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Coconino County

Broadband Study 2020

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Introduction

In January 2020, the Coconino County Manager approached the Economic Policy Institute (EPI) to conduct a survey of broadband use by county employees. The purpose of the study was to evaluate broadband access at offices and duty stations across the county. Coconino County is the second largest county in the contiguous United States by land size, covering 18,661 square miles. The county's terrain is varied from the Grand Canyon and Lake Powell in the north to the Hopi and Navajo reservations in the south. The size of the county, combined with traditional development patterns, has affected the availability of broadband access and communications in general throughout the county. Parts of the county are cut off from almost any communication, even by landline, with the situation on the Navajo tribal lands being particularly difficult for emergency services.

Much of the information on broadband connectivity on county lands, especially in the rural parts of the county, is anecdotal with work stations having to go to other sources to get broadband connections. The primary purpose of this study therefore was to obtain information from county employees about the availability of broadband access at their offices or duty stations, the quality and speed of the connections, the problems they experience, and the amount of down time and lost productivity resulting from poor connections. The purpose of collecting this information for the county was to provide clarification and to benchmark conditions across the county.

Methods

The broadband survey was designed by the staff of the EPI and Chris Vasquez Pasterz, the county Economic Development Manager, with input from Eric Peterson, the county Public Affairs Director. The study was released to the employees by including the survey links in the County Manager's weekly email to staff. The county was not able to provide the EPI with employee emails addresses to send a direct link to the employees which is a preferred method as it permits more detailed follow-up. The link was sent out once by the county in March and all responses are the result of the single link that was included among a number of messages to staff.

The survey was designed to be completed by staff. When the link in the County Manager's email was activated, it opened the survey in Qualtrics, which is a program used by the EPI to collect survey data over the internet. A copy of the survey can be found in Appendix A. A total of 95 useable surveys were returned by the middle of June, the point at which the researchers closed the survey to any further input. The survey was deployed the week before the Covid-19

pandemic changed working conditions for most county offices. The general lack of responses may have been the result of the Covid-19 changes and the fact that this survey link may have been lost in the flurry of messages that went out regarding new working conditions.

Flagstaff (90.5%) provided the bulk of all respondents, followed by Page and Tuba City (3.2% respectively), Williams (2.1%) and Happy Jack (1.1%). See Table 1 below. Since responses from Flagstaff predominate, this study cannot make statistically valid inferences about the rural areas of the county. This is particularly unfortunate as one of the main purposes of this study was to measure base line conditions in the rural parts of the county.

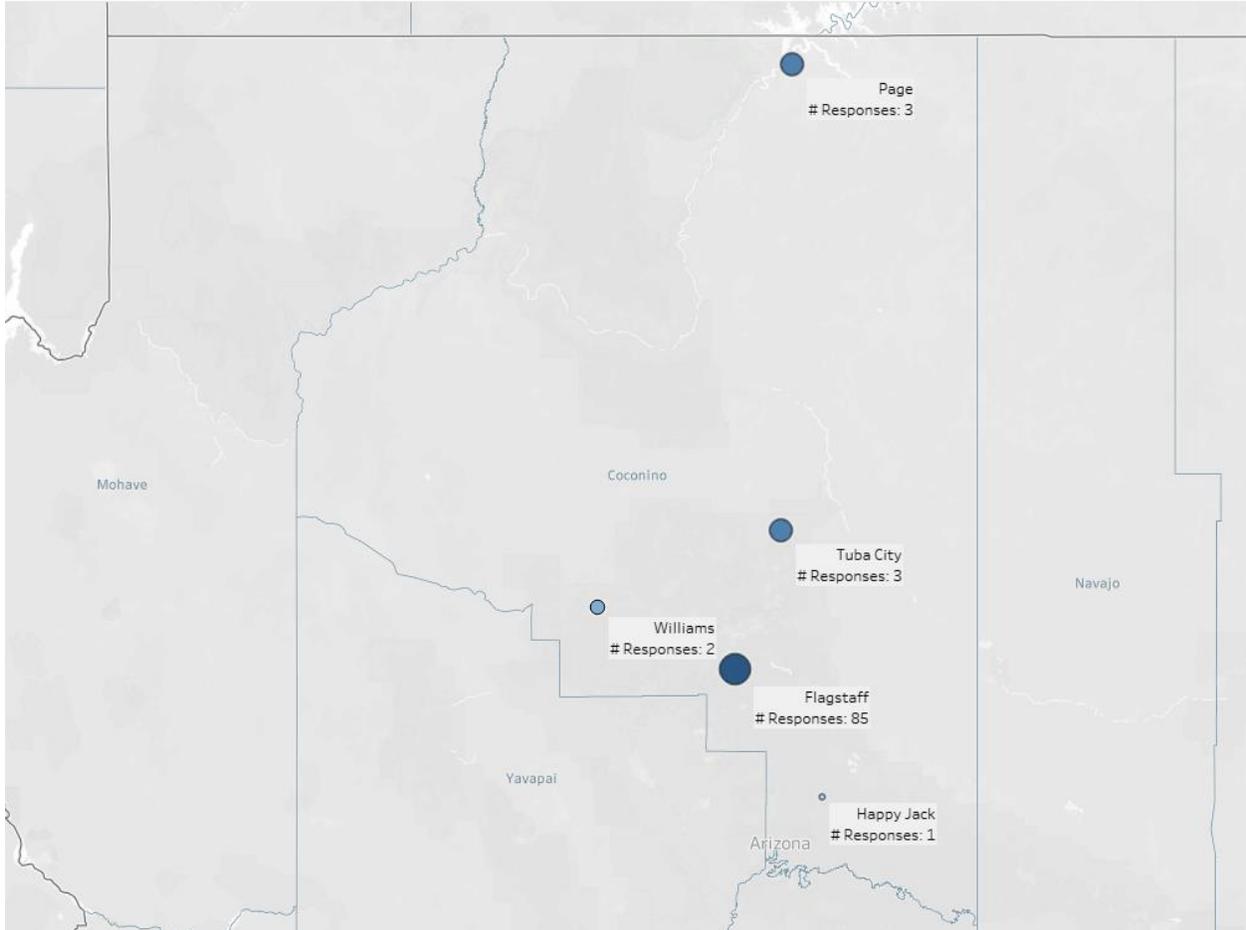
Nevertheless, the small number of rural participants presents a stark contrast to the Flagstaff broadband service measures. To provide a rural assessment, a set of comparison tables are provided in Appendix D for all major questions in the survey.

Table 1. Where are you located?

Coconino County Broadband Study		
Where are you located?		
	Count	(%)
Flagstaff	86	90.5%
Tuba City	3	3.2%
Page	3	3.2%
Williams	2	2.1%
Happy Jack	1	1.1%
Total	95	100.0%

Figure 1. Where are you located?

Coconino County Broadband Study



Work Location and Broadband Activities

The 95 respondents to this survey are distributed among the county departments. The single largest cohort of responses (29%) are from Health and Human Services, followed by the Sheriff's Office (12%), Public Works (7%), and Human Resources (6%). The remainder of departments can be found in Table 2.

Table 2. Department that you work in?

Coconino County Broadband Study		
Department that you work in		
	Count	%
Health and Human Services	27	29%
Sheriff's Office	11	12%
Public Works	7	7%
Human Resources	6	6%
Parks & Recreation	5	5%
County Attorney	5	5%
Community Development	5	5%
Assessor	5	5%
Public Defender	4	4%
Information Technology	4	4%
Education	3	3%
Clerk of the Superior Court	3	3%
Finance/Purchasing	2	2%
County Manager	2	2%
Public Affairs	1	1%
Facilities Management	1	1%
Emergency Management	1	1%
Building Division	1	1%
Board of Supervisors	1	1%
Total	94	100%

Two-thirds (66%) of all respondents indicated that they answered the survey from their office or duty station. There was no indication where the other third of respondents completed the survey. See Table 3.

Table 3. Where did you complete this survey?

Coconino County Broadband Study
Are you completing this survey
from your office or duty station?

	Count	%
Yes	63	66%
No	32	34%
Total	95	100%

Next, respondents were asked about their use of the Internet for official office duties. Almost all (99%) of respondents used the Internet for email, followed by two-thirds of respondents (67%) who used the Internet for VoIP (voice over internet protocol) to run Skype for Business, or other protocols such as Microsoft Teams. A further three-fifths (60%) used the Internet for records retrieval, while 42% used the internet for maintenance scheduling or programming. Two-fifths (40%) used the Internet for mapping and maintaining a Web presence, either through a blog or on social media. One-third (33%) used the Internet for e-government purposes, while smaller percentages used the Internet for other purposes (29%), which includes calendars of meetings, GIS retrieval and GIS products, emergency callouts etc. The remaining uses of the Internet for work activities included public safety/EMS (27%), E-commerce /sales/permits (20%) and E-health (13%). See Table 4.

Table 4. What do you use the Internet for as a part of your official duties?

Coconino County Broadband Study
Please check the items that you use the Internet for
as part of your official duties

	Count	%
Email	92	99%
VoIP Internet phone (Vonage, Skype for Business, Face Time, etc.)	62	67%
Records retrieval	56	60%
Maintenance scheduling/programming	39	42%
Mapping	37	40%
Maintaining a Web presence, blog or social media	37	40%
E-government	31	33%
Other	27	29%
Public safety/EMS	25	27%
E-commerce/sales/permits	19	20%
E-health	12	13%

Does not sum to 100% due to multiple responses

Almost all (97%) of respondents use the Internet daily for official county business, while the remaining 3 percent use the Internet 2-3 times a week for official county business. See Table 5.

Table 5. How often do you use the Internet for official county business?

Coconino County Broadband Study
How often do you use the Internet
for official county business?

	Count	%
Daily	85	97%
2-3 times a week	3	3%
Once a week	0	0%
Monthly	0	0%
Total	88	100%

Broadband Activities

Respondents were asked what form of Internet service they had at their office or duty station. Slightly more than half (57%) had high speed cable access to the Internet. These responses came primarily from Flagstaff (60%) and Tuba City (67%). One-fourth (25%) of respondents indicated that they used a mobile wireless connection such as a smartphone or mobile hotspot. Half of Page (50%) and 33% of Tuba City respondents use this method of connecting to the Internet for official business. Twenty-two percent indicated that they connected by some other manner. Two-fifths of these (44%) indicated that they did not know the form of connection, while the remainder of responses were via wireless, T1 lines, or other technical means. A further one-fifth (20%) connected via DSL with half of Page respondents (50%) and one-third (33%) of Tuba City respondents connecting in this manner. The remaining type of Internet connections, Fixed Antennae Wireless (6%), Dial-up Service and Satellite (5% respectively), were used by relatively few respondents, all of whom were located in Flagstaff. See Table 6.

Table 6. What form of Internet service do you have at your office or duty station?

Coconino County Broadband Study		
What form of Internet service do you have at your office/duty station?		
	Coun t	%
High Speed Cable	47	57%
Mobile Wireless (Smartphone, Mobile Hotspot, etc.)	21	25%
Other	18	22%
DSL	17	20%
Fixed Antennae Wireless	5	6%
Dial-up Service	4	5%
Satellite	4	5%
Does not sum to 100% due to multiple responses		

A majority of respondents (75%) indicated that the Internet service options at their place of work were adequate. One-fourth (25%) did not feel the services were adequate. See Table 7. Considering the fact that the majority (91%) of responses were from Flagstaff, only 21% of respondents there felt that Internet services were inadequate. Not surprisingly two-thirds (67%) of rural respondents felt that the Internet services at their workplace were not adequate.

Table 7. Are the Internet service options available at your place of work adequate?

Coconino County Broadband Study
Are the Internet service options available
at your place of work adequate?

	Count	%
Yes	65	75%
No	22	25%
Total	87	100%

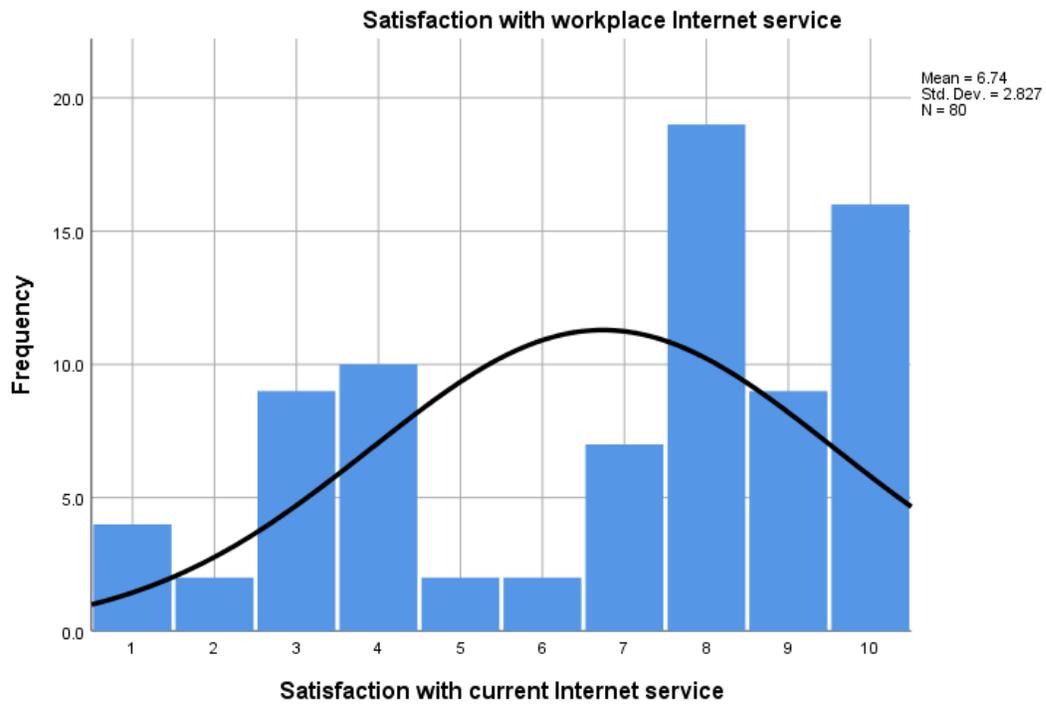
Respondents were asked to rank their satisfaction with their workplace Internet service on a scale of 1 to 10 where 1 was “extremely dissatisfied” and 10 was “extremely satisfied”. The average score was 6.7, slightly more toward “satisfied”. Overall, 55% of respondents ranked their workplace Internet service with a score of 8 - 10. See Table 8.

Table 8. Are the Internet service options available at your place of work adequate?

Coconino County Broadband Study
On a scale of 1 to 10 how satisfied are you with the
Internet services where you work?

	Count	Column N %
Extremely Satisfied	16	20.0%
2.00	9	11.3%
3.00	19	23.8%
4.00	7	8.8%
Neither satisfied nor dissatisfied	2	2.5%
6.00	2	2.5%
7.00	10	12.5%
8.00	9	11.3%
9.00	2	2.5%
Extremely Dissatisfied	4	5.0%
Total	80	100.0%

Figure 2. Satisfaction with workplace Internet service



Internet Problems and Issues

The next section of the survey covered specific Internet problems and issues and how they affected the productivity of respondents. The first question in this section asked respondents how frequently they experienced buffering, delays, or interruptions of the Internet while working. The outages were listed on a frequency scale from daily through weekly, monthly, and never. The interruptions were measured on the basis of slowing, brief outages, outages of one hour, two hours or several hours, or outages that lasted for a day.

Slowing was a daily occurrence for more than one-third of all respondents (36%) and a weekly occurrence for a further 24%, accounting for an inconvenience for almost two-thirds (60%) of all respondents. Brief outages were not as much of an issue as slowing but still affected 11% of respondents daily and 21% weekly, inconveniencing almost a third of all respondents (30%). Outages that lasted for one hour were also less frequent, affecting 3% daily and 7% weekly, while 2-hour outages affected 6% of respondents weekly. Day-long outages occurred relatively infrequently, affecting 3% of respondents weekly. See Table 9. However, 22% of rural respondents indicated that they experienced loss of connectivity for a day.

Table 9. How frequently do you experience buffering/delays/interruptions to your workplace Internet service?

Coconino County Broadband Study					
How frequently do you experience buffering/delays/interruptions?					
	Daily	Weekly	Monthly	Yearly/Less than yearly	Never
Slows	36.1%	24.1%	21.7%	10.8%	7.2%
Out briefly	10.7%	21.3%	32.0%	29.3%	6.7%
Out for an hour	2.7%	6.8%	16.4%	52.1%	21.9%
Out for 2 hours	0.0%	5.5%	8.2%	53.4%	32.9%
Out for several hours	0.0%	2.8%	5.6%	48.6%	43.1%
Out for a day	0.0%	2.9%	0.0%	30.0%	67.1%

Percentages are by rows

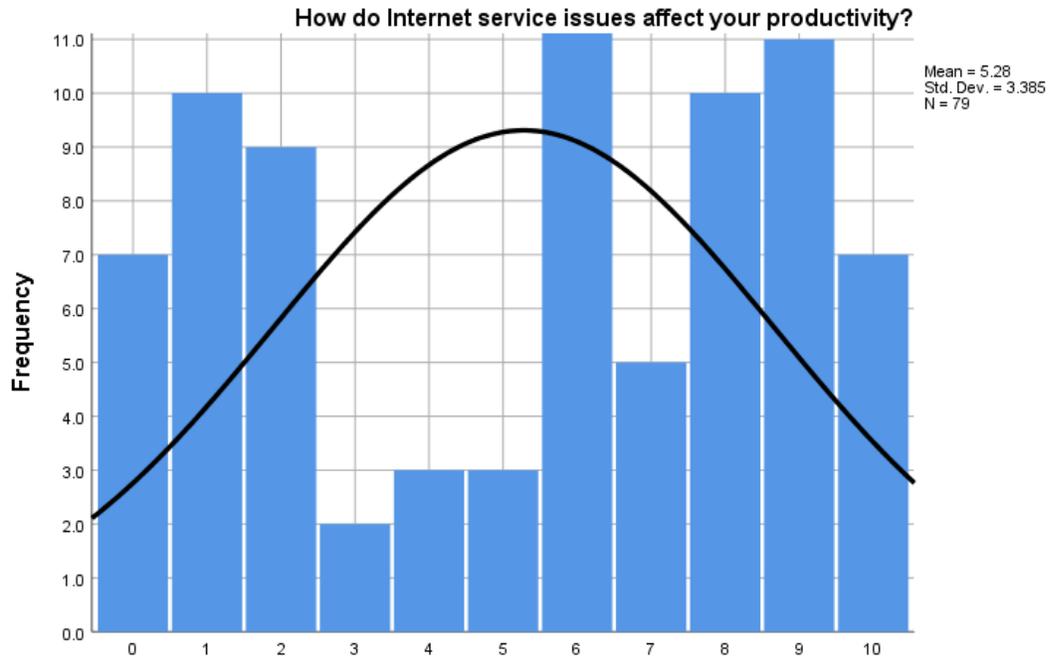
How did the slowing that resulted from buffering, delays and interruptions affect workers' productivity? Almost one-tenth (9%) of respondents experienced no loss of productivity from Internet service delays. Almost one-fourth (24%) experienced between 10% and 20% loss of productivity, while more than one-third (35%) suffered productivity losses between 80 and 100%. The median score, the point at which 50% of the sample was above and 50% below, was 6, indicating that 60% of respondents indicated some loss of productivity that results from Internet service outages. See Table 10 and Figure 3.

Table 10. To what extent do outages caused by buffering/delays/interruptions affect your productivity?

Coconino County Broadband Study
To what extent do outages caused by
buffering/delays/interruptions affect your
productivity?

Not at all	8.9%
10%	12.7%
20%	11.4%
30%	2.5%
40%	3.8%
50%	3.8%
60%	15.2%
70%	6.3%
80%	12.7%
90%	13.9%
A great deal	8.9%
Total	100.0%

Figure 3. How do Internet service issues affect your productivity?



How satisfied were respondents with the level of Internet services where they work? Respondents were asked to rate their level of satisfaction on a scale of 1 to 5 where 1 was “poor” and 5 was “excellent”. They were asked to rate the speed, reliability, impact of disconnects, and the overall reliability of Internet services. Overall, respondents rated Internet services with a mean score of 3.3, the highest mean score for the list of Internet services. A mean score of 3.3 rates between good and very good with almost half (48%) rating the overall services as either very good (31%) or excellent (17%). The next highest mean scores were for speed and reliability (3.2 respectively) with 48% rating reliability as either very good or excellent, while 47% rated speed as either very good or excellent. The level of disconnects received the lowest mean score (3.1) with more than one-third (38%) of respondents rating the level of disconnects as either poor or fair. None of the mean scores fell below good but on the other hand none of the mean scores were above 3.3, leaving room for improvement. See Table 11.

There was a great deal of difference when comparing satisfaction between Flagstaff and the rural areas in the county. Flagstaff respondents rated speed 3.4, reliability 3.3, disconnects 3.3 and overall 3.4. Rural areas rated speed 1.9, reliability 2.2, disconnects 1.8, and overall 2.0. While the rural sample was small, the disparity between Flagstaff and the rural responses indicates the level to which improvements need to be made to the system to have adequate systems for all employees.

Table 11. Satisfaction with aspects of Internet services.

Coconino County Broadband Study

How satisfied are you with the following aspects of Internet service where you work?

	Poor (1)	Fair	Good (3)	Very Good	Excellent (5)	Mean
Speed	11.9%	19.0%	22.6%	29.8%	16.7%	3.2
Reliability	9.5%	21.4%	21.4%	32.1%	15.5%	3.2
Disconnects	12.2%	25.6%	15.9%	30.5%	15.9%	3.1
Overall	7.1%	22.6%	22.6%	31.0%	16.7%	3.3

Respondents were asked what “work-arounds” they used to overcome Internet issues. This was an open-ended question where respondents could write about the “work-arounds” they used. Most of the adaptations were technical, such as “switching to a hot spot of my office cellphone.” Other comments indicated there were no work-arounds, “There are really no ‘work-arounds’ since the majority of the work relies on having internet access”, “We can only work with items that we have downloaded on our computers”, “We check our emails on our phones/tablets and if necessary, close the office to go home to use our home internet to complete our work.” One respondent indicated that they “go to Starbucks.” The verbatim open-ended responses can be found in Appendix B.

Respondents were then asked to indicate whether there were others in their office that had to use Internet “work-arounds” as well. Only 67% of all respondents answered this question. Of those who answered, more than three-fourths (78%) of their office workers also had to use “work-arounds” during Internet service disconnects. See Table 12. A further question was asked about how many people in their offices had to use the same “work-arounds.” The average number of workers was 11 people, with a median of 8 persons. In total, 415 persons have to use alternative adaptations.

Table 12. Are there others in your office that must use internet "work-arounds" too?

Coconino County Broadband Study		
Are there others in your office that must use internet "work-arounds" too?		
	Count	%
Yes	50	78%
No	14	22%
Total	64	100%

The last question in this section asked how many hours a month improved Internet service would free up if respondents no longer had to use “work-arounds.” See Table 13. The average amount of time that would be saved by improved Internet services was 5 hours per month, while the median was 3 hours. At the extreme end of the distribution, 3 respondents indicated that improved Internet service would save 20, 40 and 60 hours. Assuming only those respondents who answered this question (59 respondents) had improved Internet service, it would save 295 hours of lost productivity per month. When accounting for all the people (415) who are affected by “work-arounds,” 2,075 hours of lost productivity could be recaptured.

Table 13. How many hours a month would improved Internet service save?

Coconino County Broadband Study
How many hours a month would
improved Internet service save?

	Count	(%)
No hours	9	16.1%
1 hour	12	21.4%
2 hours	7	12.5%
3 hours	3	5.4%
4 hours	2	3.6%
5 hours	6	10.7%
6 hours	1	1.8%
7 hours	0	0.0%
8 hours	4	7.1%
9 hours	0	0.0%
10 hours	4	7.1%
11 hours	1	1.8%
12 hours	1	1.8%
13 or more hours	6	10.7%

Mean = 5 hours saved
Median = 3 hours saved

Internet Speed

Internet speed is an important aspect of the ability to work. Respondents were asked to test the Internet speed at their work stations by going to an application that was embedded in the survey. Internet speeds are measured in terms of Mbps, the number of bits transferred per second over an Internet connection. Higher Mbps generally mean faster Internet, although there are a number of factors that affect Internet speeds. Mbps is typically represented in terms of download speed and upload speed. For example, an Internet service advertising Mbps of 45/24 means a user can expect download speeds up to 45 Mbps, and upload speeds up to 24 Mbps. Therefore, the higher the Internet connection speed, the faster a person can download and upload text, audio, and video files. Speeds above 200 Mbps and up into the 1,000 Mbps range are considered to be faster than average, and can support five or more users. Internet speeds above 100 Mbps download are considered to be good for regular use.

The download and upload speed question was answered by 62% of all respondents. Across the board, the average download speed was 153.47 Mbps while the average upload speed was 223.57 Mbps. However due to a small number of speeds in the 800 and 900 Mbps range the distribution of the mean is skewed away from normal. Therefore the median or mid-point of the distribution where 50% of responses are above and 50% of response are below should also be considered. The median download speed was 93.89 Mbps while the median upload speed was 40.27 Mbps. The speeds also differed for urban and rural parts of the county. See Table 14.

Table 14. Upload and download Internet speeds for urban and rural areas of the county

Coconino County Broadband Study				
Mean and median upload and download speeds				
	Community/Town			
	Urban (Flagstaff)		Rural	
	Mean	Median	Mean	Median
Download speed	167.05	94.08	33.52	9.75
Upload speed	245.43	66.21	34.12	5.65

The last question in this section asked whether there were any specific tasks that couldn't be completed because of Internet limitations at the work station. Only 62% of respondents answered this question. Of those that responded, 14% indicated that there were no tasks that they could not complete because of Internet limitations. Of the remainder, a number of the tasks require specific software and access and therefore either run slowly or not at all. It was noted that GIS runs very slowly. Some were specific to their office such as this message, "I cannot realistically download video from Evidence.com and then upload it to the Co. Attorney Folder. The same begins to apply for all other media to a lesser degree." A number of respondents noted that "video chats are slow and glitch."

Internet Services at Home

The final section of the survey asked respondents about whether they have Internet services at home, whether they access the county network from home, the type of connection, and finally a comparison of home Internet services with work.

Almost all respondents who answered this question (96%) have an Internet connection at their home; a minority (4%) do not. See Table 15.

Table 15. Do you have an Internet connection at home?

Coconino County Broadband Study		
Do you have an internet connection at home?		
	Count	%
Yes	70	96%
No	3	4%
Total	73	100%

A majority of respondents who have an Internet connection at home (76%) access the county network from home. Almost one-fourth (24%) do not access the county network from their home connection. See Table 16.

Table 16. Do you currently access the county network from home?

Coconino County Broadband Study
Do you currently access the county network from home?

	Count	%
Yes	52	76%
No	16	24%
Total	68	100%

Wireless connections (43%) and access via the cable company (41%) are the most popular home connections for county employees with an Internet connection. No other types of access ranked higher than 11%. The 7% of other open-ended responses consisted of County Cradlepoint device and satellite. See Table 17.

Table 17. How do you receive you Internet service at home?

Coconino County Broadband Study
If you have Internet service at home, how do you receive your service?

	Count	%
Wireless	32	43%
Cable	30	41%
DSL	8	11%
Cell phone	5	7%
Other	5	7%
I don't have Internet service.	4	5%
Dial-up	2	3%

Does not sum to 100% due to multiple responses

Respondents were asked to compare their home Internet connection to those at work. Only 29% said that their connection was somewhat or much better than work while 30% reported it was about the same and 42% said that it was either much or somewhat worse than work. The mean score of 2.7 reflects this. See Table 18. When comparing it to overall satisfaction, employees rated the county system at 3.3 higher than their own connections.

Table 18. Rate you home Internet connection in comparison to work?

Coconino County Broadband Study
Rate your home Internet connection in comparison to work?

	Much worse (1)	Somewhat worse (2)	About the same (3)	Somewhat better (4)	Much better (5)	Mean
Home connection compared to work	28.6%	12.9%	30.0%	14.3%	14.3%	2.7

The last question in the survey asked respondents if there were any other issues with Broadband service in their workplace that had not been discussed. There were only 38 responses to this question. Twenty-six responses (68%) indicated that there were no issues. The remainder of the comments were about working from home, worries about home internet being capable of handling workloads and whether the cable companies were going to charge homeowners more because of higher through-put. There was also an explanation by the Chief Information Officer for the county on Wi-Fi and building wiring. All of these remarks can be found in Appendix B.

Conclusion

The Coconino Broadband Study has generated some valuable data about the use and importance of broadband connectivity for county employees. Almost all county employees (97%) depend upon being connected to the Internet daily. These employees use the Internet for communication, mainly email, and VOIP, specifically Microsoft Teams. Other employees use the Internet to access and maintain records, prepare purchase orders, schedule maintenance, maintain public safety and dispatch EMS services. If it were not for the Internet, the county employees would be limited in their ability to perform their jobs and productivity would be severely impacted.

Generally, employees who responded to this study had adequate work access to the Internet, with more than three-fourths (83%) accessing the Internet through high speed cable or wireless. These good connections are unfortunately not the norm for all employees; one-fourth (25%) stated that the Internet service options available to them at their place of work were inadequate. Just over half (55%) of respondents indicated that they were very or extremely satisfied with their work Internet access. Since a majority of the respondents were from Flagstaff where Internet service is generally good, this conclusion is not likely to be the same for rural or remote areas of the county.

Even though most respondents felt that their Internet service was adequate, more than one-third (36%) experienced daily slowing of their workstation Internet connections. However, day-long outages occurred infrequently. Buffering and other types of delays and interruptions adversely affected productivity for one-third (35%) of respondents who suffered at least an 80% reduction in productivity. Overall Internet services were rated between good and very good while speed and reliability also received similar scores. Internet connectivity issues resulted in workers having to resort to various alternative “work-arounds,” such as using their personal phones or going to a site with free wireless. Finally, respondents estimated that 5 hours of productivity per month would be saved by improved Internet services at their work sites.

Since respondents in Flagstaff with relatively good connections still suffer from Internet-induced productivity losses, this is probably more of a serious issue in the remote and disconnected rural areas of the county. The arrival of the Covid-19 pandemic caused a radical realignment of working conditions and a greater emphasis has been placed on working from home, remote meetings, etc. Productivity is now becoming dependent on inadequate home Internet connections, and this may further intensify productivity limitations.

Almost all respondents (96%) have an Internet connection at home, and three-fourths (76%) access this connection for county work. Most respondents feel that their connection is worse at home (mean score 2.7) compared to their work station (mean score 3.3).

This study would have benefited from greater rural participants from the outlying sections of the county to be able to provide a worthwhile comparison to the city of Flagstaff. With 95% confidence, the average satisfaction with Internet services for Flagstaff respondents is between 3.3 and 4.6 on a 10-point scale with 1 being "extremely satisfied". For rural respondents on the same question, the satisfaction is between 5.6 and 8.4. This illustrates that these are two different groups based on their levels of satisfaction.

If a larger rural sample can be obtained, meaningful comparisons could be made and potential improvements considered.

Appendix A: Coconino Broadband Survey

Coconino County Broadband Study

Coconino County Broadband Access Study

You have received this anonymous survey because you are a Coconino County Team Member. The Economic Policy Institute at Northern Arizona University has been tasked by County Manager James Jayne to evaluate broadband access in Coconino County. This survey will ask you about your ability to access broadband services at your office or duty station. The purpose of this study is to evaluate all county employees ability to access much needed broadband services in order to improve productivity and service delivery. If you have any questions for the county, please direct these to Chris Pasterrz, County Economic Development Manager at 928-699-8361 or cpasterz@coconino.az.gov. If you have problems with completing the survey please contact Thomas Combrink at Thomas.Combrink@nau.edu.

1. What is your title:

2. What town or community is your office or duty station located in?

Office Name/Duty Station (1) _____

Community/Town (2) _____

Zip Code (3) _____

3. Are you completing this survey from your office or duty station?

Yes (1)

No (2)

Next we would like to ask about your ability to use the internet for official work from your office/duty station.

4. Please check the items that you use the Internet for as part of your official duties:

Email (1)

VoIP Internet phone (Vonage, Skype for Business, FaceTime, etc.) (1)

Public Safety/EMS (1)

Records retrieval (1)

E-commerce/sales/permits (1)

Mapping (1)

Maintaining a Web presence, blog or social media (1)

Maintenance Scheduling/Programming (1)

E-health (1)

E-government (1)

Other (1) _____

5. How often do you use the Internet for official county business?

- Daily (1)
- 2-3 times a week (2)
- Once a week (3)
- Monthly (4)

6. What form of Internet service do you have at your office/duty station?

- Dial up Service (1)
- DSL (2)
- High Speed Cable (3)
- Satellite (4)
- Fixed Antennae Wireless (5)
- Mobile Wireless (Smartphone, Mobile Hotspot) (6)
- Other: (7) _____

Next we would like to ask about the reliability and adequacy of internet access at your place of work

7. Are the Internet service options available at your place of work adequate?

Yes (1)

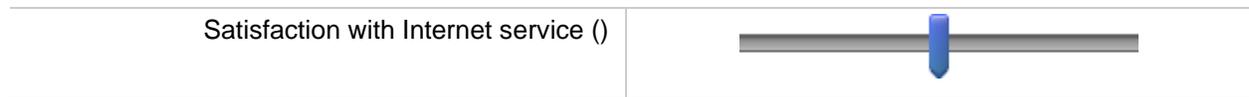
No (2)

8. On a scale of 1 to 10 how satisfied are you with current Internet service where you work?

Extremely Moderately Slightly Neither Slightly Moderately Extremely
satisfied satisfied satisfied satisfied dissatisfied dissatisfied dissatisfied
nor
dissatisfied

1

10



9. How frequently do you experience buffering/delays/interruptions while conducting work and how long do these last on average?

	Daily (1)	Weekly (2)	Monthly (3)	Yearly/Less than yearly (4)	Never (5)
Slows (v9_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Out briefly (v9_2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Out for an hour (v9_3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Out for 2 hours (v9_4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Out for several hours (v9_5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Out for a day (v9_6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. Thinking about buffering/delays/interruptions caused by Internet outages, to what extent do these outages affect your productivity?



11. How satisfied are you with the following aspects of the Internet service where you work?

	Poor (1)	Fair (2)	Good (3)	Very Good (4)	Excellent (5)
Speed (v11_1)	<input type="radio"/>				
Reliability (v11_2)	<input type="radio"/>				
Disconnects (v11_3)	<input type="radio"/>				
Overall (v11_4)	<input type="radio"/>				

12. What "work-arounds" do you use as a result of internet issues?

13. Are there others in your office that must use internet "work-arounds" too?

- No (2)
- Yes. If yes how many people have to use work-arounds for internet access? (1)

14. How many hours a month would improved internet service free up if you no longer had to use "work-arounds"?

- Number of hours a month freed up (4)

15. Please click on the URL listed below and take the speed test which will indicate the download and upload speed of your internet connection. The speed test will open in another window, once you have the speed of your internet connection please write them down so that you can enter them in the survey. Once you have the speeds from the test you can close the speed test window and return to your survey.

Speed test - please go to <http://www.speedtest.net> click to begin the test and enter the results below.

Download speed (1) _____

Upload speed (2) _____

16. Are there any specific work tasks that you cannot complete because of Internet limitations at your work station?

17. Do you have an Internet connection at home?

Yes (1)

No (2)

18. Do you currently access the County network from home?

Yes (5)

No (6)

19. If you have Internet service at home, how do you receive your service?

- Wireless (1)
- Cell phone (2)
- DSL (3)
- Cable (4)
- Dial-up (5)
- Other: (6) _____
- I don't have Internet service (7)

20. If you have an Internet connection at home, please rate your home connection in comparison to your work connection.

- Much worse (1)
- Somewhat worse (2)
- About the same (3)
- Somewhat better (4)
- Much better (5)

21. Do you have any other issues with broadband services at your work place that we have not asked about?

Thank you for completing this survey. Your responses will be reported in aggregate and the information received from this survey will be forwarded to the County Manager.

Appendix B: Verbatim Responses to open ended questions

Please list the items that you use the Internet for as part of your official duties:

Access systems for work

BACKGROUND OR ADDITIONAL INFORMATION

Board Meetings, health education

Call out I am responding

Call Out Software

cruising the internet

Electronic meetings, skype, zoom, Microsoft Teams, e-learning, video sharing, graphic files/brochure/flyer sending

File sharing across departments and from Mobile phones

HANDS - ADHS Database

I oversee GIS, Service Delivery, IT Security, Network Engineering, Business Applications, and Budget from my office. The data-center is located in a different location but I regularly connect to various servers, critical applications, and resources to support the County.

In case "E-government" was not intended to include it, I regularly use electronic court filing. making maps

Munis ERP system access

Online Training and School

Other programs that we partner with that we utilize their online programs as well.

Research

Specific ADHS Program Software

Timesheets Training Programs

Web based operational programs

What form of Internet service do you have at your office/duty station?

County network

Don't know

Don't know

Dont know

I do not know

Not sure what the County uses to deliver service to Downtown Flagstaff

Not sure, would have to ask IT

Ruckus Microwave 250MB

T1

TDS Wi-Fi Modem

Unknown

Unknown

UNKNOWN

VoiP

Wifi

wireless broadband

What "work-arounds" do you use as a result of internet issues?

Exercise more and refocus. Gives me the opportunity to step back and repriorities todo list
ADHS has issued our office 1 MiFi we will use this with out laptops and connect that way. Although we are a paperless program, we have a paper back up system. We do intake on paper and when we are able to then we enter the data into our database. We cannot issue any food benefits to participants till the system is back up and all the data is entered.

Back to the books. This won't go on much longer tho, as nearly all my reference sources are moving online.

Cell service

Checking Email on my phone during outages, working on offline projects.

Do something that does not require internet like filing or cleaning up my work station.

Find something else to work on

go to Starbucks

Hard copies. Paper files.

Having documents, files, calendars stored another way

I always have non-internet projects handy. I will take my phone off the County network when that helps.

I have a hotspot for use when I need

I have paper files that I can work from.

I try to multi-task several jobs at the same time while waiting for certain functions to execute.

I use my cell phone if needed.

I use my phone or go home

I use the phone to connect to people when email is not available. I delay the internet research

I usually wind up using my phone to atleast stay up on emails

I work on other things I can do offline in the rare occasion of an internet outage.

If Internet goes down I turn to other projects that I can focus on until restored.

In person meetings-2.25 travel time; start early on reports due; personal mobile hot spot.

In the case of a slowdown, I multitask while I wait for mail to load.

Log off, wait, reboot

MiFi

N/A

Non-digital work, or resorting to using me cell phone to conduct work while the internet is slow or down.

none

None

paper

Personal hotspot

Phone calls or personal device if possible. Mostly, nothing, just wait.

Rarely, but when necessary shift as needed to work on activities not requiring Internet.

Sign off, and sign back up

Swear and Complain..haha

Switch to hotspotting of my office cellphone.

The County VPN cuts out every hour or two when working remotely, cutting off internet for a minute or so. This causes ArcGIS to require a restart, which takes the most time out of all programs used. I just restart ArcMap and work in Excel during the outage.

There is really no "work-arounds" since majority of our work relies on having internet access. We can only work with items that we have downloaded on our computers. We check our emails on our phones/tablets and if necessary, close the office to go home to use our home internet to complete our work.

Use my phone with cellular service

Use of Smart Phones. General phone calls. Wait until arrival in Flagstaff to complete.

Use paper forms to complete client appointments or use ADHS laptop with ADHS MiFi to get access to the database and email.

Use personal phone

Usually just wait until it comes back. Work on other things.

Verizon mifi upto 2 GB a month

waiting it out or calling IT

We complete our work on paper forms which it takes more time.

We do not require work-arounds in our working area. The Information Technology Department has replaced a significant amount of legacy switches/routers across the infrastructure reducing End Of Life equipment from 87% down to 8% in the last 24 months. This does cause outages but is always coordinated with our customers. We have also upgraded various circuit speeds in various locations across the County causing outages for upgrades.

We have access to other computers, if needed.

We have people come back and pick up records or we can definitely mail them.

when cable net goes down I use my cellphone as a hot spot. I also have a personal mobile wifi hotspot

When there are outages, I perform other tasks, or I go home and use the internet at my residence.

Work from home

Work in other projects

Work later in the evening and/or working longer hours

work offline, start another project

Work on other tasks until service is restored

Working on something else while waiting for a page to load.

If you have Internet service at home, how do you receive your service?

County Cradlepoint device

Dont have internet

Satellite

Do you have any other issues with broadband services at your work place that we have not asked about?

As all of my kids and my wife are at home, the internet becomes more taxed as more people use it, slowing it down to a crawl. With school cancelled for the rest of the year, this is not going to get better but will get worse. So far my provider, Centurylink, has not increased my bill, but I am concerned they will try to.

besides the slowness and delays I often get that a programs I am working in has stopped working and has to be restarted. This causes loss of data or PC to freeze up..

cant order Starbucks

I'm TELECOMMUTING DUE TO COVID 19 SO ALL THE RESPONSES ARE BASED ON THE CURRENT SITUATION

Internet on the Navajo Nation is overall slower in comparison to residences in Flagstaff area.

No

No, but our broadband is getting used a lot more at home, now that we're working from home.

No; but when I did the speedtest again, it now says .22 Mbps for uploads. Very slow!

Nothing just fix it

The building wiring gets wet and the internet goes away

The challenge at work is wifi around the park and away from the source/buildings.

Work station vs shared rooms/work stations in the building; wireless vs wired connections

Yes, many of the buildings are using CAT5 cabling within the walls and is capped at 100mbps. We are asking some users to connect wirelessly versus wired in these locations as the Wireless Access Point is wired with CAT6 allowing 1GB throughput. All patch panels must be replaced if continuing to utilize wired connections. In addition, several VOIP phones are interconnected to the computers and utilize a 100mb interface. This is another cost and bottleneck we are working to solve. Thank you for working on this and I am happy to work together. Matt Fowler, CISM, VCP-DCV Chief Information Officer / IT Director Chief Information Security Officer (CISO) Coconino County, AZ 928-679-7911
mfowler@coconino.az.gov

Appendix C: County Department comparisons for specific questions

Coconino County Broadband Study
County Department comparison
Are the Internet service options available at your
place of work adequate?

	Are the Internet service options available at your place of work adequate?	
	Yes	No
	Row N %	Row N %
Assessor	100.0%	0.0%
Board of Supervisors	100.0%	0.0%
Building Division	0.0%	100.0%
Clerk of the Superior Court	33.3%	66.7%
Community Development	50.0%	50.0%
County Attorney	100.0%	0.0%
County Manager	100.0%	0.0%
Education	100.0%	0.0%
Emergency Management	0.0%	100.0%
Facilities Management	100.0%	0.0%
Finance/Purchasing	100.0%	0.0%
Health and Human Services	84.0%	16.0%
Human Resources	100.0%	0.0%
Information Technology	100.0%	0.0%
Parks & Recreation	0.0%	100.0%
Public Affairs	100.0%	0.0%
Public Defender	100.0%	0.0%
Public Works	50.0%	50.0%
Sheriff's Office	54.5%	45.5%

**Coconino County Broadband Study
County Department comparison
Satisfaction with Internet service**

	Satisfaction with Internet service
	Mean
Assessor	5.50
Board of Supervisors	4.00
Building Division	7.00
Clerk of the Superior Court	6.67
Community Development	4.50
County Attorney	1.50
County Manager	5.50
Education	3.00
Emergency Management	3.00
Facilities Management	.
Finance/Purchasing	4.00
Health and Human Services	3.17
Human Resources	3.80
Information Technology	2.00
Parks & Recreation	6.50
Public Affairs	4.00
Public Defender	2.50
Public Works	5.40
Sheriff's Office	6.09

Lower mean score indicates higher level of satisfaction

**Coconino County Broadband Study
County Department comparison**

Thinking about buffering/delays/interruptions caused by Internet outages, to what extent do these outages affect your productivity?

	To what extent do these outages affect your productivity?
	Mean
Assessor	4
Board of Supervisors	10
Building Division	10
Clerk of the Superior Court	7
Community Development	7
County Attorney	1
County Manager	5
Education	2
Emergency Management	4
Facilities Management	10
Finance/Purchasing	7
Health and Human Services	4
Human Resources	4
Information Technology	8
Parks & Recreation	7
Public Affairs	2
Public Defender	6
Public Works	6
Sheriff's Office	6

Lower mean score indicates lower effect on productivity

Coconino County Broadband Study
County Department comparison
How satisfied are you with the following aspects of Internet
service where you work?

	Speed	Reliability	Disconnects	Overall
	Mean	Mean	Mean	Mean
Assessor	2.8	3.0	2.8	3.0
Board of Supervisors	3.0	3.0	1.0	3.0
Building Division	3.0	1.0	1.0	2.0
Clerk of the Superior Court	2.3	2.7	2.7	2.3
Community Development	2.0	2.0	1.7	2.3
County Attorney	4.0	4.0	4.0	4.2
County Manager	4.0	4.0	4.0	4.0
Education	4.5	4.5	4.5	4.5
Emergency Management	3.0	3.0	3.0	3.0
Facilities Management	5.0	4.0	4.0	5.0
Finance/Purchasing	4.5	3.5	3.5	4.0
Health and Human Services	3.3	3.5	3.3	3.5
Human Resources	2.8	2.8	2.8	2.8
Information Technology	3.7	4.0	3.7	4.0
Parks & Recreation	2.5	2.5	2.5	2.5
Public Affairs	3.0	2.0	4.0	3.0
Public Defender	4.0	4.0	4.0	4.0
Public Works	2.8	2.7	2.5	2.7
Sheriff's Office	2.8	2.9	2.9	3.0

1 = Poor

5 = Excellent

Coconino County Broadband Study
County Department comparison
Are there others in your office that must use
internet "work-arounds" too?

	Are there others in your office that must use internet "work-arounds" too?	
	Yes	No
	Row N %	Row N %
Assessor	80.0%	20.0%
Board of Supervisors	100.0%	0.0%
Building Division	100.0%	0.0%
Clerk of the Superior Court	50.0%	50.0%
Community Development	100.0%	0.0%
County Attorney	66.7%	33.3%
County Manager	100.0%	0.0%
Education	0.0%	0.0%
Emergency Management	100.0%	0.0%
Facilities Management	100.0%	0.0%
Finance/Purchasing	100.0%	0.0%
Health and Human Services	73.7%	26.3%
Human Resources	100.0%	0.0%
Information Technology	33.3%	66.7%
Parks & Recreation	75.0%	25.0%
Public Affairs	100.0%	0.0%
Public Defender	50.0%	50.0%
Public Works	100.0%	0.0%
Sheriff's Office	87.5%	12.5%

Coconino County Broadband Study
County Department comparison
How many people have to use work-arounds for internet access?

How many people have to use work-arounds for internet access?			
	Mean	Minimum	Maximum
Assessor	13	3	26
Board of Supervisors	1	1	1
Building Division	.	.	.
Clerk of the Superior Court	3	3	3
Community Development	6	2	10
County Attorney	50	50	50
County Manager	10	10	10
Education	.	.	.
Emergency Management	3	3	3
Facilities Management	40	40	40
Finance/Purchasing	7	2	12
Health and Human Services	8	3	20
Human Resources	6	2	10
Information Technology	4	4	4
Parks & Recreation	6	3	10
Public Affairs	2	2	2
Public Defender	25	24	25
Public Works	7	1	12
Sheriff's Office	14	2	23

**Coconino County Broadband Study
County Department comparison
Home connection compared to work**

	Home connection compared to work
	Mean
Assessor	2.8
Board of Supervisors	2.0
Building Division	1.0
Clerk of the Superior Court	3.0
Community Development	4.3
County Attorney	2.0
County Manager	3.0
Education	3.5
Emergency Management	1.0
Facilities Management	1.0
Finance/Purchasing	3.0
Health and Human Services	2.4
Human Resources	2.5
Information Technology	2.3
Parks & Recreation	3.0
Public Affairs	4.0
Public Defender	1.0
Public Works	2.3
Sheriff's Office	4.3

1 = Much worse than work

5 = Much better than work

Appendix D: Comparison Between Flagstaff and Rural Responses

Coconino County Broadband Study
Department of survey respondent by location

	Flagstaff	Rural
	%	%
Health and Human Services	31%	11%
Sheriff's Office	7%	56%
Public Works	7%	11%
Human Resources	7%	0%
Parks & Recreation	6%	0%
County Attorney	6%	0%
Community Development	6%	0%
Assessor	6%	0%
Public Defender	5%	0%
Information Technology	5%	0%
Education	4%	0%
Clerk of the Superior Court	2%	11%
Finance/Purchasing	2%	0%
County Manager	2%	0%
Public Affairs	1%	0%
Facilities Management	1%	0%
Emergency Management	1%	0%
Building Division	1%	0%
Board of Supervisors	0%	11%
Total	100%	100%

Coconino County Broadband Study
Are you completing this survey from your
office or duty station by location?

	Flagstaff	Rural
	%	%
Yes	65%	78%
No	35%	22%
Total	100%	100%

Coconino County Broadband Study
Please check the items that you use the Internet for as part of
your official duties by location

	Flagstaff	Rural
	%	%
Email	99%	100%
VoIP Internet phone (Vonage, Skype for Business, Face Time, etc.)	69%	44%
Records retrieval	60%	67%
Maintenance scheduling/programming	39%	67%
Mapping	39%	44%
Maintaining a Web presence, blog or social media	39%	44%
E-government	35%	22%
Other	25%	67%
Public safety/EMS	26%	33%
E-commerce/sales/permits	19%	33%
E-health	12%	22%

Does not sum to 100% due to multiple responses

Coconino County Broadband Study
How often do you use the Internet for official
county business by location?

	Flagstaff	Rural
	%	%
Daily	96%	100%
2-3 times a week	4%	0%
Once a week	0%	0%
Monthly	0%	0%
Total	100%	100%

Coconino County Broadband Study
What form of Internet service do you have at your
office/duty station by location?

	Flagstaff	Rural
	%	%
High Speed Cable	60%	25%
Mobile Wireless (Smartphone, Mobile Hotspot, etc.)	24%	38%
Other	17%	63%
DSL	20%	25%
Fixed Antennae Wireless	7%	0%
Dial-up Service	5%	0%
Satellite	4%	13%

Does not sum to 100% due to multiple responses

Coconino County Broadband Study
Are the Internet service options available at your
place of work adequate by location?

	Location	
	Flagstaff	Rural
	%	%
Yes	79%	33%
No	21%	67%
Total	100%	100%

Coconino County Broadband Study
How satisfied are you with your current Internet
service where you work?

	Location	
	Flagstaff	Rural
	Mean	Mean
Satisfaction with Internet service	3.9	7.0

1 = extremely satisfied, 10 = extremely dissatisfied

Coconino County Broadband Study
How frequently do you experience
buffering/delays/interruptions by location?

	Location	
	Flagstaff	Rural
	Mean	Mean
Slows	2.4	1.3
Out briefly	3.1	2.4
Out for an hour	4.0	3.0
Out for 2 hours	4.3	3.1
Out for several hours	4.5	3.3
Out for a day	4.8	3.6

1 = daily, 2= weekly, 3 = monthly, 4 = less than yearly, 5 = never

Coconino County Broadband Study
Thinking about buffering/delays/interruptions
caused by Internet outages, to what extent do
these outages affect your productivity?

	Location	
	Flagstaff	Rural
	Mean	Mean
How do outages affect your productivity?	5.10	6.56

0 = not at all, 10 a great deal

Coconino County Broadband Study
How satisfied are you with the following aspects of
Internet service where you work by location?

	Location	
	Flagstaff	Rural
	Mean	Mean
Speed	3.4	1.9
Reliability	3.3	2.2
Disconnects	3.3	1.8
Overall	3.4	2.0

1 = poor, 5 = excellent

Coconino County Broadband Study
Are there others in your office that must use
internet "work-arounds" too by location?

	Flagstaff	Rural
	%	%
Yes	77%	86%
No	23%	14%
Total	100%	100%

Coconino County Broadband Study
How many hours a month would improved internet service free up if you no longer had to use "work-arounds" by location?

	Location	
	Flagstaff	Rural
	Mean	Mean
How many hours a month would improved internet service free up	5.5	10.8

Coconino County Broadband Study
Compare download and upload speeds by location

	Location	
	Flagstaff	Rural
	Mean	Mean
Download speed	167.0	33.5
Upload speed	245.4	34.1

Coconino County Broadband Study
Do you have an internet connection at home by location?

	Flagstaff	Rural
	%	%
Yes	97%	88%
No	3%	13%
Total	100%	100%

Coconino County Broadband Study
Do you currently access the County network
from home by location?

	Flagstaff	Rural
	%	%
Yes	81%	33%
No	19%	67%
Total	100%	100%

Coconino County Broadband Study
If you have Internet service at home, how do
you receive your service by location?

	Flagstaff	Rural
	%	%
Wireless	41%	63%
Cable	44%	13%
DSL	12%	0%
Cell phone	8%	0%
Other	6%	13%
I don't have Internet service.	5%	13%
Dial-up	3%	0%

Does not sum to 100% due to multiple responses

Coconino County Broadband Study
Rate your home Internet connection in comparison to work by location?

	Somewhat Much worse (1)	Somewhat worse (2)	About the same (3)	Somewhat better (4)	Much better (5)
Flagstaff	30.2%	12.7%	31.7%	14.3%	11.1%
Rural	14.3%	14.3%	14.3%	14.3%	42.9%