Redwood Coast Connect, January 2009

EXECUTIVE SUMMARY

The full report is available at:
http://redwoodcoastconnect.humboldt.edu/

Executive Summary

Redwood Coast Connect (RCC) is a project of Redwood Coast Rural Action (RCRA), a regional network of community leaders in partnership with the California Emerging Technology Fund (CETF). Envisioned to be the first phase in an ongoing initiative to make broadband Internet available to all residents in the region, this study focused on analyzing:

- Demand–including willingness to pay, the relative importance of broadband to homes and businesses, present uptake rates and potential for and challenges to demand aggregation
- Supply–including mapping of current coverage, identifying unserved and underserved communities, and identification of critical missing infrastructure
- Current policy climate–including identification of policy barriers to rural deployment as well as opportunities for advocacy

The region covers almost 11,000 square miles (the size of Connecticut and New Jersey combined) and has a total population of approximately 266,000. There are 11 incorporated cities encompassing approximately 48% of the total regional population. In addition to the cities and smaller communities, there are 20 federally recognized tribal communities.

Settlement patterns in the region follow geographic features including mountain ranges and rivers that create a variety of challenges in serving all communities with broadband. Much of the land is heavily forested, some of which is not easily accessible by road. Winter storms and constant roadwork all too frequently disrupt services–even to the most populated areas. Infrastructure is expensive to build and difficult to maintain.

Much of the region lacks access to any fiber network affecting broadband availability, quality and reliability. Efforts to provide broadband to all residents and businesses will depend on significant investments in both middle and last mile infrastructure. It is clear that the underserved and unserved communities will require unique approaches and partnerships between larger telecom and cable companies linked to smaller local Internet providers.

The premise behind this study was that aggregation of demand would increase purchasing power making the economic case stronger for providing services to the unserved and underserved communities. In addition to aggregating demand, it is assumed that some level of public subsidy would be necessary to stimulate a buildout of infrastructure, thus increasing broadband availability.

The geographic and geologic challenges, coupled with the low population numbers, have resulted in an initial determination by larger telecom and cable companies that the remaining communities do not fit their "investment return models." At the region's annual Broadband Forum in August 2008, telecom and cable company representatives stated that with few exceptions the remaining unserved and underserved communities are not priority targets for expanded services. In addition, locally based service providers, including Wireless Internet Service Providers (WISPs), have the desire to serve niche markets but lack infrastructure capital, have limited access to backhaul, and do not qualify for existing public subsidies.

Methodology
Through a combination of quantitative and qualitative research methods, the level of local demand and the willingness to pay for broadband services for residential, business and governmental sectors were identified. Supply was also mapped identifying areas of unserved and underserved populations. Unserved and underserved communities were ranked according to both supply and demand, and resulting potential revenues were estimated. Conversations with potential providers, policy makers and business leaders set the stage for moving from information gathering and analysis to implementation.

Survey Process

Written community surveys, online surveys, telephone surveys, and business mail-back surveys yielded 1869 completed surveys. The telephone and business mail-back survey data are more reflective of the general population since the sample was drawn using random selection for participation. Written survey respondents were self-selected, and data indicated a higher interest in broadband services and a higher educated respondent pool. Considering the data collectively, questions where the results were consistent among the methods are considered very robust.

Community Meetings

Seven community meetings were held in the counties of Del Norte, Humboldt, Mendocino, and Trinity from early November 2007 to early January 2008. The objectives of those meetings were to provide information to the public in making a compelling case for broadband deployment in the region; to understand the context of broadband demand in hearing from community members about why and how having reliable broadband access could impact their lives; and to support community mobilization and networking toward regional commitment to and ownership of steps towards building broadband infrastructure and services.

## *Residential Demand for Broadband*

Residential: Importance of Internet Access at Home
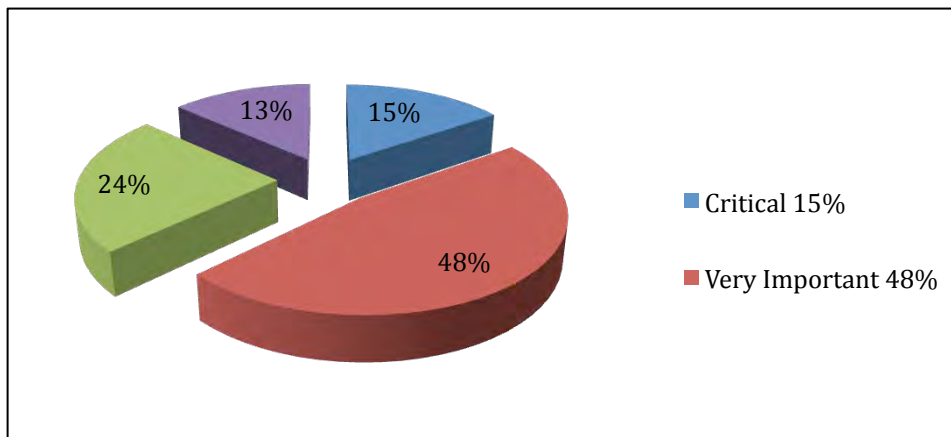
Telephone survey, 95% confidence level, margin of error +/- 4%, sample size = 556

A majority of telephone survey participants (63%) consider Internet access at home to be either of critical importance or very important. Those who don't subscribe to Internet at home cite a lack of availability and excessive cost as the primary reasons why.

Residential: Type of Internet Access
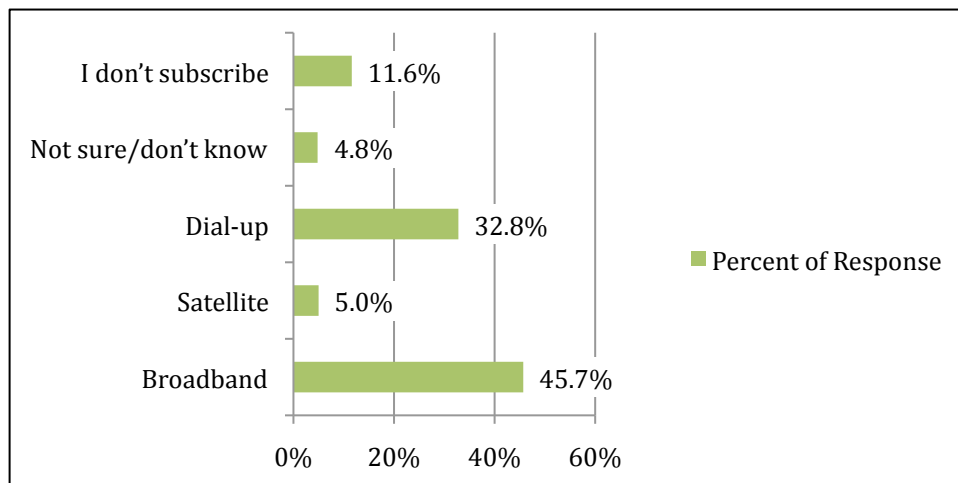
Telephone survey, 95% confidence level; margin of error +/- 4%, sample size = 556

For this project, both those residents reporting using only dial-up (32.8%) and those using satellite (5.0%) are considered unserved. Those who don't subscribe are a mix of households where Internet is available but they choose not to subscribe and those for whom the service is not available. Uptake rates for Internet (including broadband and satellite) appear high at 84% of respondents. It is unknown from the information collected what the uptake rate for broadband regionally might be. Using the telephone results, it can be estimated that over 35,000 households in the four-county area access the Internet through dial-up.

Residential Willingness to Pay
Over 36% of telephone survey participants reported that they would pay more for a faster connection at home. Considering only those participants who currently have dial-up access (i.e., using a modem to connect to the Internet at 56k), this number soared to over 60%. Although most respondents currently pay approximately $20 per month for Internet access, the telephone and written survey results indicate that most participants in both surveys who have dial-up are willing to pay $30 per month or more. Although $30 was the most common response, over 40% of telephone and written survey participants were willing to pay more than $40 per month.

Business Demand for Broadband
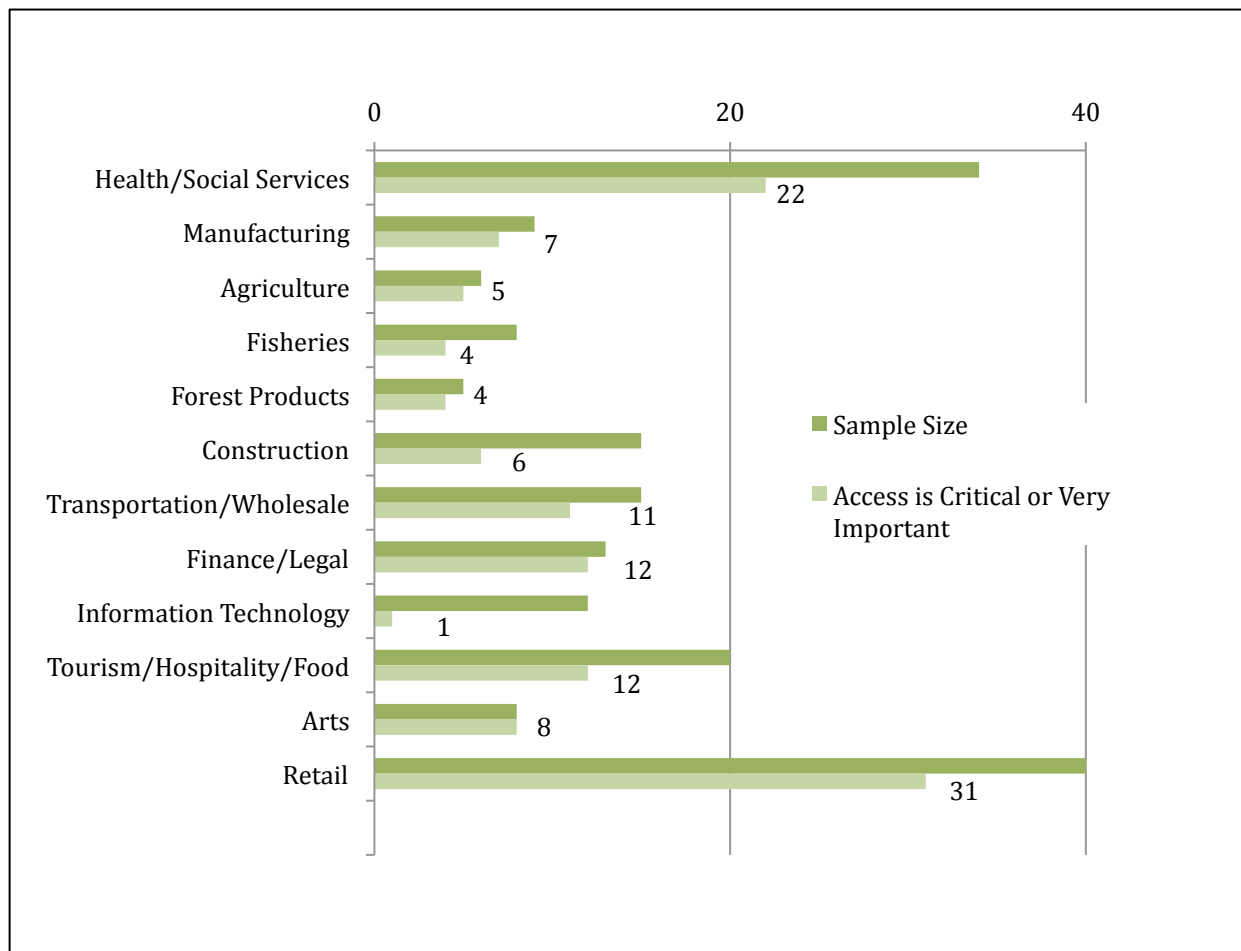
The above chart represents the relative importance of broadband to various industry sectors. Over 70% of businesses surveyed indicated that a broadband connection at work is critical or very important. These data were derived from both self-selected and business mail-back surveys. Additional breakdown and analysis of survey data are necessary to determine with better clarity which industry clusters are most dependent on having broadband service. Based on industry cluster focus groups held as part of the Targets of Opportunity project, health, manufacturing, finance/legal, information technology, and innovation and management services all stated that having reliable broadband services was critical to the future growth of their industries.

Business: Type of Internet Connection
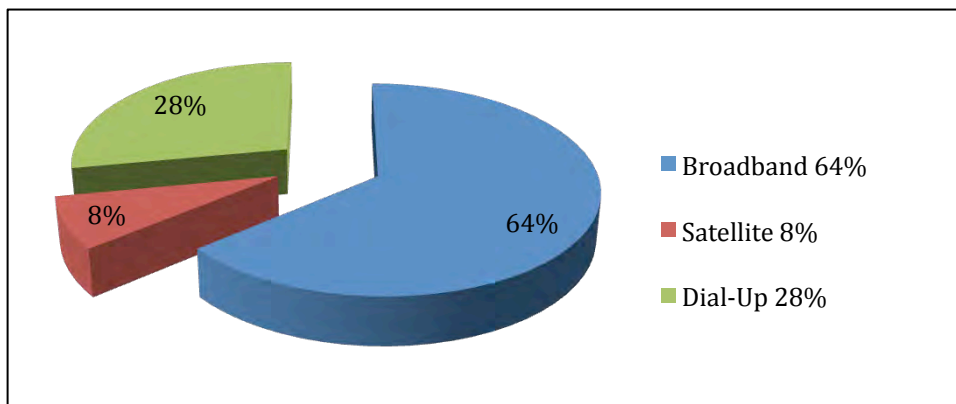
Most businesses surveyed have access to broadband (wireless, DSL, T-1, cable, etc.)

Business Sector: Amount Willing to Pay for Broadband Access
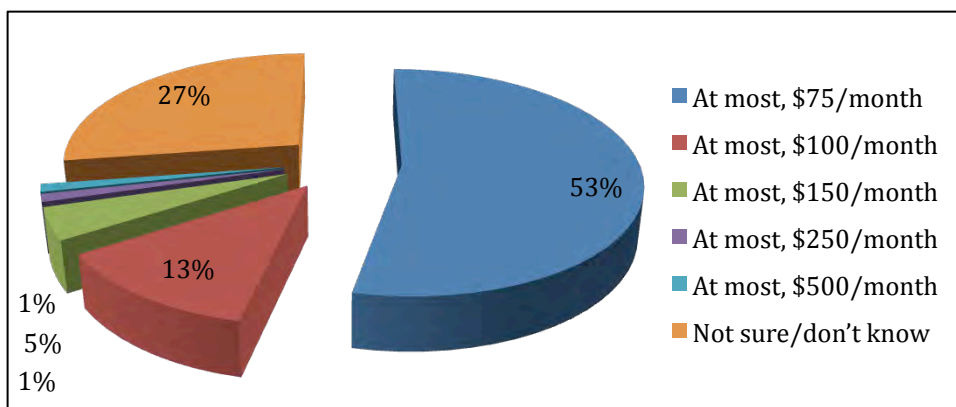
Numbers represent actual responses; margin of error +/- 7% for total sample, sample size= 212

Over 28% of businesses surveyed were willing to pay more for a faster connection, and 39% would pay more for a more reliable connection. However, regardless of current access, most business survey participants indicated a willingness to pay no more than $75 per month for broadband.

Aggregation of Demand

Aggregation of demand at the industry sector level (health care, education, business, government and residential) as a strategy to engaging large providers to extend services does not apply as neatly to the Redwood Coast region as it might in more urban environments. The regional demand is already segmented by a variety of telecom companies, each having their own territory. Multiple providers serving a single area is unusual outside of more urbanized areas.

There are, in the Redwood Coast region, blocks of public or quasi-public sector entities (health centers, schools and governmental agencies) whose demand could be used to leverage additional services should the needs of the whole region prevail over favorable pricing they currently enjoy. Government-supported programs continue to build out these critical nodes (i.e., E-Health network) which extend into rural areas, but presently the broadband services stop at the site (school, clinic or office). Opening up those networks to better serve rural communities by allowing use of those networks by other subscribers or extending the capacity at

the individual sites to serve the community surrounding their site with broadband capacity should be a policy consideration.

In this study, the strategy for aggregating demand was to approach each underserved and unserved community on a geographic basis looking at both supply and apparent demand. By having a good understanding of the opportunities and barriers for each community, the hope is that we could build appropriate partnerships to extend broadband services to those communities.
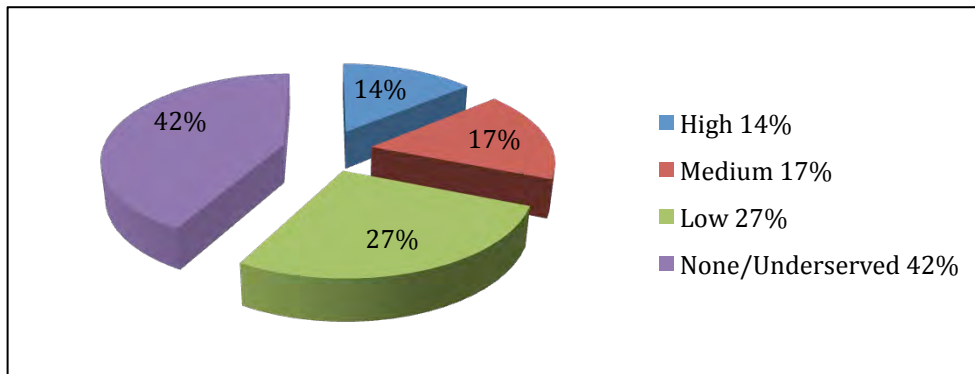
Apparent demand was ranked none, low, medium or high based on a combined numeric score taking into consideration the following:
• Participation in RCC activities
• Broadband importance and willingness to pay from survey data for that area
• Broadband importance to businesses
• Local leadership in broadband issues

Supply

According to the random telephone survey, over 90% of the study population has a personal computer. Sixty-nine percent of the respondents were found to be unserved by broadband access (either no Internet access, or access by dial-up only). However, a recent survey by the California Center for Rural Policy (CCRP) revealed a more troubling statistic–households with incomes below the Federal Poverty Level (FPL) are clearly disadvantaged with up to 14.2% reporting no phone, 45.1% reporting no computer and 55.4% reporting no Internet access in their home.

Ranking of Broadband Supply Available in Communities

N = 100 communities in the region

Supply for each community was ranked none, low, medium or high according to the following factors:
• Number of service providers
• Number of wireline service providers
• Proximity of services to the community
• Single carrier highest upload and download speeds
• Backhaul availability

Unserved and Underserved Communities Prioritized by Demand, Supply and Revenues (Del Norte County)

Del Norte County	Estimated Residences	Demand Rank	Supply Rank	Backhaul Needed	Estimated Annual Revenues
Hiouchi	183	Medium	Low	No	8,553
Klamath	267	Medium	None	Yes	99,580
Gasquet	274	Low	Low	No	12,830

Unserved and Underserved Communities Prioritized by Demand, Supply and Revenues (Humboldt County)

| Humboldt County	Estimated Residences	Demand Rank	Supply Rank	Backhaul Needed	Estimated Annual Revenues
Hoopa	1882	High	Low	Yes	247,907
Willow Creek	961	High	Low	Yes	126,679
Whitethorn	440	High	Low	Yes	57,925
Miranda	354	High	Low	Yes	46,587
Alderpoint	165	High	Low	Yes	36,339
Blocksburg	88	High	Low	Yes	11,556
Fieldbrook	Unknown	High	Low	Yes	Unknown
Orleans	270	High	None	Yes	66,554
Weott	141	High	None	Yes	38,210
Myers Flat	133	High	None	Yes	29,193
Briceland	81	High	None	Yes	17,806
Bridgeville	394	Medium	None	Yes	90.088
Kneeland	217	Low	Low	No	28,635
Shelter Cove	Unknown	Low	Low	Yes	Unknown
Orick	239	Low	None	Yes	66,971
Phillipsville	83	Low	None	Yes	18,170
Crannell	Unknown	Low	None	Yes	3,600
Petrolia	161	None	Low	Yes	21,150
Honeydew	74	None	Low	Yes	9,812
Ettersburg	Unknown	None	Low	Yes	Unknown
Harris	Unknown	None	Low	Yes	Unknown
Redcrest	213	None	None	Yes	46,757
Korbel	105	None	None	Yes	26,736
Dinsmore	Unknown	None	None	Yes	3,600
Richardson Grove	Unknown	None	None	Yes	3,600
Ft. Seward	Unknown	None	None	Yes	Unknown
Holmes	Unknown	None	None	Yes	Unknown

Unserved and Underserved Communities Prioritized by Demand, Supply and Revenues (Mendocino County)

Mendocino County	Estimated Residences	Demand Rank	Supply Rank	Backhaul Needed	Estimated Annual Revenues
Albion	553	High	Low	No	149,310
Little River	469	High	Low	No	126,517
Hopland	726	High	None	Yes	261,401
Philo	587	High	None	Yes	211,198
Manchester	313	High	None	Yes	112,524
Point Arena	263	High	None	Yes	94,828
Comptche	197	High	None	Yes	70,784
Caspar	169	High	Low	No	60,798
Leggett	162	High	None	Yes	58,281
Westport	160	High	None	Yes	57,512
Potter Valley	1006	Medium	Low	Yes	271,643
Piercy	103	Medium	Low	Yes	27,843
Boonville	732	Medium	None	Yes	263,517
Elk	196	Medium	None	Yes	70,399
Yorkville	169	Medium	None	Yes	60,974
Navarro	76	Medium	None	Yes	27,313
Branscomb	35	Medium	None	Yes	12,695
Covelo	628	None	Low	Yes	169,507
Whale Gulch	53	None	None	Yes	19,235
Dos Rios	42	None	None	Yes	15,003

Unserved and Underserved Communities Prioritized by Demand, Supply and Revenues (Trinity County)

Trinity County	Estimated Residences	Demand Rank	Supply Rank	Backhaul Needed	Estimated Annual Revenues
Weaverville	2117	High	Low	Yes	388,656
Hawkins Bar	57	High	None	Yes	20,344
Hayfork	1416	Medium	Low	Yes	259,900
Lewiston	1038	Medium	Low	Yes	190,593
Trinity Center	279	Medium	Low	Yes	51,254
Zenia	143	Medium	Low	Yes	26,249
Douglas City	531	Medium	None	Yes	191,230
Junction City	410	Medium	None	Yes	147,491
Burnt Ranch	264	Medium	None	Yes	95,005
Mad River	145	Medium	None	Yes	52,283
Big Bar	143	Medium	None	Yes	51,469
Ruth	141	Medium	None	Yes	50,859
Coffee Creek	170	Low	Low	Yes	31,065
Hyampom	140	Low	None	Yes	50,452
Trinity Village	170	None	None	Yes	61,031
Wildwood	85	None	None	Yes	30,515
Big Flat	57	None	None	Yes	20,344
Forest Glen	14	None	None	Yes	5,086
Peanut	14	None	None	Yes	5,086

The above charts prioritize all unserved and underserved communities in the four-county region. Demand was used as the most important highest ranking criterion (higher than even potential revenue) because in no cases will revenue alone justify the capital improvements and provision of services. The lack of backhaul in most instances significantly increases the cost of providing services. Clearly, building local demand will be critical in many of the underserved communities. For examples of possible backhaul routes, estimated costs and potential revenues, see Section 4, Infrastructure.
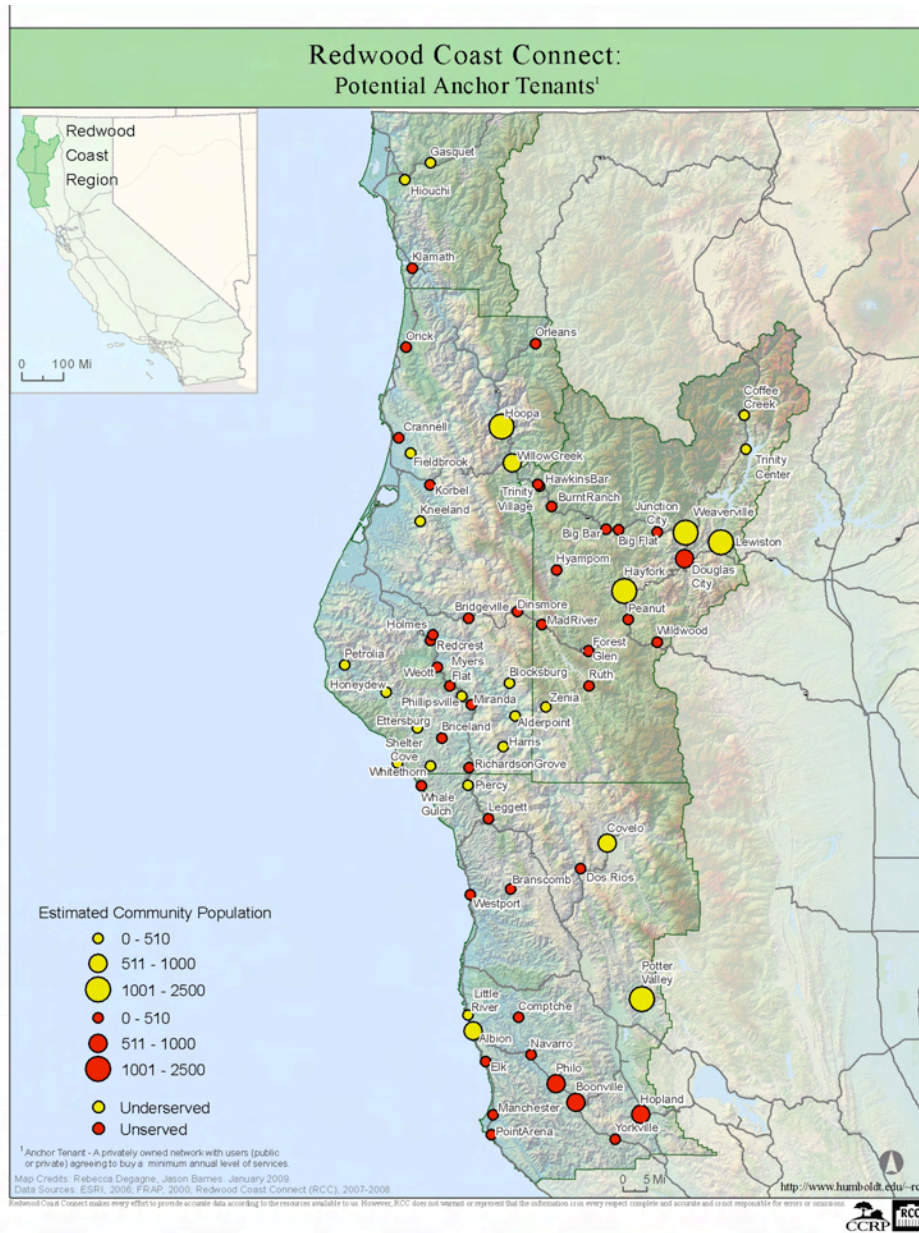
Anchor Tenants

The "anchor tenant" (or "main customer") concept comes into play when talking about demand aggregation. The RCC project has reinforced findings in previous studies. Small rural communities rarely have any businesses larger than microenterprise size, but they may have government offices in communities not served

by broadband. Agency purchasing is generally with pre-negotiated contracts at very good prices, which takes them out of the mix for aggregating demand; in some cases, it takes out the sole potential anchor tenant in a small community.

For example, the National Park Service (NPS) was contacted in Orick in 2006 as a potential anchor tenant for aggregation in the Orick Wireless Business Plan project since there is no backhaul available there and it would be extremely expensive to build microwave or fiber backhaul. While the NPS wants to help the community, security has been tightened since 9/11 and NPS was mandated to become part of a single domain model. As a result, Internet access for the NPS is now via a dedicated line to Denver.

All non-exempt state agencies[1] are required to utilize the CALNET MSAs to obtain mandatory telecommunications and network services. Exempt state agencies[2] and departments are encouraged, but are not required, to use the CALNET MSAs to purchase mandatory services. These services are identified at www.calnet.ca.gov. According to State Parks CIO Alan Friedman, where local telecom services are less expensive than the CALNET rates, they can make a case to purchase locally. According to Michael Liang of the State Department of Business, Transportation, and Housing, a CALNET contract is the first option, but where lower pricing options are available, they may be used.

The Corporation for Education Network Initiatives in California (CENIC) is another example of a closed network, this one provides services statewide to the education system or both K-12 and higher education. CENIC is a network providing a fiber-based backbone to which district offices and schools can connect. These closed networks, while serving government institutions in a cost effective manner, remove the only available anchor tenants in many of the underserved and unserved communities, utilize all available backhaul capacity in many areas, and limit access to their infrastructure.

Infrastructure
Microwave connects areas of the Redwood Coast along with key fiber links for backhaul. Del Norte County is served by a single fiber optic line traveling south from Oregon and terminating in Crescent City. Humboldt County is served by a single fiber optic line traveling north along Highway 101 from Santa Rosa and terminating in Eureka. Trinity County has no fiber optic backhaul lines serving its communities. Mendocino County has two fiber optic lines serving its communities: one traveling along Highways 1 and 128 and terminating in Fort Bragg and the other line along Highway 101 that also serves Humboldt County.

Critical gaps in fiber to provide backhaul and route diversity/redundancy are both north-south and east-west:
- Crescent City to Eureka (85 miles)
- Eureka to Redding (150 miles)
- Eureka to Red Bluff (150 miles)
- Crescent City to Medford (110 miles)
- Mendocino South Coast to Highway 101 or Fort Bragg (60-70 miles)

The key to providing last mile service in the unserved or underserved areas is backhaul. In well-served areas of the Redwood Coast, lack of route diversity/redundancy is a broadband reliability issue, with outages causing disruptions in Internet access, long distance calls, credit card processing and cellular service.

---

[1] Non-exempt state agencies are those under the jurisdiction of the Executive Branch of California state government.

[2] Exempt state agencies and departments (colleges and universities, agencies headed by constitutional officers or agencies such as the State Compensation Insurance Fund and the Lottery) are those that are not required to use the CALNET MSA to purchase mandatory services.

Policy and Program Strategies

Three key areas could be addressed at state programmatic and policy levels: anchor tenants, capital funding and Infrastructure buildout.

Anchor Tenants

Government offices (including education, state and federal agencies) and public lands hold the greatest promise in being integral to getting broadband services to small communities. Unlocking these assets and integrating them into solutions for remote communities could entail:
- New public/private partnerships utilizing public assets to support new infrastructure (i.e., cell towers)
- Opening of closed networks for extending broadband into the hardest-to-serve communities
- Allowing government offices in the hardest-to-serve communities to participate in aggregation of demand with those communities

Capital Funding

Research confirmed that few of the underserved and unserved communities are economically viable broadband service areas to providers. There is need for additional backhaul capacity in addition to last mile solutions in these communities. Public subsidy in the form of low cost capital and grants for planning and feasibility is critical.
- Expand funding available to WISPs and other small local entrepreneurs willing to serve small remote communities
- Provide grant funding to support community efforts in creating business plans for broadband coverage in their communities
- Support research and development of new technologies that hold promise for rural communities
- Reinstate support for buildout of phone services (i.e., AB140 which expired in 2006)

Infrastructure Buildout

Creating a fiber ladder with north-south trunks connected with east-west laterals is critical to providing service throughout rural areas. Successful infrastructure buildout that will serve the state into the future will require intentionality. It will necessitate using public assets more effectively while combining them with private sector investments.
- Create an "open trench" policy whereby state funded infrastructure projects look, at a minimum, at the feasibility of laying conduit or fiber in the ditch while it is open. Better yet, require it in projects that run along key rights-of-way (Caltrans). This should be a policy at all levels of government.
- Fund a pilot project to determine the viability of micro-trenching as an alternative to laying fiber in a public right-of-way (Caltrans)
- Create public owned infrastructure that can be leased by private operators willing to serve hardest-to-serve areas

Key Outcomes outside the Scope of this Project

Possibly more important than the actual data developed as a result of the survey process are the new linkages and relationships developed between local broadband advocates and regional service providers during the course of this project. Examples of accomplishments include:
- While looking for coverage data to establish regional broadband supply, one WISP provided key information on its transmission towers (location and height) to the RCC team. RCC used that information to model viewsheds showing the potential coverage within the existing infrastructure. That WISP currently uses this new map on its website to show availability.
- A WISP in Weaverville was having difficulty resolving tower issues, including the National Park system wanting to remove a key tower between Weaverville and the Interstate 5 corridor. Local referrals were made to agencies to help resolve issues as well as suggest potential tower sites.

- A WISP in northern Sonoma and southern Mendocino counties was caught between two providers and could get no response to its request for a T-1 line. With new contacts developed at a telecom company through the RCC project, the WISP was able to get connected to the appropriate contacts within Verizon.
- Mendocino Coast Broadband Alliance, a community group in Albion, with the assistance of the RCC team has surveyed their community, mapped all residents, created their own aggregation report and contacted several potential providers in a local effort to get broadband.
- Recently there were an unexpectedly large number of applications from regional providers to the California Advanced Services Fund (CASF) fund to extend services to underserved and unserved communities; this is the direct result of relationships developed in part through the RCC project.
- There are new partnerships between CASF applicants (providers of backhaul and wireless Internet companies) along both of the Highway 101 and Highway 299 corridors.