entity	Public Administration	Hines	More community interaction.
Business	Retail Trade	Portland	Better training online for remote staff. Efficiency in data communication between sites.
Business	Professional & Technical Services	Astoria	We would be able to host on premise a lot of services currently hosted by paid vendors; better utilize video conferencing to reach new markets and support ongoing projects; reduce delays from slow downloads; re-invest funds to security devices instead of excessive fees for ISP providers.
Business	Professional & Technical Services	Eugene	Access main office applications, files, etc. via VPN from home office
Business	Professional & Technical Services	Brookings	Highest-level broadband (competing community has better quality) access would bring prosperity to the impoverished South Coast. People want to move here, but the lack of broadband has the economy by the throat.
Business	Professional &	Portland	Quicker access speed to off-site cloud computations for

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
	Technical Services		scientific modeling.
Government entity	Information	Salem	We're in pretty good shape. More reliable providers would help.
Government entity	Public Administration	Lincoln City	We currently have broadband access. However, since many of our patrons do not, it limits their access. With better broadband I would expect to be able to supply more online resources and distance learning opportunities to more patrons.
Business	Manufacturing / Processing	Beaverton	More reliable internet. At times the service slows down or crashes which can be cause problems with processing shipments.
Government entity	Public Administration	Burns	Have faster operating systems. We currently use video conferencing, electronic case management systems with document storage, outlook e-mail and share point sites. Our system as it is now does not provide the bandwidth needed for quick operations.
Business	Professional & Technical Services	Eugene	Upload my creative work more efficiently. Current upload speeds are extremely limited for modern media creation and distribution.
Government entity	Professional & Technical Services	Enterprise	Work more efficiently, have phones that work.
Business	Health Care & Social Assistance	Maupin	currently have broadband internet
Business	Information	Klamath Falls	Publish more video
Business	Retail Trade	Roseburg	we need the better speed
Business	Agriculture / Forestry / Fishing	Williams	Better faster credit card transactions
Government entity	Public Administration	Jacksonville	We use Esri Survey 123 And Collector applications when we have a wildfire and multiple used of these applications are trying to sync we often have syncing issues due to the week Wi-Fi service we currently have
Business	Manufacturing / Processing	Eugene	increase internet sales
Business	Retail Trade	Grants Pass	speed up ordering speed up marketing
Business	Manufacturing / Processing	Elmira	Be able to process transactions faster and give better customer service. Allow customers to have the option to connect to Wi-Fi.
Business	Arts, Entertainment & Recreation	Bend	Our internet is already sufficiently fast 90% of the time. Occasional bottlenecks such as Windows updates, uploading large files for off-site backups and video streaming of tutorials etc. can cause some hiccups, but nothing major. Fast upload / download speeds would make this less and less of an issue, as it did when we recently updated from 20 / 4 (down / up) to 100 / 10 (down / up).

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
Business	Agriculture / Forestry / Fishing	Jacksonville	We need dependable high speed, unlimited internet access. Being on satellite internet, we continually run out each month and struggle to do payroll or communicate some months. Definitely could benefit from cable internet that isn't dependent on amount of use but speed.
Business	Administrative & Support Services	Clatskanie	More reliable internet, do more business
Government entity	Transportation & Warehousing	Spray	State programs that our slow internet will not allow us to be a part of at this time.
Government entity	Public Administration	Eugene	Need more band width in order to handle the new programs and changing requirements for employees
Business	Arts, Entertainment & Recreation	Selma	Our current broadband connection is very unstable. Large blocks of the business day pass with no usable connection at all. I expect to be able to at least have the ability to upload and download small documents and sales photos.
Business	Information	Creswell	More stable connection; more video on public-facing platform
Business	Professional & Technical Services	Florence	Greater efficiency and increased productivity due to faster and more reliable internet service.
Government entity	Construction	Sheridan	Website
Government entity	Public Administration	Sutherlin	increase productivity
Business	Real Estate	Bandon	More thorough marketing with the use of video. Less monitoring of limited bandwidth access.
Business	Manufacturing / Processing	Chiloquin	Better Customer & Business Service
Business	Retail Trade	Eagle Point	Start a YouTube channel. Slow upload speeds currently prevent this.
Business	Arts, Entertainment & Recreation	Camp Sherman	Upload videos efficiently Use cloud backup
Nonprofit	Educational Services	Happy Valley	Faster internet and better reliability
Nonprofit	Other services (exc. public admin)	Klamath Falls	Integrating more software to make digital documents and minimal our paperwork
Government entity	Public Administration	Tillamook	I would be able to operate more efficiently. We have several off site locations that barely get by with our current internet options. Both have very slow dsl; cable is too expensive to bring to the sites.
Business	Accommodation & Food Services	Camp Sherman	This is probably the biggest deal breaker for customers. If there is any negative feedback it is always because of the Wi-Fi or internet access.
Nonprofit	Educational Services	Myrtle Point	Our mission is to support our community. The library is fortunate to have a dedicated broadband connection only though a single line providing service to the library alone. The community at large has no option other than satellite

Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
			for internet access. Our connection while much better than our previous satellite connection is still slow compared to surrounding cities. We would like to be able to provide faster service with more bandwidth so our patrons would be able to attend online classes, start businesses and work from home to just name a few. It would be even better to have broadband access available to residences in our area not just the library.
Business	Retail Trade	Lincoln City	Speed up processing and researching.
Business	Professional & Technical Services	Elmira	access more data and information
Nonprofit	Educational Services	Portland	provide more bandwidth and speed to guests for video-conferencing and video streaming
Business	Construction	Coos Bay	Nothing additional as we currently have good broadband service
Government entity	Educational Services	Camp Sherman	We would expect to use many more educational software programs for use with students than we are currently able to do. We could get more kids/staff on the computers at one time--currently it is very slow with only 8 kids/staff online at once. We could assign more assignments to kids to work on the computers. Staff could work more efficiently, not waiting for internet pages to load. Access to multimedia programs would be increased. The community could attract more families to live in the School District if there were improved internet access. This would lead to a sustainable school population to draw on over time.
Business	Real Estate	Astoria	Faster banking, bookkeeping, research, better advertising, reach more clients, research and purchase supplies
Business	Arts, Entertainment & Recreation	Albany	More staff online simultaneously without service interruption
Nonprofit	Arts, Entertainment & Recreation	Eugene	Work faster
Business	Real Estate	Eugene	have more reliable service.
Business	Health Care & Social Assistance	Corvallis	I would like to be able to deliver telehealth services from a home office location, but it is in a rural area with inadequate broadband service. The office location would permit it, but that is not as relevant.
Government entity	Public Administration	Tualatin	Stream HD quality video using both cell service and broadband simultaneously.
Business	Health Care & Social Assistance	Lebanon	Probably develop a website and use social media
Business	Real Estate	Corvallis	More video conferencing with clients to reduce travel to client sites
Government entity	Information	Burns	Streaming services

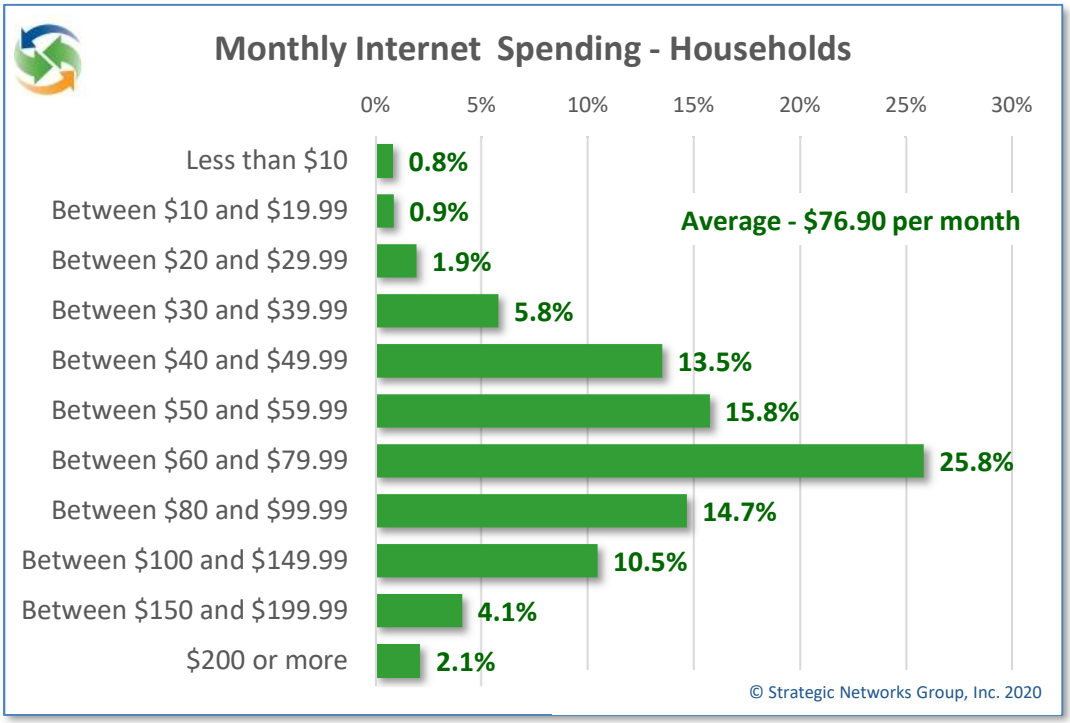
Open text feedback from respondents to SNG's eBusiness Checkup			What would you expect to be able to do through using broadband access that your organization is not doing now with the internet?
Sector	Industry	City	
Business	Real Estate	Portland	Add video to our marketing fliers
Nonprofit	Other services (exc. public admin)	Portland	expand our geographic reach in both advertising and also training delivery.
Nonprofit	Other services (exc. public admin)	Wolf Creek	Build better connections with our Audience and members. Create a blog. Offer online learning and conference workshops
Business	Construction	Cloverdale	Save TIME, spend less money for connection with one faster, more efficient connection rather than relying on 2 connections (1 primary, 1 back up)
Business	Agriculture / Forestry / Fishing	Hubbard	Our inventory and sales system is cloud based and our unreliable and slow internet causes delays and frustrations daily.
Business	Agriculture / Forestry / Fishing	Aurora	remote access to desktop
Business	Agriculture / Forestry / Fishing	Eugene	The primary operation at this location is a vineyard and tasting room. My spouse and I also live at this location and operate four additional businesses from this location on a part time basis. We pay $679.00 per month for 3 Mbps. There is no other service provider and the service provider has repeatedly told us no additional bandwidth is available for us. The service fails when daytime temperatures exceed 90 degree Fahrenheit disrupting e-commerce transactions in the tasting room, communications with the winery "head office" which is 20 miles away, dissatisfying our guests, disrupting their social media posts at our operation causing missed word of mouth opportunities. Reliable, fast service would improve these and allow us to grow our rural business.
Business	Agriculture / Forestry / Fishing	Cheshire	Data backup, data sharing with employees, online sales, online marketing
Business	Real Estate	Cheshire	Consistently conduct business online if we had a reliable connection. The lack of reliable and fast internet directly impacts our profits and customer service.

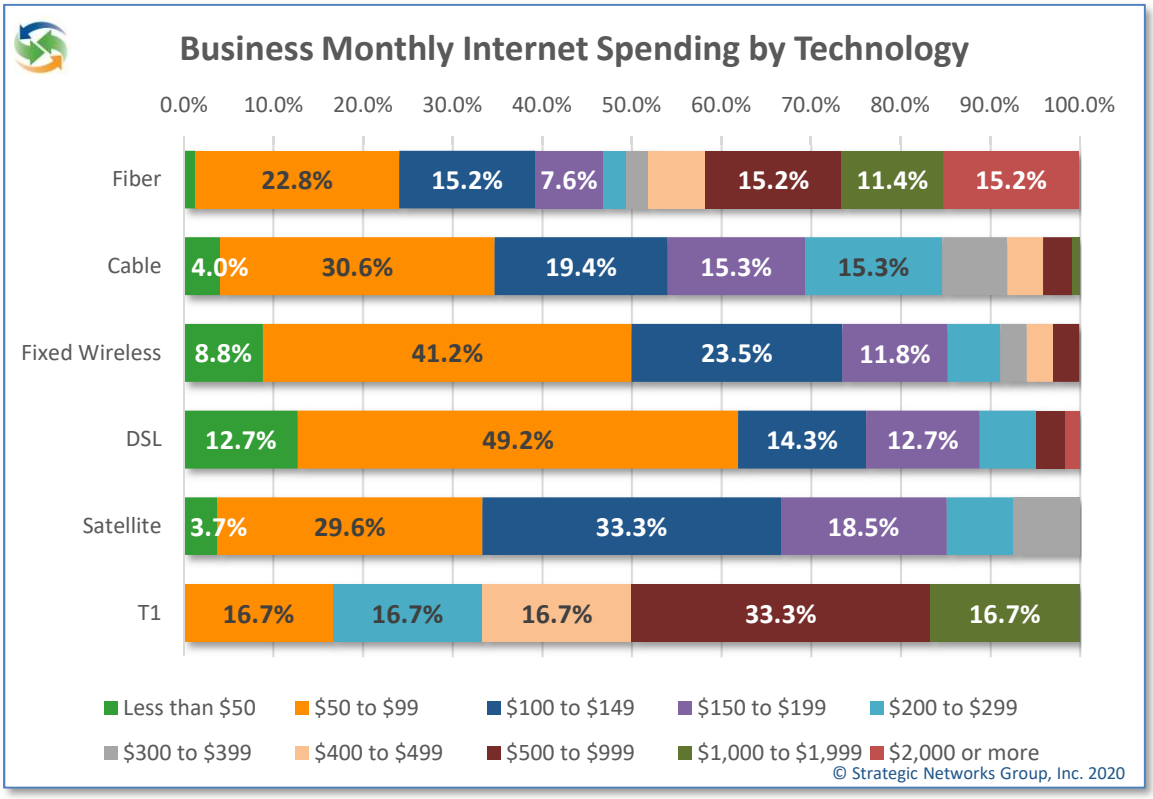
The following is a sample of the open text feedback that household respondents across Oregon to SNG's eHousehold Checkup between October to December 2019. Personal identifiers have been removed to protect respondent confidentiality.

Age	City	In what ways do you think that broadband can be used to further benefit your household and your community?
65 years and over	Beaverton	engaging the elderly, health care help, monitoring of individuals' health,
35 to 54 years	La Grande	Would like more options for internet service providers. Though I live just outside the city limits, there is currently only one provider that can provide service for my home, and they are aggressive with bundling and cost increases. Fewer provider options means less leverage for negotiation of services.
65 years and over	Keizer	With the technology, perhaps more businesses could have their employees work from home saving time, money, less stress and environmentally effective.
18 to 34 years	Corvallis	Utilizing local utility cooperatives would allow greater community input on the development of broadband within the community rather than relying on large disinterested companies being able to decide for us.
65 years and over	Portland	improve the economy; improve access to education, improve delivery of social services
35 to 54 years	John Day	We have very limited options. At my residence we could access satellite or a 5 Mbps WiMAX solution. DSL is not available because CenturyLink will not allow any new connections even on existing copper connections in our neighborhood. No fiber is available in our neighborhood. So our choices are overpriced satellite with annoying latency issues and data prioritization that kicks in around the second week in the month, or an antiquated WiMAX system that can't deliver broadband speeds. Where fiber is available in our community we only have one provider and will pay whatever we have to for access. We need more choices and a greater variety of services to be competitive with other regions.
35 to 54 years	Mayville	Economic growth. As more people are using the internet to do their jobs or basic functions - paying bills, ordering supplies that you can't get locally, it is vital that we have higher speeds of broadband. We are also very rural and the ability to access doctors remotely would save time and money, not to mention the stress of travel would be very beneficial.
35 to 54 years	The Dalles	Cost of service is a limiting factor for a large part of our community. They have access but they can't afford to get it.
55 to 64 years	Days Creek	Businesses would be possible if there was access to true broadband. our DSL speed is very similar to dial up speed and is very undependable. online banking is very difficult because security issues commonly time out the connection and sometime shut down because they monitor the connection speed.
35 to 54 years	Coos Bay	Our community is severely disadvantaged by lack of true broadband speed. At this point I think a wireless solution is going to be the only way to get true broadband to our rural residents. The cost for high bandwidth connections makes this prohibitive. Any help would be greatly appreciated.

6.4 Supplemental Charts for Reference

The following charts derived from data collected for this study from households and businesses participating in the SNG statewide assessments are provided below in support of statements or statistics cited in the body of this report.



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