NTIA Report 25-575

An Analysis of Aggregate CBRS SAS Data from April 2021 to July 2024

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Technical Report

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U.S. DEPARTMENT OF COMMERCE

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Assistant Secretary of Commerce for Communications and Information
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CONTENTS

FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

Cat A	Category A CBSD, permitted to transmit a maximum EIRP of 1 W (20 dBm/MHz) and only to be deployed indoors or outdoors with antenna heights less than 6 m above average terrain height.
Cat B	Category B CBSD, permitted to transmit a maximum EIRP of 50 W (37 dBm/MHz) outdoors and are expected to have antenna heights greater than 6 m above average terrain height.
CBRS	Citizens Broadband Radio Service
CBSD	Citizens Broadband Radio Service Device, a fixed station that authorizes and controls End User Devices on a Priority Access or General Authorized Access basis, as defined in Part 96 of Title 47 in the U.S. Code of Federal Regulations.
CFR	Code of Federal Regulations
CONUS	continental United States
DPA	Dynamic Protection Area
E_UTRA	Evolved Universal Terrestrial Radio Access
EIRP	equivalent isotropic radiated power
ESC	environmental sensing capability, a system that detects and communicates the presence of a signal from an Incumbent User to an SAS to facilitate shared spectrum access
FAD	full activity dump
FCC	Federal Communications Commission
GAA	General Authorized Access
ITS	Institute for Telecommunication Sciences
NTIA	National Telecommunications and Information Administration
NR	5G New Radio
OCONUS	outside the continental United States
PAL	Priority Access License
SAS	Spectrum Access System
U.S.	United States
WInnForum	Wireless Innovation Forum

EXECUTIVE SUMMARY

This NTIA report on the Citizens Broadband Radio Service (CBRS) presents updated aggregate use data through mid-2024, revealing continued growth in CBRS device deployments.

The CBRS band at 3550–3700 MHz was authorized in 2015 for shared commercial use in the United States through the efforts of the Department of Defense (DoD), Federal Communications Commission (FCC), and the National Telecommunications and Information Administration (NTIA). A unique aspect of CBRS was the introduction of Dynamic Protection Areas (DPAs) around which commercial entrants can dynamically share spectrum with protected incumbents. Dynamic sharing is enabled by automated Spectrum Access Systems (SASs), which, among other tasks, manage the operation of new entrants to protect incumbent users from harmful interference. CBRS aimed to facilitate growth in wireless broadband devices, provide cost-effective wireless broadband access for rural communities, create new jobs and businesses, increase productivity, spur innovation, and improve public safety.

To quantify progress towards meeting these goals, the NTIA's Institute for Telecommunication Sciences (ITS) obtained operational data from the SAS administrators on a quarterly basis. ITS first presented and carried out longitudinal analysis on these data in 2023.[1] This report provides an updated presentation and analysis of the quarterly data from April 1, 2021, to July 1, 2024.

Nationwide numbers of Citizens Broadband Radio Service Devices (CBSDs) by quarter are provided, broken down into the following categories: type (i.e., Category A or B), installation type (i.e., indoor or outdoor), license tier (i.e., Priority Access, General Authorized Access, or both), air interface, and location type (i.e., urban or rural). Nationwide numbers of active grants by quarter are broken down by license tier, maximum allowed radiated power, bandwidth, and channel usage. Choropleth maps illustrate categorical CBSD statistics by state and county. Mean band utilization, defined as the mean number of channels granted per county, is used to quantify the amount of newly available spectrum that is used across the country. Finally, CBSD counts and band utilization within DPA-impacted and non-impacted counties are compared to examine the CBRS spectrum sharing approach. The following are key findings from this analysis:

- CBRS deployments have grown significantly, with an increase of 270,621 from April 1, 2021, to July 1, 2024. Annual increases in 2022 and 2023 were 95,692 and 78,058, respectively.
- Rural CBSDs have more than doubled with an increase of 166,650 (160.6%), and on July 1, 2024, 67.5% of all CBSDs were in rural census blocks.
- In 2023, there were more new CBSD deployments in DPA-impacted counties (46,583) than in non-impacted counties (31,482).
- 5G New Radio CBSD deployments increased to 11.9% of active CBSDs on July 1, 2024.
- GAA-only CBSDs accounted for 57.6% of the increase in CBSDs; on July 1, 2024, 71.4% of the CBSDs were GAA-only and 94.9% of all CBSDs had GAA grants.

[1] [1] D. Boulware et al., "An Analysis of Aggregate CBRS SAS Data from April 2021 to January 2023," NTIA Technical Report TR-23-567 (May 2023). [Online] Available: https://its.ntia.gov/publications/3311.aspx. [Accessed 28 May 2024]

- Since July 1, 2021, the number of CBSDs with PAL grants increased by 92,544 CBSDs (418%) to a total of 114,682 CBSDs on July 1, 2024.
- On July 1, 2024, 82.7% of all counties in the United States used at least one channel of CBRS and 41% of all counties used all 15 channels.

AN ANALYSIS OF AGGREGATE CBRS SAS DATA FROM APRIL 2021 TO JULY 2024

Douglas M. Boulware,[2] Anthony W. Romaniello[2]

This report presents an analysis of aggregate Citizens Broadband Radio Service (CBRS) Spectrum Access System (SAS) data reported quarterly from April 1, 2021, to July 1, 2024. The data provide insights into the growth of CBRS, the impact of dynamic spectrum sharing, the role of General Authorized Access (GAA) usage, and CBRS's role in rural and urban wireless connectivity. From April 1, 2021, to July 1, 2024, the number of active CBRS Devices (CBSDs) nationwide increased by 270,621 to 400,403. Over the same period, more CBSDs were deployed within Dynamic Protection Area (DPA)–impacted counties than non-impacted counties, increasing the number of active CBSDs in DPA-impacted counties to 198,864. The number of CBSDs with Priority Access License (PAL) grants grew to 114,682, but GAA CBSDs dominated deployments. On July 1, 2024, 71.4% of active CBSDs were GAA-only, 82.3% of active grants were GAA, 82.2% of CBSDs with a PAL also had at least one active GAA grant, and 67.5% of all active CBSDs were deployed in rural census blocks.

Keywords: 3550–3700 MHz; 5G; cellular; Citizens Broadband Radio Service (CBRS); Citizens Broadband Radio Service Device (CBSD); rural connectivity; Spectrum Access System (SAS); spectrum management; spectrum sharing; spectrum utilization; urban connectivity

1. INTRODUCTION

In 2015, the Federal Communications Commission (FCC) established spectrum-sharing rules [1], governing commercial use of the Citizens Broadband Radio Service (CBRS) in the U.S. from 3550 MHz to 3700 MHz. The National Telecommunications and Information Administration (NTIA) and the Department of Defense (DoD) have worked with the FCC as it has implemented the rules. CBRS established a new spectrum-sharing paradigm, enabling commercial access to spectrum with a collaborative partnership among stakeholders in government and industry.

Given the novelty of this spectrum sharing approach, it is important to regularly assess the state and growth of CBRS. In March 2021, NTIA requested that Spectrum Access System (SAS) administrators submit operational data on a quarterly basis to facilitate longitudinal analysis. In 2023, NTIA provided an analysis of aggregate SAS data from April 1, 2021, through January 1, 2023, [2]. This report extends the analysis to include data up to July 1, 2024. Section 2 gives an overview of the aggregate SAS data. Sections 3, 4, and 5 provide nationwide, state-level, and county-level statistics and maps to quantify and characterize the current state and ongoing growth of CBRS, and Section 6 provides a summary of conclusions drawn from the data.

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2. DATA COLLECTION

NTIA coordinated with the SAS administrators and the FCC to determine data that would be appropriate for sharing with federal regulators to support this study. To facilitate data quality and anonymization requirements, ITS developed a Python script that the SAS administrators used to build aggregate datasets from the SAS full activity dump (FAD), which includes CBSD registration and grant data.

The script aggregates CBSD grant data for each census block nationwide, but in each quarterly dataset the script failed to resolve the census block location of a small number of CBSDs. In each dataset the percentage of CBSDs with unresolved locations represented less than 0.1% of the total number of CBSDs. The data for these CBSDs were still included in the aggregate data and thus are still included in all nationwide statistics in Section 3 except the urban and rural statistics. CBSDs in unknown census block locations are not included in the state and county statistics and maps. The number of CBSDs in each quarterly dataset for which the census block could not be resolved are detailed as "Unknown" within the "Location Type" attribute in Table 1. For additional information on the aggregate data see [2].

3. NATIONWIDE STATISTICS

This section presents the national quarterly aggregate data from January 1, 2023, to July 1, 2024. For comparison, data from April 1, 2021, and January 1, 2022, are also included. See [2] for detailed quarterly data from April 1, 2021, to January 1, 2023.

3.1 CBSD Statistics

This subsection provides quarterly statistics describing active CBSDs. CBSD counts do not allow for an analysis of the coverage or efficiency of CBRS. However, they do provide some insights into the growth and evolution of CBRS, and a lack of CBSD deployments would certainly signify issues within the ecosystem. Table 1 provides nationwide counts of CBSDs in total and by differentiating attributes including CBSD type (Cat A, Cat B), installation type (indoor, outdoor), license tier (GAA-only, PAL-only, mixed license), air interface (E_UTRA, NR, other), and location type (urban, rural, unknown).

Subsection 3.1.1 examines the nationwide growth in the number of active CBSDs, while growth and change within the distribution of CBSD type, installation type, license tier, air interface, and urban and rural CBSDs are discussed in Subsections 3.1.2, 3.1.3, 3.1.4, 3.1.5, and 3.1.6, respectively.

Table 1: Nationwide counts of active CBSDs by category.

Attribute	Value	4/1/21	1/1/22	1/1/23	4/1/23	7/1/23	10/1/23	1/1/24	4/1/24	7/1/24
CBSD Type	Cat A	1,114	3,180	10,545	11,459	13,170	15,644	16,626	17,384	18,043
	Cat B	128,668	188,161	276,488	290,619	314,343	332,204	348,465	364,045	382,360
Installation Type	Indoor	906	2,978	10,084	11,125	12,831	15,388	16,322	17,102	17,795
	Outdoor	128,876	188,363	276,949	290,953	314,682	332,460	348,769	364,327	382,608
License Tier	Only GAA	129,782	161,997	230,504	233,504	249,926	263,801	269,750	276,986	285,721
	Only PAL	0	14,219	18,807	19,595	19,633	19,829	20,933	20,460	20,400
	Mixed	0	15,125	37,722	48,979	57,954	64,218	74,408	83,983	94,282
Air Interface	E_UTRA	48,197	76,028	119,789	125,030	133,420	137,878	141,038	141,332	141,560
	NR	0	46	17,065	25,512	30,713	35,014	39,128	43,195	47,628
	Other	81,585	115,267	150,179	151,536	163,380	174,956	184,925	196,902	211,215
Location Type	Urban	25,996	40,867	80,889	90,677	100,531	109,659	116,349	123,095	129,956
	Rural	103,768	150,438	206,108	211,366	226,948	238,159	248,713	258,306	270,418
	Unknown	18	36	36	35	34	30	29	28	29
Number of Active CBSDs		129,782	191,341	287,033	302,078	327,513	347,848	365,091	381,429	400,403

3.1.1 Number of Active CBSDs

Figure 1 illustrates the steady and significant growth in the number of active CBSDs nationwide. From April 1, 2021, to July 1, 2024, this total increased by 270,621 (208.5%). In annualized terms, growth in the number of active CBSDs slowed slightly in 2023 compared to 2022. In 2022, the total increased by 95,692 (50.0%) with a mean quarterly increase of 23,923. In 2023 this further increased by 78,058 (27.2%) with a mean quarterly increase of 19,515. On July 1, 2024, there were 400,403 active CBSDs nationwide.

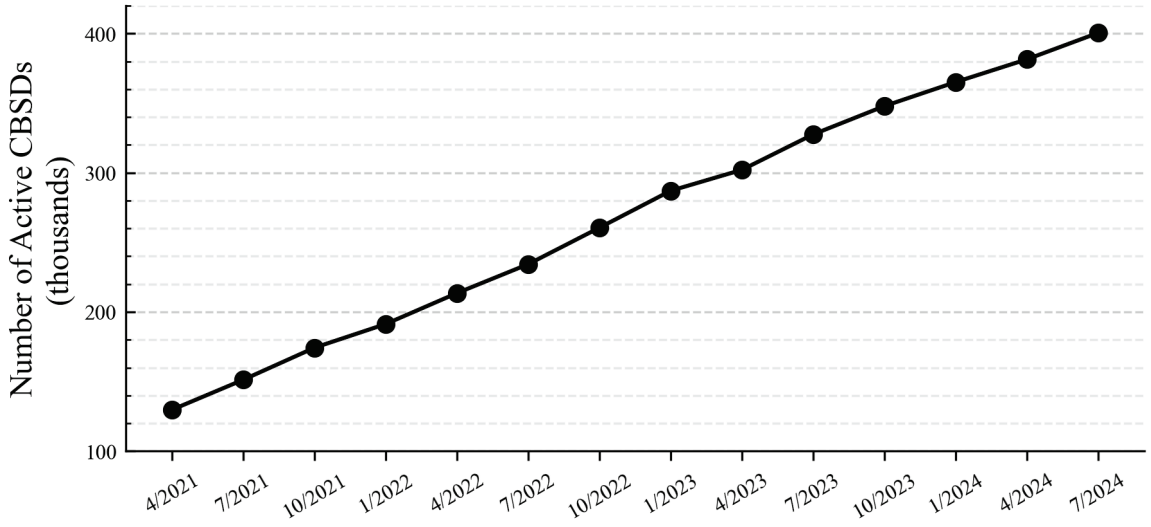


Figure 1: Nationwide number of active CBSDs from 4/1/2021 to 7/1/2024.

3.1.2 CBSD Type

Figure 2 illustrates quarterly distributions of all active CBSDs nationwide by category. Since its inception, the CBRS ecosystem has been dominated by Cat B CBSDs. From April 1, 2021, to July 1, 2024, the number of active Cat B CBSDs increased by 253,692 (197.2%). In 2022 and 2023, the number of Cat B CBSDs increased by 88,327 and 71,977, respectively. Although there are comparatively far fewer Cat A CBSDs, Cat A CBSD deployments have experienced greater relative growth. From April 1, 2021, to July 1, 2024, the number of active Cat A CBSDs increased by 16,929 (1519.7%). In 2022 and 2023, the number of Cat A CBSDs grew by 7,365 and 6,081 respectively. As a result, the percentage of active CBSDs which are Cat A has grown over time, from 0.9% on April 1, 2021, to 4.5% on July 1, 2024.

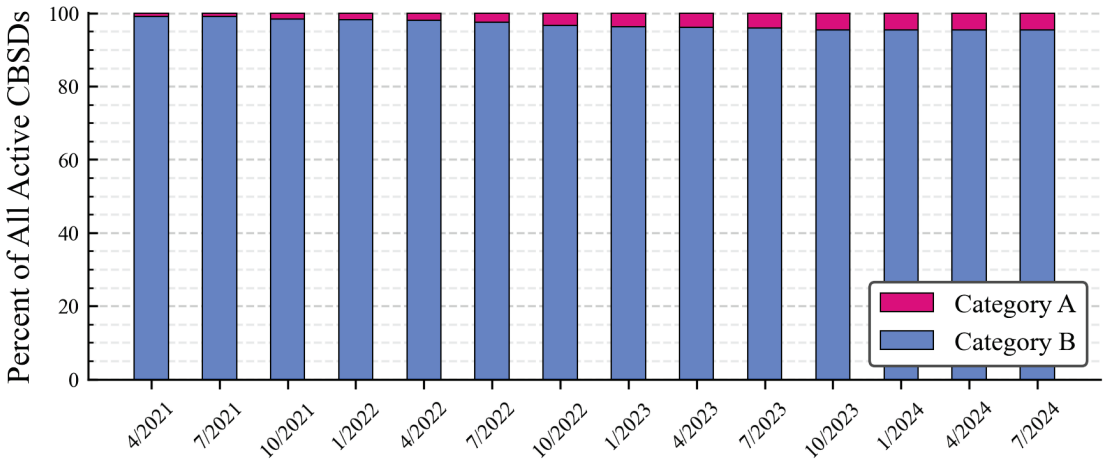


Figure 2: Nationwide percentage of active Cat A and Cat B CBSDs from 4/1/2021 to 7/1/2024.

3.1.3 Installation Type

The CBRS rules allow for Cat A CBSDs to be deployed indoors or outdoors, while Cat B CBSDs may only be deployed outdoors. Given the predominance of Cat B CBSDs, a similar majority in outdoor CBSDs is observed in Table 1. Indoor CBSDs grew from 0.7% of all active CBSDs on April 1, 2021, to 4.4% on July 1, 2024.

While indoor deployments represent a minority use case overall, they constitute the majority of deployments for Cat A CBSDs. Figure 3 illustrates quarterly distributions of indoor and outdoor Cat A CBSDs over the analysis period and shows that outdoor deployments became less common for Cat A CBSDs. Specifically, the percentage of active Cat A CBSDs deployed outdoors decreased from 18.7% on April 1, 2021, to only 1.4% on July 1, 2024.

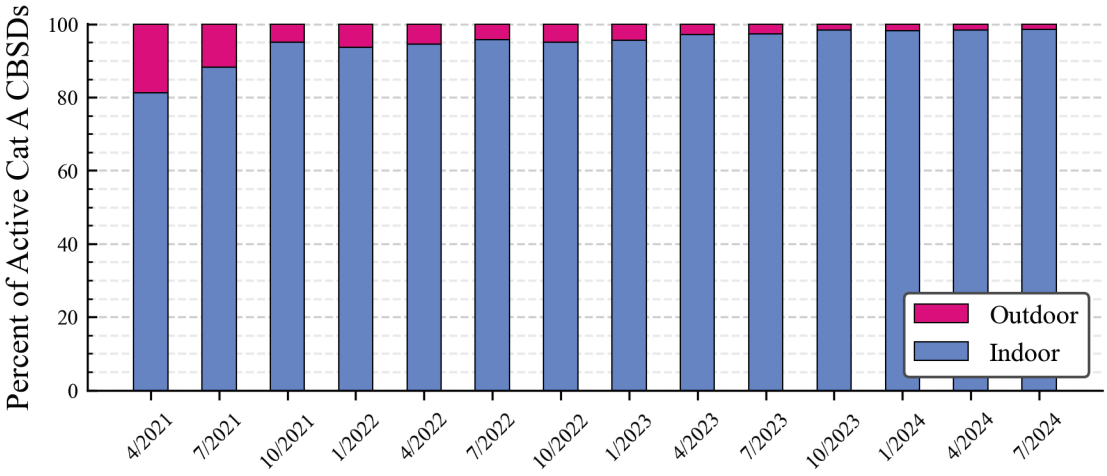


Figure 3: Nationwide percentage of active Cat A CBSDs with indoor versus outdoor installations from 4/1/2021 to 7/1/2024.

3.1.4 License Tier

A single CBSD may possess active PAL and GAA grants at the same time. The GAA tier presents an interesting case study because GAA use is licensed-by-rule to provide lower-cost access to the band. Use of GAA grants does not require an expensive license, but users must coordinate with the SAS and accept interference from users in all tiers. PAL grants provide an option for users who require priority access to the spectrum. Under an ideal sharing framework, SAS data would indicate that users are finding value at all tiers of access.

Figure 4(a) illustrates the number of active nationwide CBSDs that use only PAL grants, only GAA grants, and mixed license (i.e., GAA and PAL grants). Over the analysis period, the numbers of both mixed license and GAA-only CBSDs have grown substantially, with GAA-only CBSDs outnumbering all other types every quarter. As shown in Figure 4(a), active CBSDs with only GAA grants increased by 155,939 (120.2%) over the analysis period to a total of 285,721 on July 1, 2024. After PAL deployments began in April 2021 [3], the number of CBSDs with PAL grants (either mixed license or PAL-only) grew quickly—to 22,138 CBSDs on July 1, 2021. Since July 1, 2021, the number of CBSDs with PAL grants increased by 92,544 CBSDs (418%) to a total of 114,682 CBSDs on July 1, 2024. As a result, the percentage of CBSDs with PAL grants (either PAL-only or mixed license) has grown steadily from 14.6% on July 1, 2021, to 28.6% on July 1, 2024.

In both 2022 and 2023, there was a greater increase in the number of active GAA-only CBSDs compared to active CBSDs with PAL grants. However, the annual increase in CBSDs with PAL grants grew from 27,185 in 2022 to 38,812 in 2023. Conversely, the annual increase in CBSDs with only GAA grants decreased from 68,507 in 2022 to 39,246 in 2023. Figure 4(b) illustrates these counts as percentages of the total number of active nationwide CBSDs on each date.

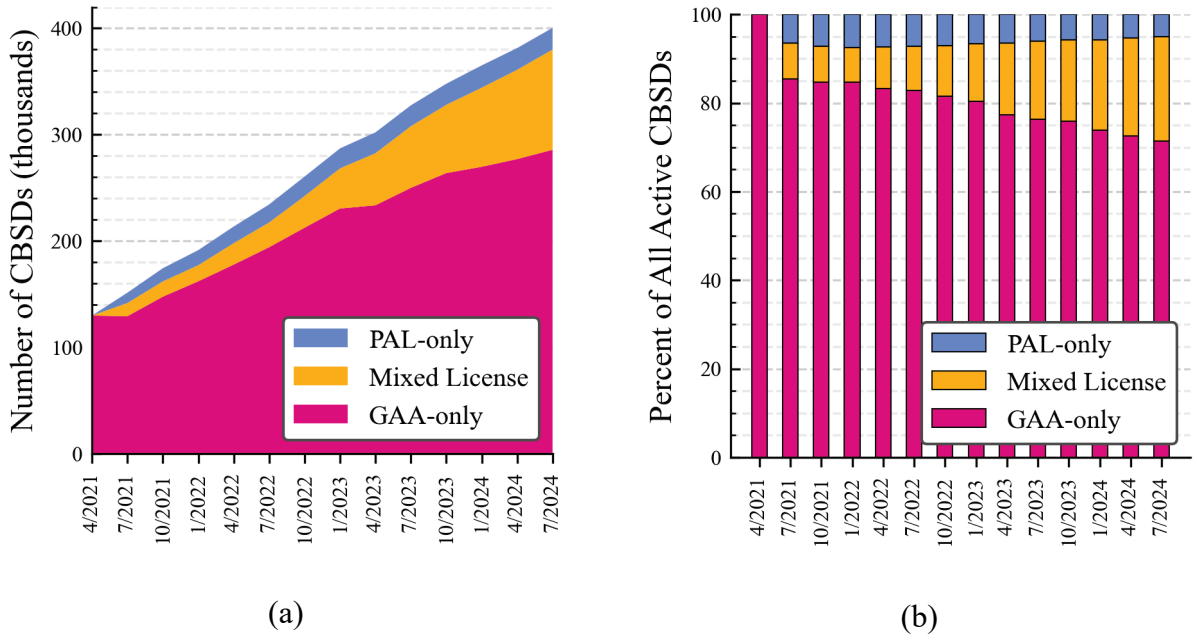


Figure 4: Nationwide number (a) and percentage (b) of active CBSDs with PAL-only, GAA-only, and mixed license from 4/1/2021 to 7/1/2024.

Regarding active CBSDs with at least one active PAL grant, Figure 5 contrasts the percentage of CBSDs that are PAL-only with those that are mixed license. The data illustrated by this figure demonstrate that the GAA tier has been an increasingly popular supplement to PALs. After an initial decrease from 56.1% on July 1, 2021, to 51.5% on January 1, 2022, the percentage of active CBSDs with a PAL grant that were also using at least one GAA grant increased steadily to 82.2% on July 1, 2024. Overall, 94.9% of the active CBSDs on July 1, 2024, had at least one GAA grant.

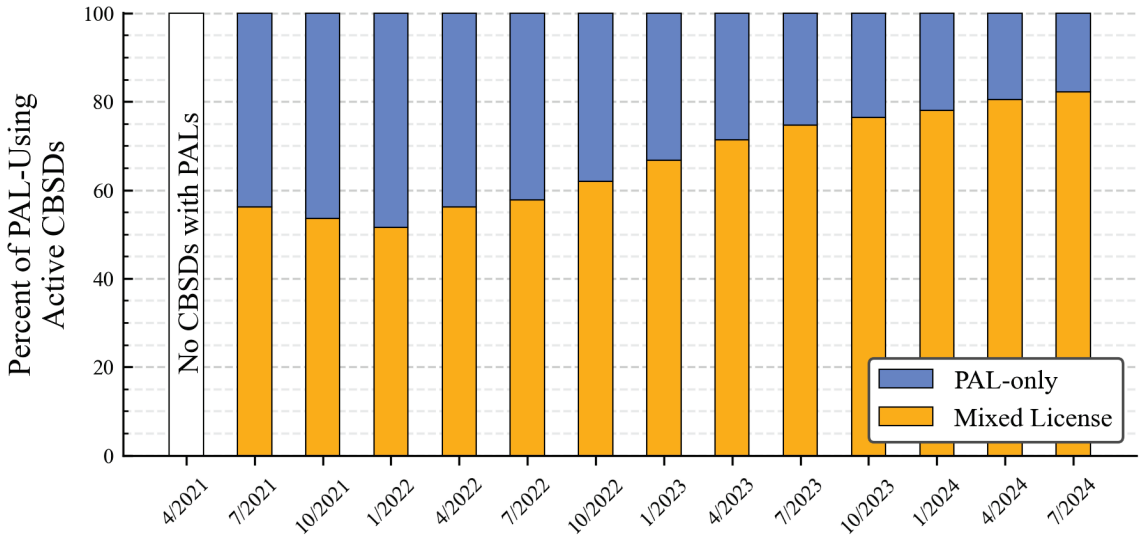


Figure 5: Nationwide percentage of active CBSDs with at least one PAL grant that were PAL-only versus mixed license from 4/1/2021 to 7/1/2024.

3.1.5 Air Interfaces

As shown in Table 1, instances of E_UTRA, NR, and Other air interfaces increased every quarter. Note that the specific distribution of the individual interfaces within this Other category is not separated out in the aggregate, anonymized FAD data. Between April 1, 2021, and July 1, 2024, Other air interfaces had the largest increase of 129,630, compared to 93,363 for E_UTRA, and 47,628 for NR. While E_UTRA continued to increase in 2023, it did so by less than half of the increase of 2022. In 2022, E_UTRA increased by 43,761 CBSDs compared to 21,249 in 2023. Conversely, NR increased nearly 30% more in 2023 compared to 2022. In 2022, active NR CBSDs increased by 17,019 compared to 22,063 in 2023.

Figure 6 illustrates the distribution of air interfaces from April 1, 2021, to July 1, 2024. E_UTRA declined from 37.1% on April 1, 2021, to 35.4% on July 1, 2024, after reaching a maximum of 42.1% on April 1, 2022. NR CBSDs increased from 0.0% to 11.9% over the same period. The percentage of CBSDs using an air interface other than E_UTRA or NR declined from 62.9% to 52.8% over the analysis period.

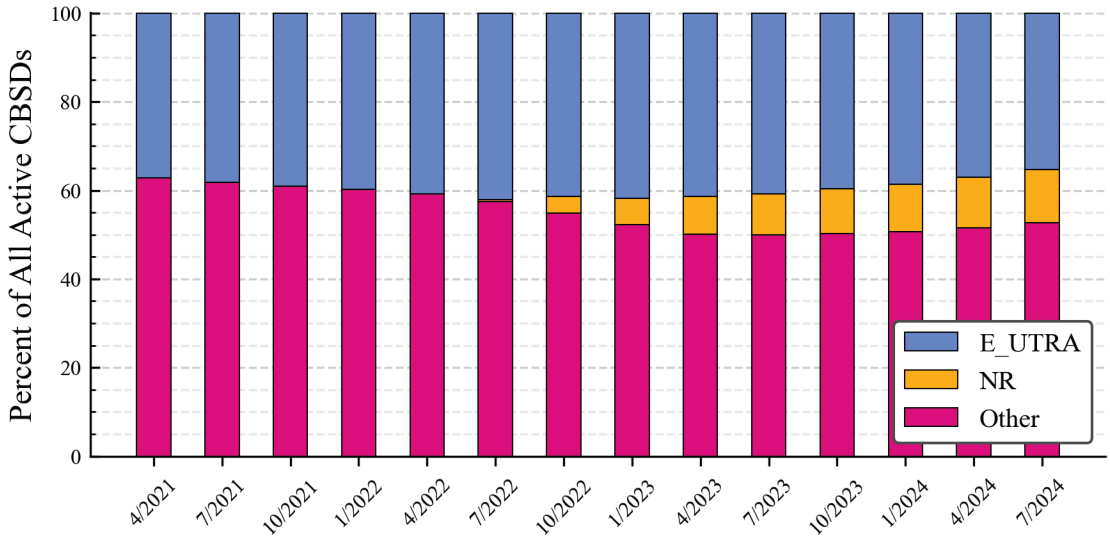


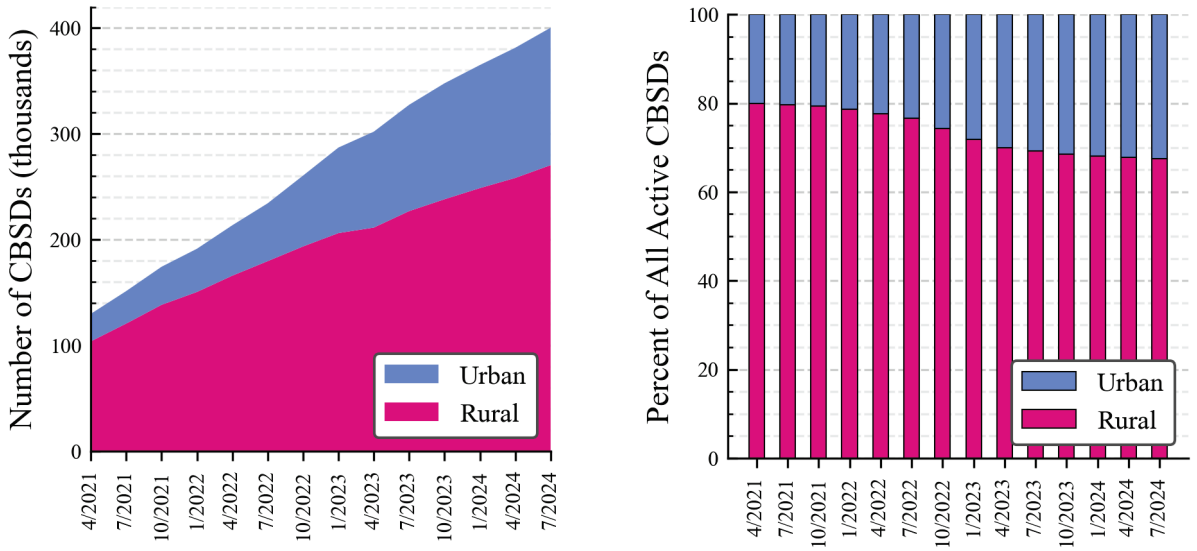
Figure 6: Nationwide percentage of active CBSDs with NR, E_UTRA, and Other air interfaces from 4/1/2021 to 7/1/2024.

3.1.6 Location Type

Recently, there has been an emphasis on closing the digital divide in rural America [4]–[6] and speculation that CBRS may play a role in increasing broadband access in rural communities [7], [8]. This section examines the CBSD deployments based on their deployment locations in either urban or rural areas. We define urban CBSDs as CBSDs that are in a Census Bureau-designated urban area; rural CBSDs are not located in a Census Bureau-designated urban area [9].

Figure 7(a) illustrates quarterly growth in the number of CBSDs in urban and rural areas and shows a substantial number of deployments in rural areas. Both urban and rural CBSD deployments experienced significant and steady increases. The number of CBSDs added in rural areas exceeded that in urban areas over the analysis period. The number of rural CBSDs more than doubled, increasing by 166,650 CBSDs from 103,768 on April 1, 2021, to 270,418 on July 1, 2024. The increase in the number of CBSDs in urban areas was smaller, with 103,960 CBSDs added between April 1, 2021, and July 1, 2024. However, this increase constitutes greater relative growth compared to rural deployments, since there were approximately four times fewer CBSDs in urban areas compared to rural areas on April 1, 2021. Both urban and rural CBSD deployments increased less in 2023 than in 2022. Urban CBSD deployments increased by 40,022 in 2022 compared to 35,460 in 2023. Rural CBSD deployments increased by 55,670 in 2022 compared to 42,605 in 2023.

Figure 7(b) illustrates these counts as a percentage of the total number of active CBSDs on each date. As shown, urban CBSDs increased from 20.0% of all active CBSDs on April 1, 2021, to 32.5% on July 1, 2024.



(a) (b)

Figure 7: Nationwide number (a) and percentage (b) of urban and rural CBSDs from 4/1/2021 to 7/1/2024.

3.2 Grant Statistics

This subsection provides quarterly statistics describing active grants. Details regarding the distribution of CBSDs that use PAL and GAA grants are discussed in subsection 3.2.1. Subsection 3.2.2 analyzes grants based on maximum allowed equivalent isotropic radiated power (EIRP). Finally, subsection 3.2.3 analyzes grant bandwidth and channel utilization.

3.2.1 Number and License Tier of Active Grants

Table 2 and Figure 8(a) illustrate nationwide counts of active PAL and GAA grants. Figure 8(b) illustrates the distribution of grant types on each date. As a percentage of the total, GAA grants have decreased slightly since the initial authorization of PAL grants. On January 1, 2022, PAL grants represented 13.2% of all CBSD grants. This increased to 17.7% on July 1, 2024. While PAL grants have increased as a percentage of the total, GAA grants accounted for 82.3% of all CBSD grants on July 1, 2024.

Table 2: Nationwide counts of active grants by license tier.

Type	4/1/2021	1/1/2022	1/1/2023	4/1/2023	7/1/2023	10/1/2023	1/1/2024	4/1/2024	7/1/2024
PAL	0	53,242	107,479	130,092	147,457	158,800	179,953	195,850	209,179
GAA	182,109	349,694	612,607	672,314	755,106	842,548	873,797	922,392	969,446
Total	182,109	402,936	720,086	802,406	902,563	100,1348	1,053,750	1,118,242	1,178,625

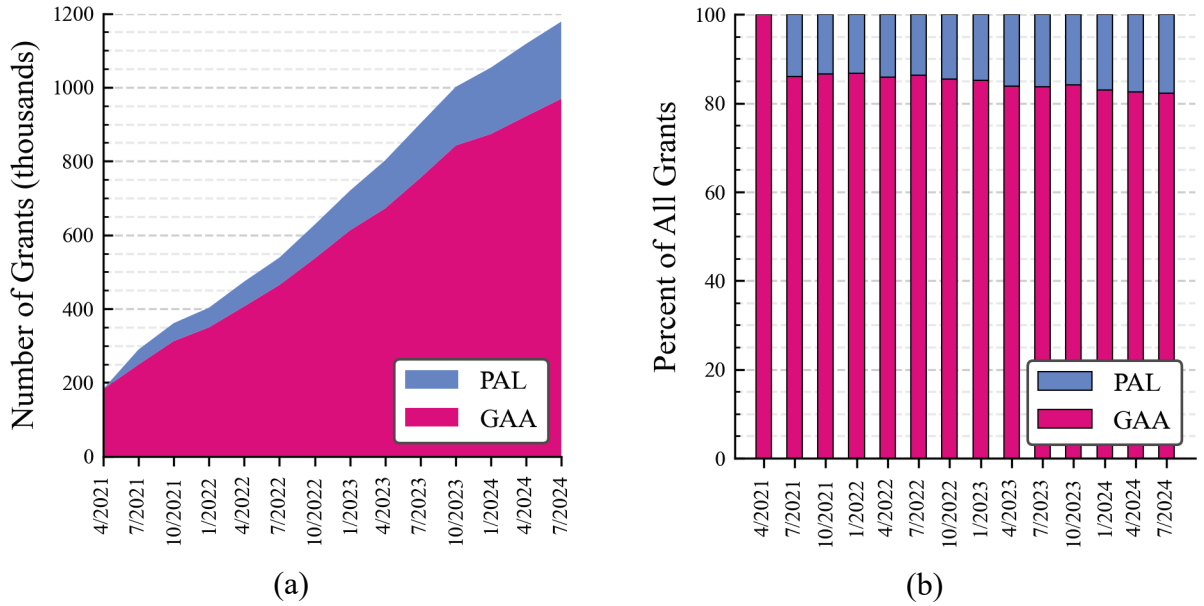


Figure 8: Nationwide number (a) and percentages (b) of PAL and GAA grants from 4/1/2021 to 7/1/2024.

3.2.2 Maximum EIRP

FAD data indicate a maximum EIRP for each grant. The data anonymization resulted in specific values being obfuscated to EIRP ranges. Tables 3 and 4 provide distributions of grants within each maximum EIRP range for Cat A and Cat B CBSDs, respectively. Figures 9 and 10 visualize these distributions for the three most common ranges for each category.

The primary trend in these data is the same for Cat A and Cat B CBSDs: the highest-power EIRP categories for each CBSD type became increasingly popular over the analysis period. The percentage of Cat A grants with a maximum EIRP in the highest category (17 to 22 dBm/MHz) increased from 32.5% on April 1, 2021, to 85.0% on July 1, 2024. Similarly, the percentage of Cat B grants with maximum EIRP in the highest category (32 to 37 dBm/MHz) increased from 61.9% to 79.8% over the same period. For both CBSD types, the three highest maximum EIRP categories were the most common in all quarterly data.

Table 3: Percents of nationwide Cat A active grants with maximum EIRP (denoted by "x") within EIRP ranges.

Max. EIRP (dBm/MHz)	Grant Type	4/1/21	1/1/22	1/1/23	4/1/23	7/1/23	10/1/23	1/1/24	4/1/24	7/1/24
x ≤ 2	Cat A	2.0	2.0	0.4	0.3	0.5	0.4	0.5	0.7	0.7
2 < x ≤ 7	Cat A	0.6	0.7	0.3	0.2	0.2	0.1	0.1	0.1	0.1
7 < x ≤ 12	Cat A	28.1	18.7	8.6	4.3	3.6	1.8	2.6	2.4	2.1
12 < x ≤ 17	Cat A	36.8	43.6	32.9	29.3	31.8	15.8	15.2	13.4	12.1
17 < x ≤ 22	Cat A	32.5	35.1	57.8	65.9	63.9	81.8	81.5	83.4	85.0

Table 4: Percents of nationwide Cat B active grants with maximum EIRP (denoted by "x") within EIRP ranges.

Max. EIRP (dBm/MHz)	4/1/21	1/1/22	1/1/23	4/1/23	7/1/23	10/1/23	1/1/24	4/1/24	7/1/24
x ≤ 2	0.1	< 0.1	0.2	0.5	0.6	0.7	1.2	1.6	0.2
2 < x ≤ 7	< 0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1
7 < x ≤ 12	0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.2
12 < x ≤ 17	1.3	0.9	0.5	0.4	0.5	0.5	0.6	0.5	0.5
17 < x ≤ 22	4.3	4.1	3.9	2.4	2.1	2.1	2.0	1.8	1.7
22 < x ≤ 27	10.6	8.3	8.0	10.0	11.4	11.3	11.1	10.8	10.7
27 < x ≤ 32	21.5	16.8	12.2	10.8	9.0	8.2	7.8	7.4	6.9
32 < x ≤ 37	61.9	69.6	75.0	75.6	76.2	76.8	76.8	77.2	79.8

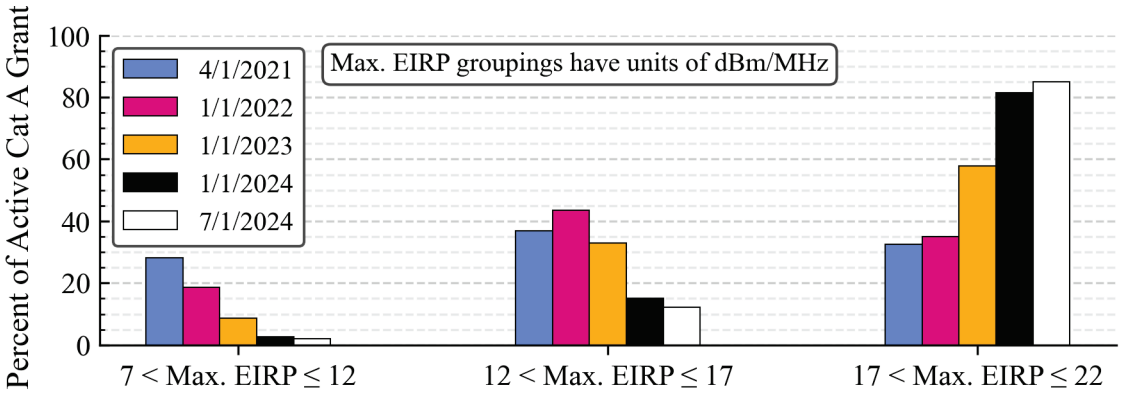


Figure 9: Percentage of active Cat A grants nationwide with maximum EIRP in one of the three most common ranges from 4/1/2021 to 7/1/2024.

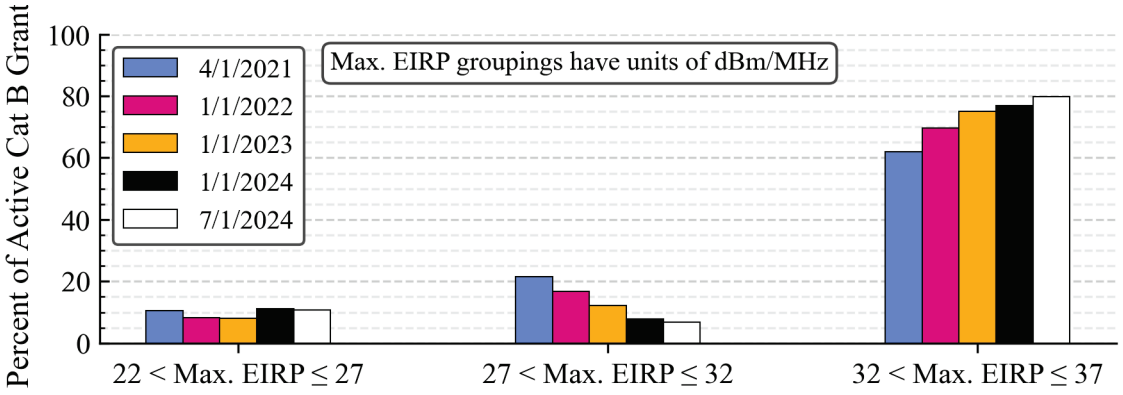


Figure 10: Percentage of active Cat B grants nationwide with maximum EIRP in one of the three most common ranges from 4/1/2021 to 7/1/2024.

3.2.3 Bandwidth and Channel Usage

Table 5 details the percent of grants with each grant bandwidth. Figure 11 illustrates the percent of active grants nationwide by bandwidth for the five most common grant bandwidths. Note that these percentages are based on individual grants and do not correspond to the total bandwidth used by CBSDs, as a single CBSD can have multiple active grants. Previously, [2] noted a significant increase in 10 MHz grants and a slight increase in 5 MHz grants from April 1, 2021, to January 1, 2023, with all other common bandwidths decreasing slightly. In the latest data, 10 MHz grants have decreased slightly to 57.2% of the total, but remain the most common.

Table 5: Percents of active grants nationwide by bandwidth and date.

Bandwidth (MHz)	4/1/21	1/1/22	1/1/23	4/1/23	7/1/23	10/1/23	1/1/24	4/1/24	7/1/24
5	0.8	3.8	4.9	5.4	5.4	8.5	7.9	7.9	7.9
10	28.2	67.5	68.7	66.6	64.8	61.2	59.9	58.8	57.2
15	0.4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
20	48.7	23.9	22.6	23.7	24.7	24.0	24.6	24.2	24.0
25	< 0.1	< 0.1	< 0.1	0.0	0.0	0.0	0.0	0.0	0.0
30	14.3	2.6	1.2	1.0	1.1	1.1	1.4	1.6	1.7
35	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.0
40	7.5	2.1	2.6	3.4	4.0	5.1	6.2	7.4	9.2
45	0.0	0.0	0.0	0.0	0.0	< 0.1	< 0.1	0.0	0.0
50	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
60	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
70	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
80	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
90	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
100	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	< 0.1	0.0	< 0.1	< 0.1	0.0	< 0.1	< 0.1	0.0	0.0
120	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
130	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
140	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.0	0.0
150	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

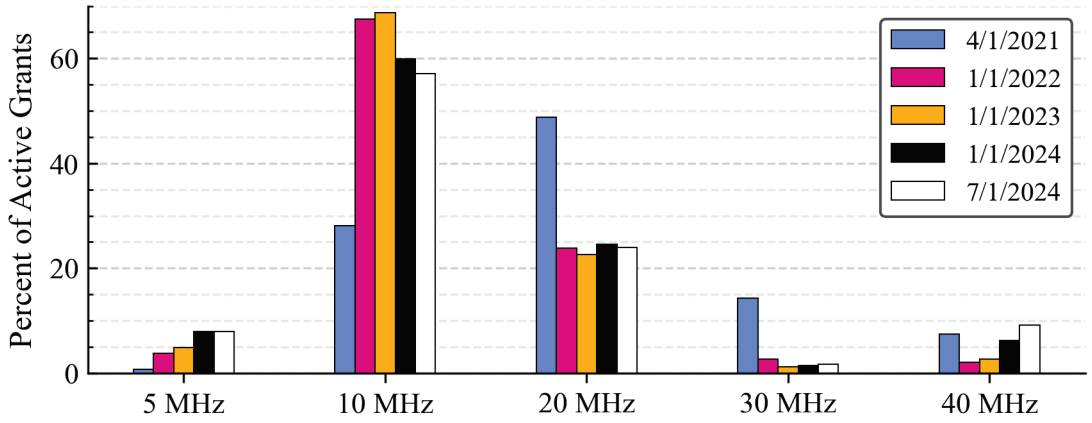


Figure 11: Percentage of active grants nationwide with the five most common bandwidths from 4/1/2021 to 7/1/2024.

CBSDs often have multiple active grants. We define CBSD bandwidth as the summation of the bandwidths of all active grants for a given CBSD. For example, the CBSD bandwidth is 30 MHz for a CBSD with three active 10 MHz grants. Mean CBSD bandwidths on a national scale are shown for each quarterly dataset in Figure 12. This figure shows that mean CBSD bandwidth has increased from 28.2 MHz on April 1, 2021, to 44.5 MHz on July 1, 2024.

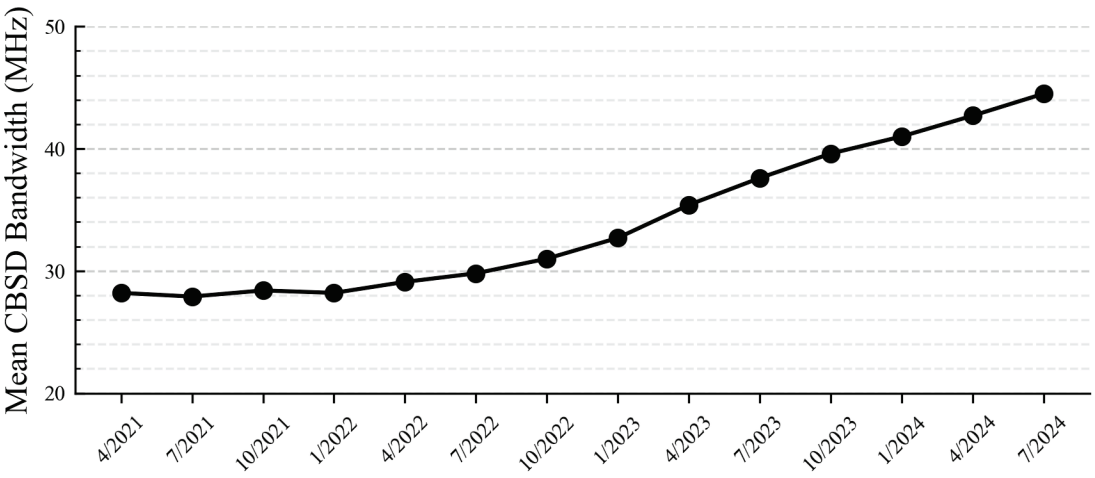


Figure 12: Nationwide mean CBSD bandwidth from 4/1/2021 to 7/1/2024.

Table 6 and Figure 13 detail the percent of grants using each channel. Note that the tabulated percentages do not add to 100% in each column because grants vary in bandwidth. If there were two grants, for example, one spanning from 3550 to 3570 MHz and the other from 3550 to 3560 MHz, the 3550–3560 MHz channel would be considered used in 100% of the grants, while the 3560–3570 MHz channel would be used in 50% of the grants. On April 1, 2021, channels in the lower portion of the band were used more often than channels in the upper portion of the band. More recently, usage has become more uniform, meaning that channels seem to be equally preferable to grant holders. Note that these data are not an appropriate metric for assessing band utilization, which is discussed in Section 5.3.

Table 6: Percents of nationwide active grants using each channel.

Channel (MHz)	4/1/21	1/1/22	1/1/23	4/1/23	7/1/23	10/1/23	1/1/24	4/1/24	7/1/24
3550–3560	20.5	10.5	10.0	9.1	9.3	8.9	9.2	6.1	5.9
3560–3570	21.6	11.5	11.1	10.4	10.4	10.0	10.4	6.9	6.7
3570–3580	19.5	10.5	9.8	9.4	9.5	9.2	9.6	6.5	6.6
3580–3590	20.1	10.3	9.7	9.5	9.6	9.4	10.1	6.9	6.9
3590–3600	16.6	8.8	8.6	8.7	8.6	8.3	8.7	6.0	6.0
3600–3610	17.9	9.7	9.2	9.3	9.2	8.9	9.0	6.1	6.0
3610–3620	16.1	10.2	9.5	9.6	9.7	9.5	9.7	6.4	6.2
3620–3630	16.5	10.4	9.7	10.2	10.5	10.7	11.1	7.4	7.3
3630–3640	13.9	9.6	9.1	9.7	10.0	10.2	10.6	6.9	6.8
3640–3650	10.2	8.1	8.3	9.2	9.5	9.8	10.2	6.8	6.7
3650–3660	7.1	7.8	8.4	9.1	9.6	10.3	10.6	7.1	7.1
3660–3670	7.5	8.5	9.2	9.9	10.6	11.6	11.9	8.3	8.6
3670–3680	6.2	6.9	7.5	8.2	8.7	9.7	9.8	6.9	7.1
3680–3690	8.8	8.5	8.2	8.6	8.9	9.6	9.8	6.8	6.9
3690–3700	7.6	7.2	6.2	6.2	6.2	7.0	7.1	5.1	5.2

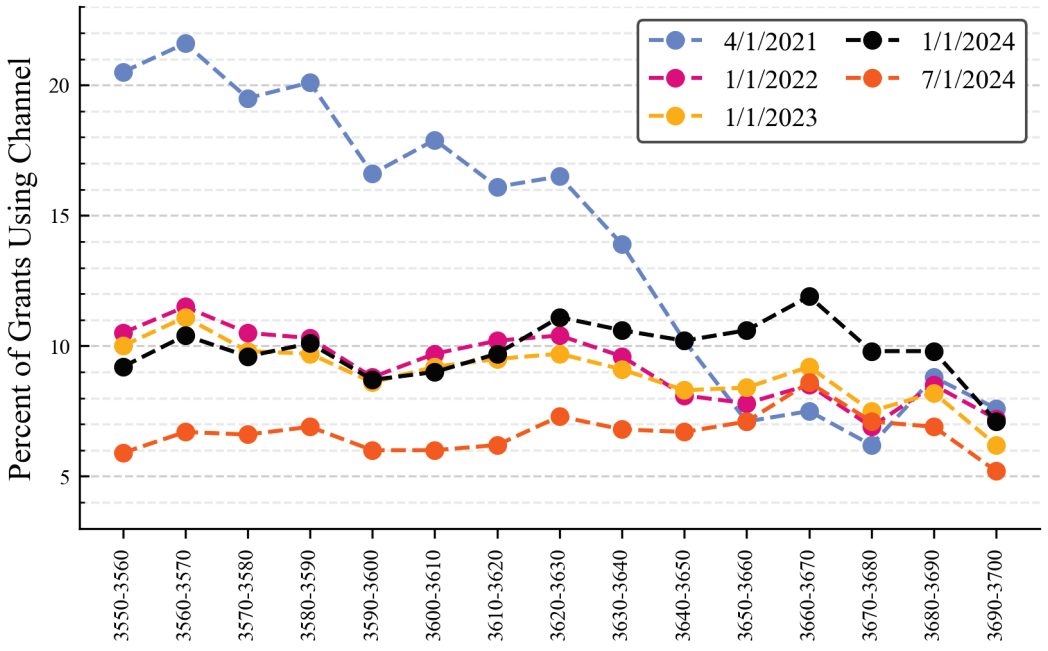


Figure 13: Nationwide percentage of active grants using each 10 MHz channel from 4/1/2021 to 7/1/2024.

4. STATE DATA

This section illustrates the aggregate data at the state level, based on the United States Census definition of the state geographic level. This is limited to all U.S. states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. Subsection 4.1 provides illustrations of the number of and growth in CBSDs by state, and subsection 4.2 provides choropleth maps [10] illustrating CBSD statistics by state.

4.1 Number of CBSDs by State

Figure 14 characterizes the growth in the number of CBSDs per state that occurred from April 1, 2021, to July 1, 2024. The figure provides the percent of states in which the number of CBSDs is equal to or greater than the value on the x-axis (abscissa). On April 1, 2021, for example, 94.6% of states and island areas had one or more CBSDs, 75% had at least 172, 50% had at least 1,220, 25% had at least 2,663, and none had more than 24,515. On July 1, 2024, 98.2% of states and island areas had at least one CBSD, 75% had at least 1,234, 50% had at least 4,422, 25% had at least 9,697, and none had more than 63,120.

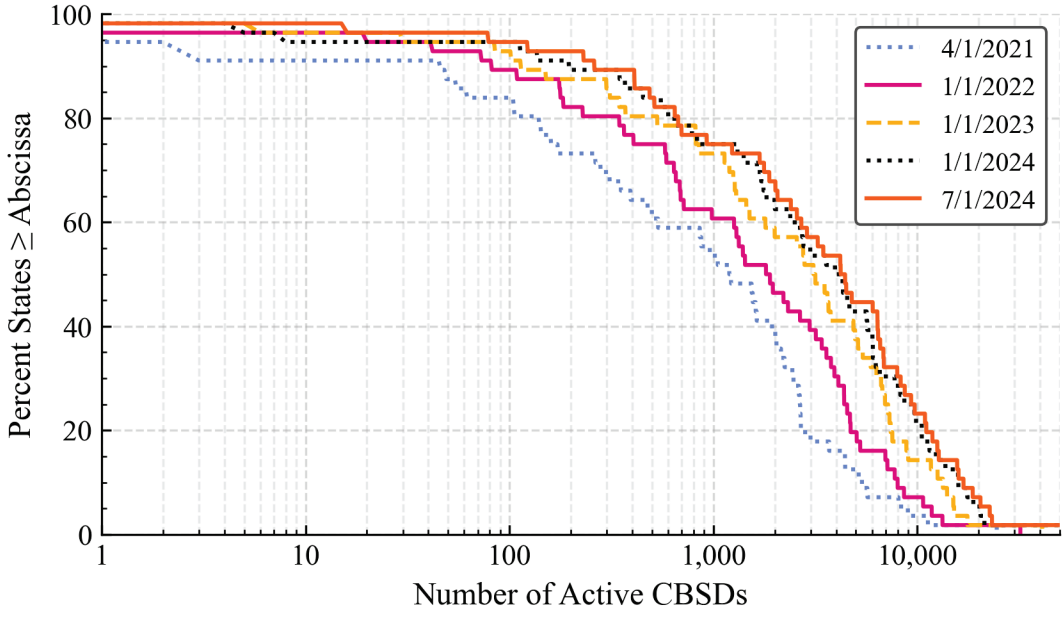


Figure 14: Percent of states and island areas in which the number of active CBSDs is equal to or greater than the value on the x-axis, on 4/1/2021, 1/1/2022, 1/1/2023, 1/1/2024, and 7/1/2024.

To illustrate this growth in absolute terms, Figures 15 and 16 provide the number of CBSDs added to each state or island area between April 1, 2021, and July 1, 2024. The mean increase over this period was 4,832 CBSDs per state or island area, with a standard deviation of 6,180. Texas led other states and island areas with an increase of 38,605 active CBSDs (more than 5 standard deviations above the mean). The state with the second largest increase in active CBSDs over the entire 21 month period was California, with an increase of 18,800, more than 2 standard

deviations above the mean. No CBSDs were added in the Northern Mariana Islands, and South Dakota and Mississippi had the next smallest increases of 14 CBSDs each. Choropleth maps of the increase in CBSDs per state are provided in Figures 21 and 22.

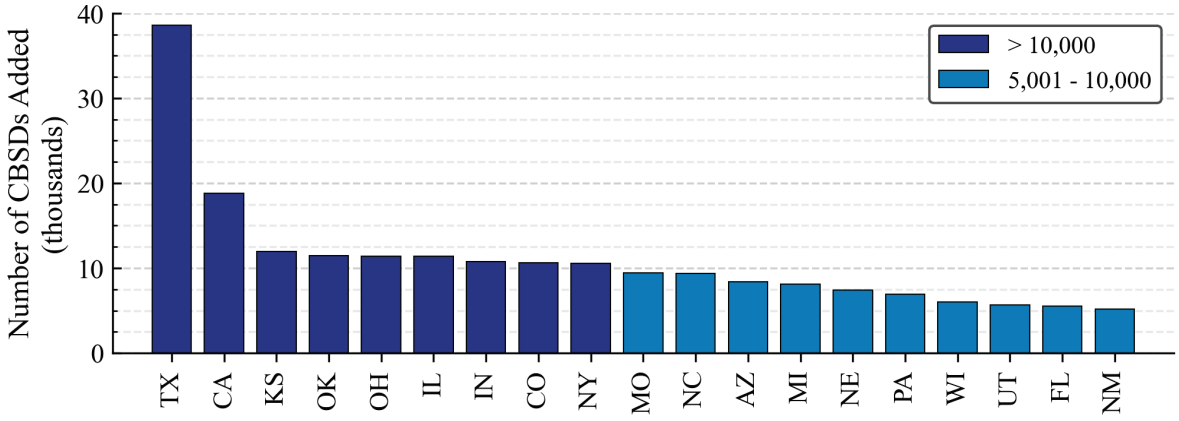


Figure 15: Increase in number of active CBSDs per state and island area (for those that increased by more than 5,000 CBSDs) from 4/1/2021 to 7/1/2024.

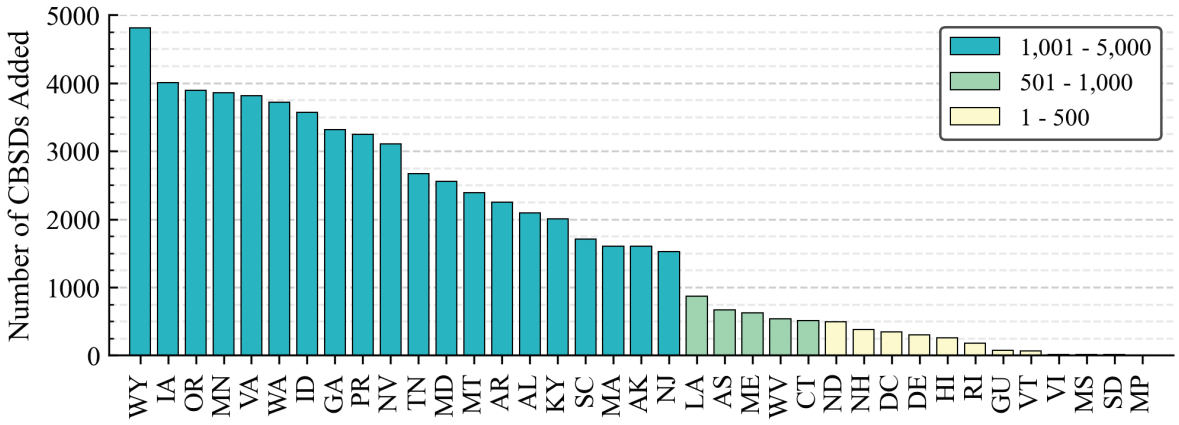


Figure 16: Increase in number of active CBSDs per state and island area (for those that increased by 5,000 or fewer CBSDs) from 4/1/2021 to 7/1/2024.

Finally, Figures 17 and 18 show the counts of active CBSDs in each state or island area on July 1, 2024. The mean number of active CBSDs per state or island area on July 1, 2024, was 7,150 CBSDs. Texas remained the state or island area with the most active CBSDs, with 63,120 active CBSDs (greater than five standard deviations above the mean). On July 1, 2024, only Guam, the Virgin Islands, and the Northern Mariana Islands had less than 100 active CBSDs, and the Northern Mariana Islands was the only state or island area with no active CBSDs. Choropleth maps of this data are provided in Figures 19 and 20.

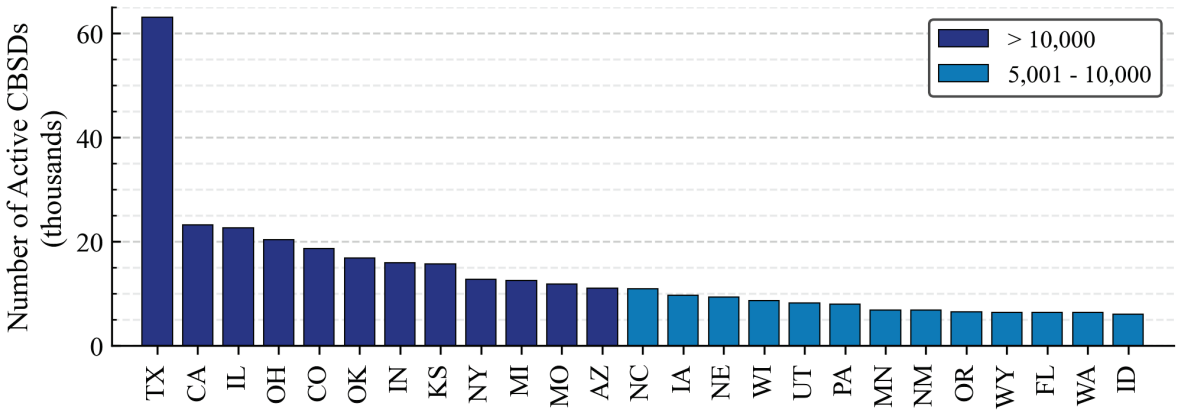


Figure 17: Number of active CBSDs in states or island areas with more than 5,000 CBSDs on 7/1/2024.

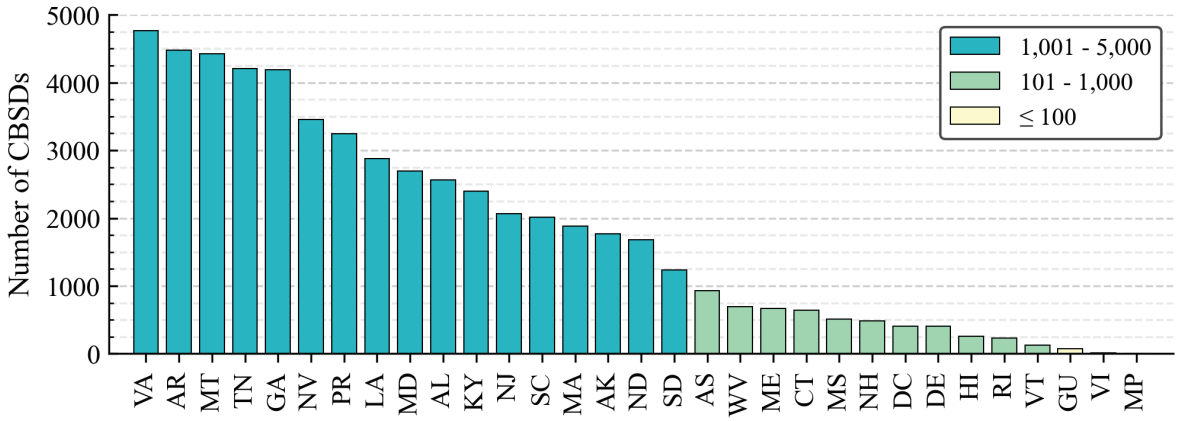


Figure 18: Number of active CBSDs in states or island areas with 5,000 or fewer CBSDs on 7/1/2024.

4.2 Choropleth Maps Illustrating Categorical CBSD Statistics by State

Choropleth maps are provided to illustrate categorical CBSD statistics by state for the contiguous (CONUS) and non-contiguous (OCONUS) U.S. and Table 7 provides a summary of these maps. Along with absolute counts of active CBSDs in each state and island area, we provide figures that normalize the CBSD counts by the total population of each state or island area as the number of active CBSDs per 10,000 people. Data from the 2020 United States Census is used for the normalization. For the same maps from 4/1/2021 and 1/1/2023, see [2].

Table 7: State choropleth map descriptions.

Figures	Description
Figures 19 and 20	Number of active CBSDs on 7/1/2024
Figures 21 and 22	Change in number of active CBSDs from 4/1/2021 to 7/1/2024
Figures 23 and 24	Number of active CBSDs per 10,000 people on 7/1/2024
Figures 25 and 26	Number of active NR CBSDs on 7/1/2024
Figures 27 and 28	Number of active indoor CBSDs on 7/1/2024

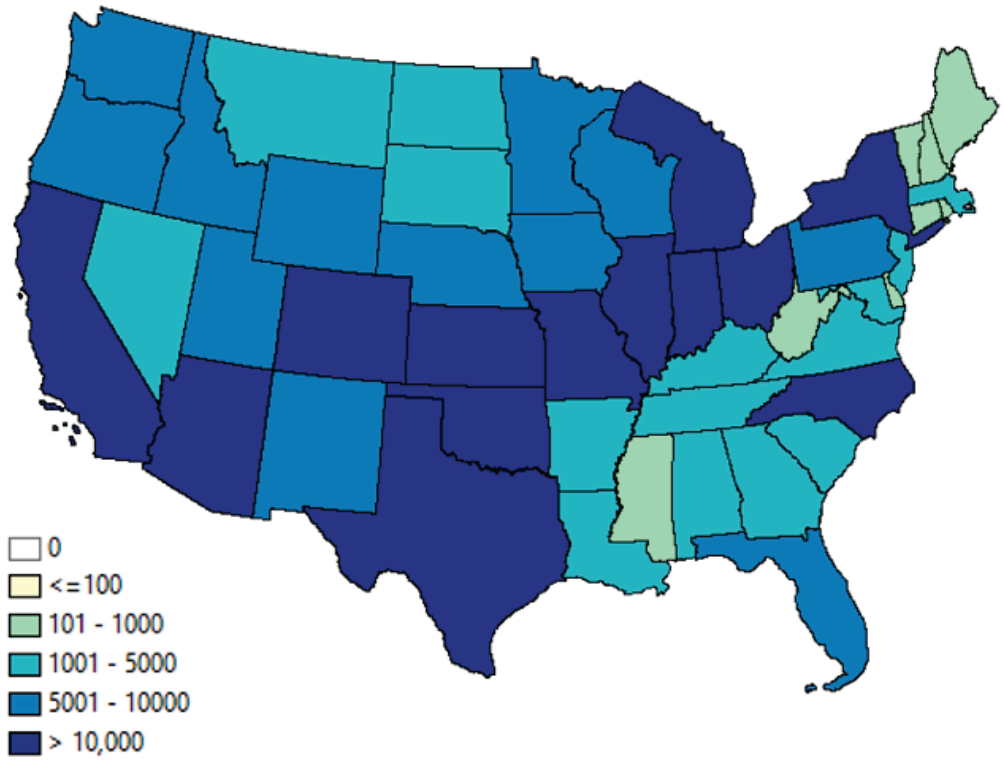


Figure 19: Number of active CBSDs by state for CONUS on 7/1/2024.

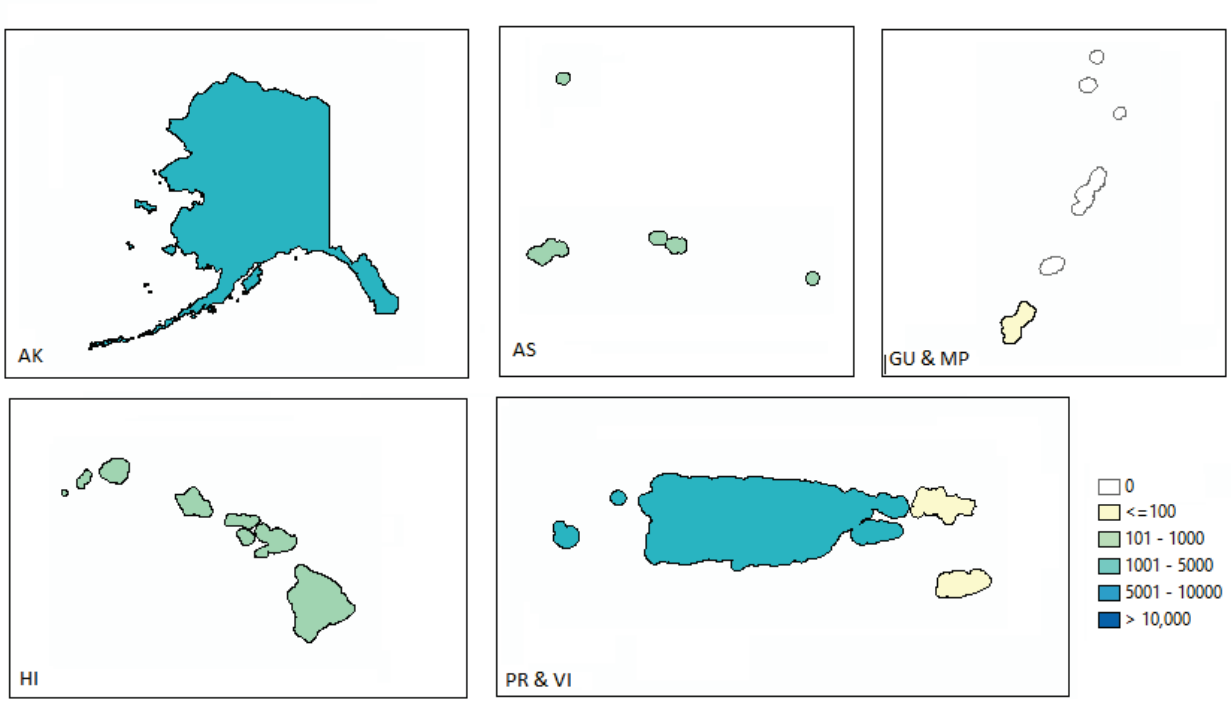


Figure 20: Number of active CBSDs by state and island area for OCONUS on 7/1/2024.

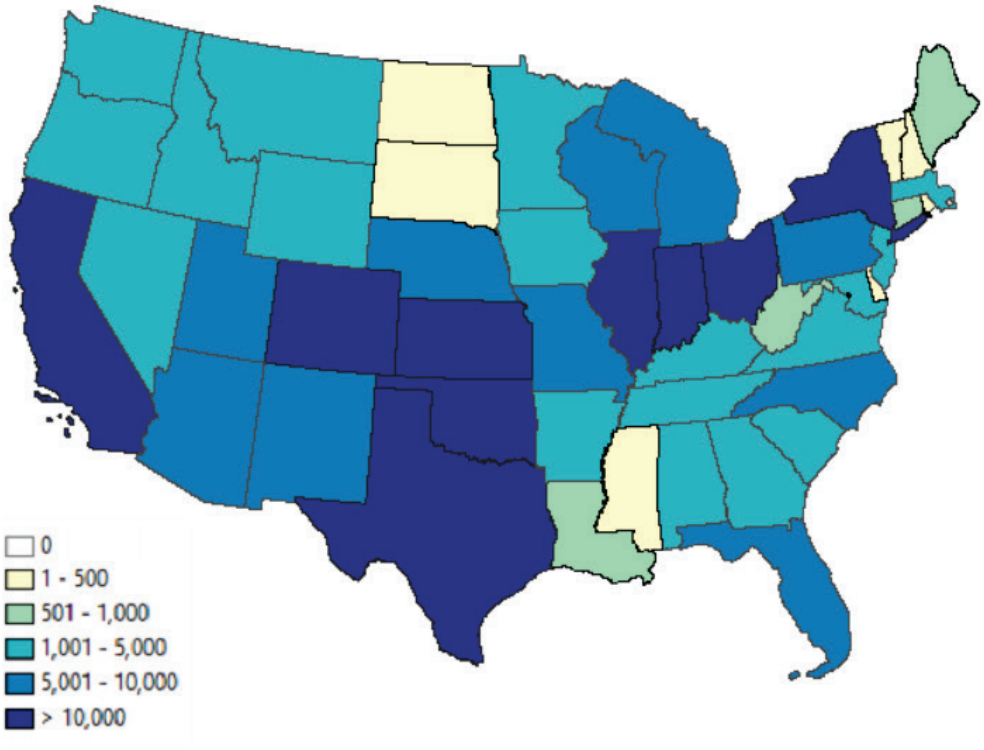


Figure 21: Change in number of active CBSDs by state for CONUS from 4/1/2021 to 7/1/2024.

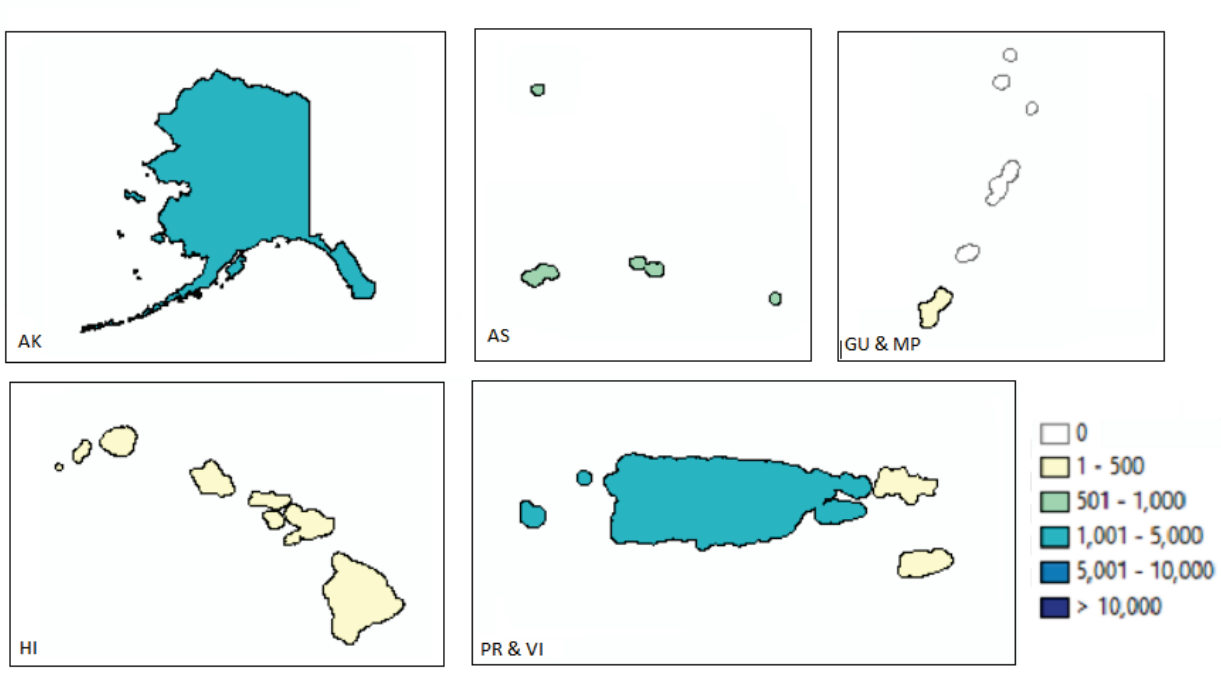


Figure 22: Change in number of active CBSDs by state and island area for OCONUS from 4/1/2021 to 7/1/2024.

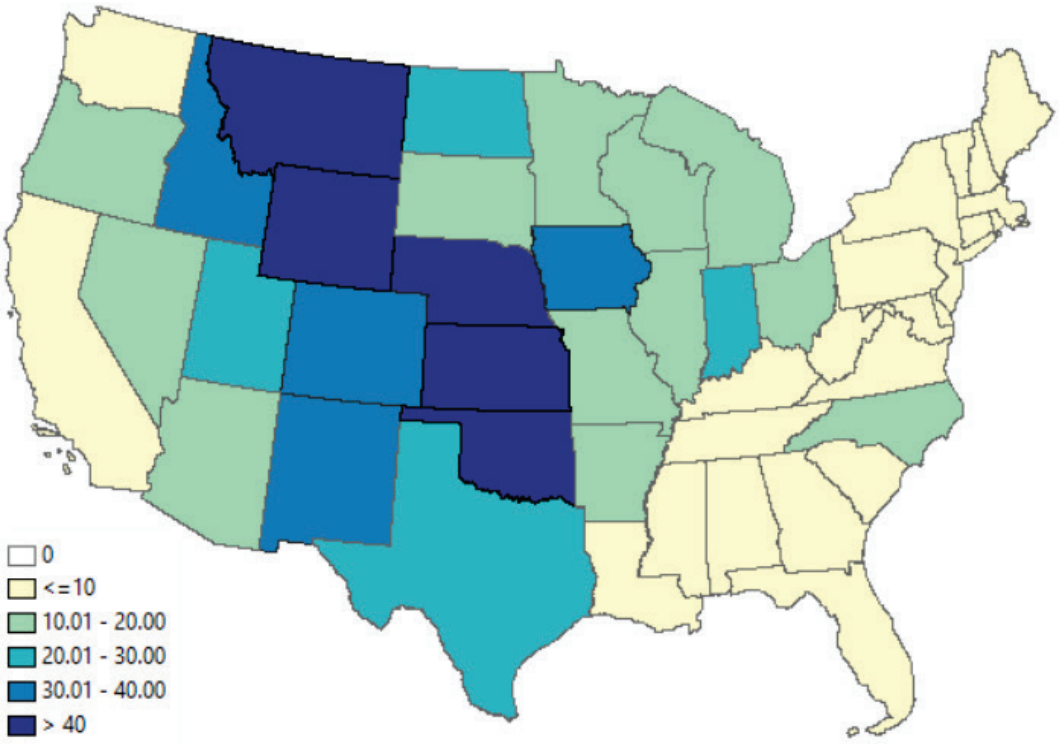


Figure 23: Number of active CBSDs per 10,000 people by state for CONUS on 7/1/2024.

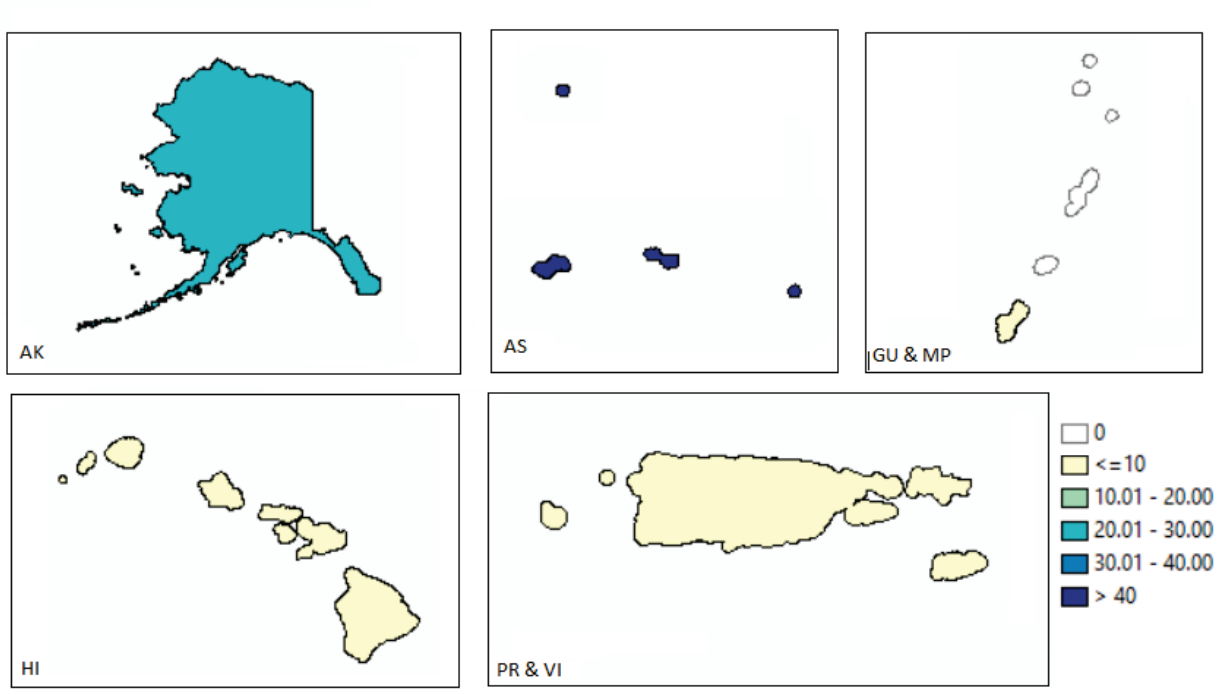


Figure 24: Number of active CBSDs per 10,000 people by state and island area for OCONUS on 7/1/2024.

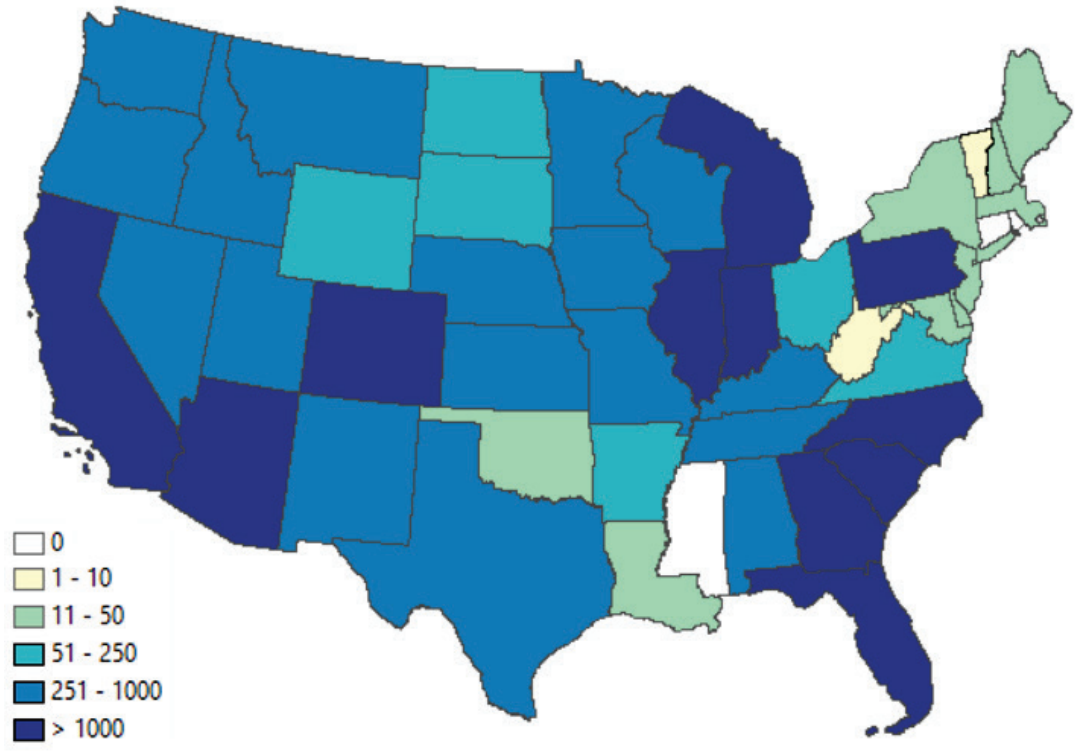


Figure 25: Number of active NR CBSDs by state for CONUS on 7/1/2024.

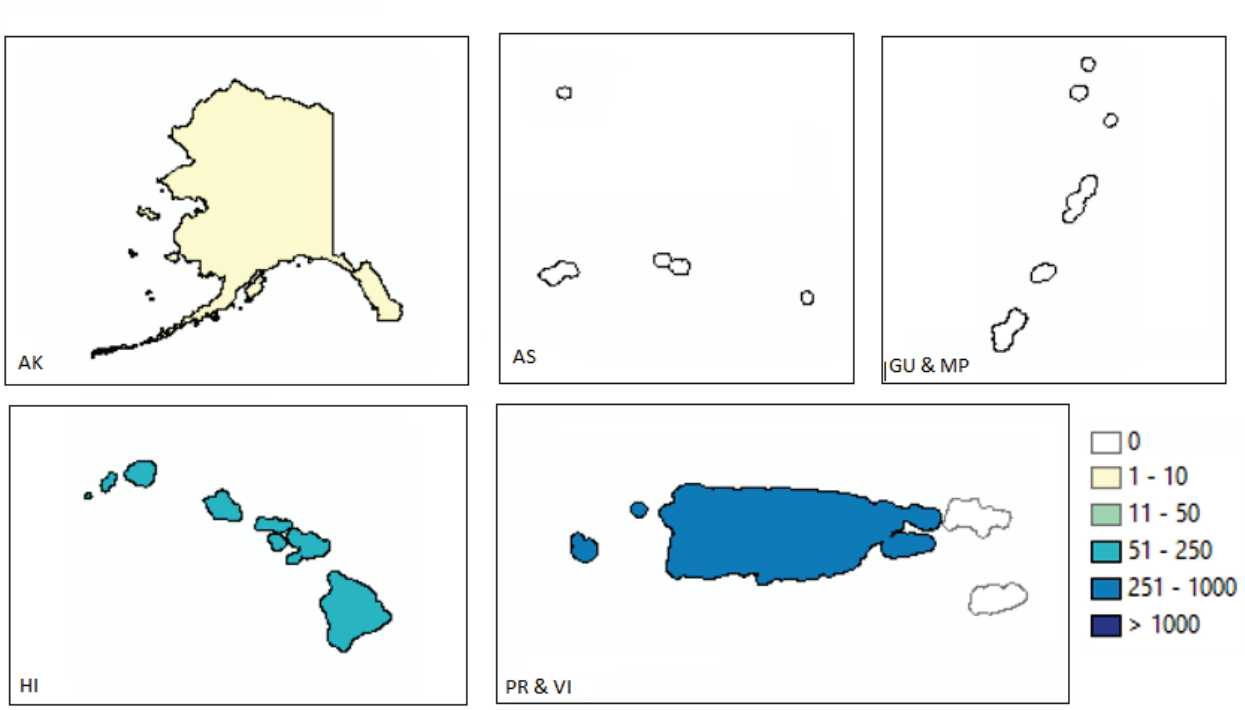


Figure 26: Number of active NR CBSDs by state and island area for OCONUS on 7/1/2024.

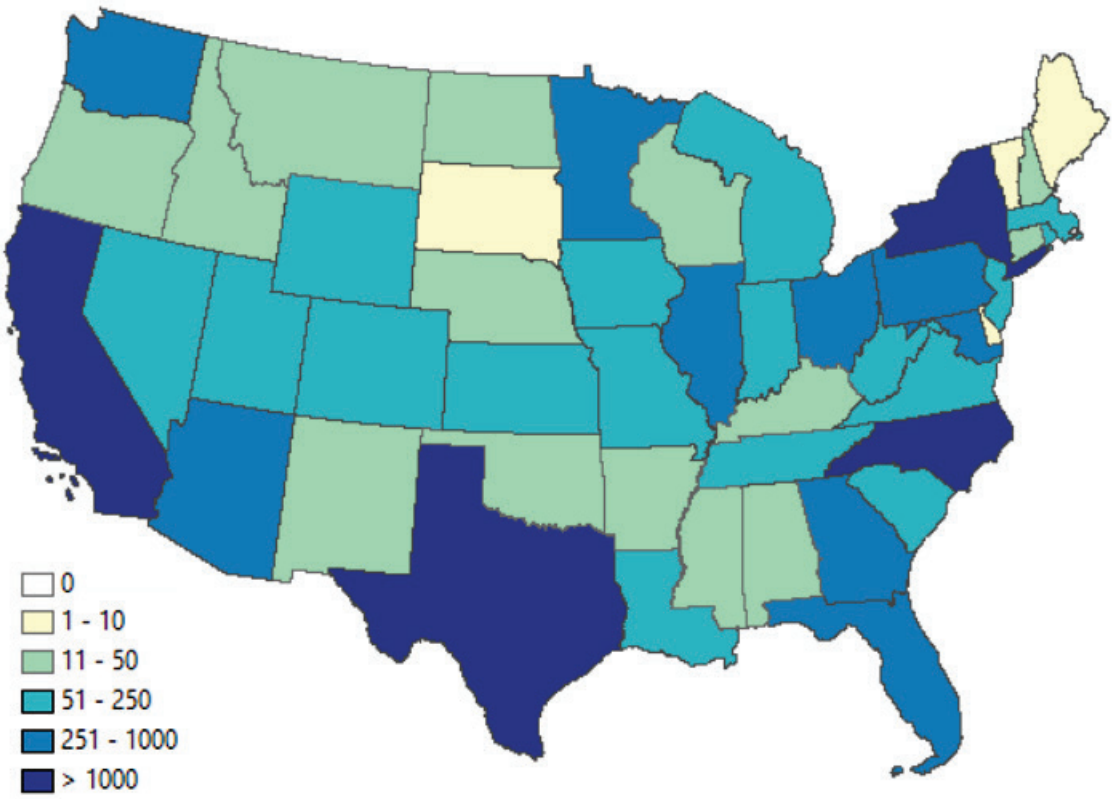


Figure 27: Number of indoor CBSDs by state for CONUS on 7/1/2024.

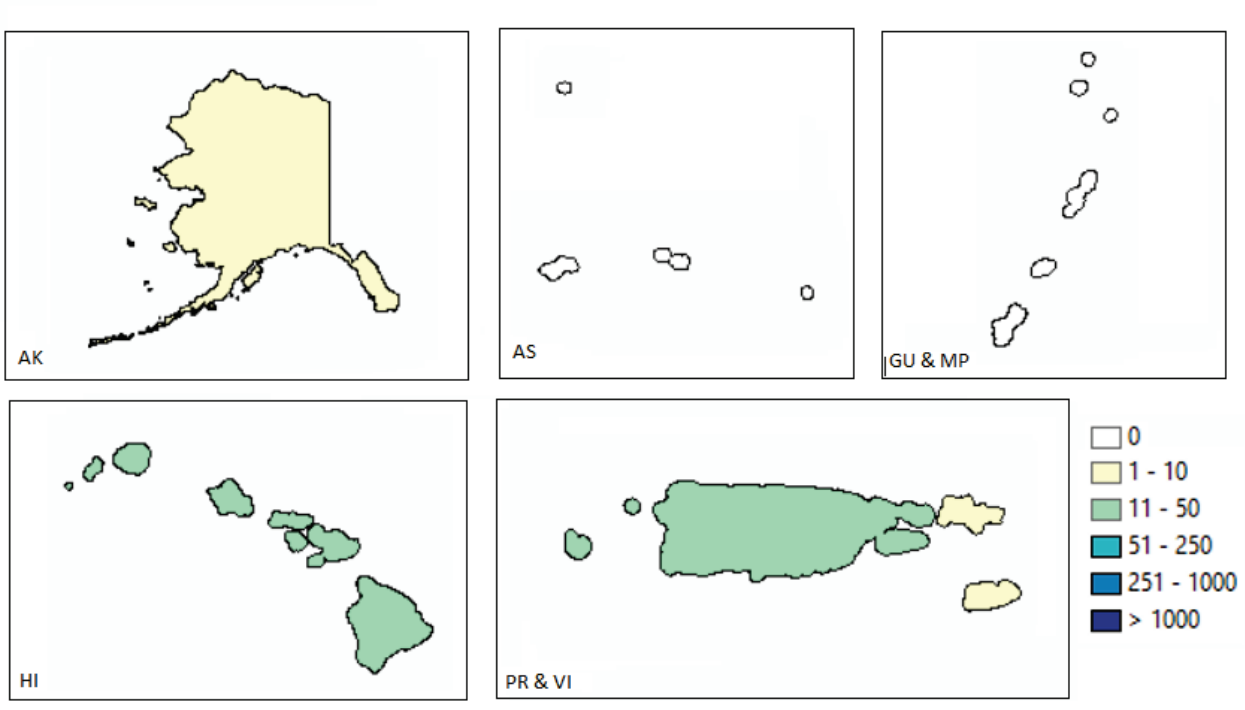


Figure 28: Number of indoor CBSDs by state and island area for OCONUS on 7/1/2024.

5. COUNTY DATA

The section illustrates the aggregate data at the county level. Subsection 5.1 provides an illustration of the number of and growth in CBSDs by county, and subsection 5.2 provides choropleth maps illustrating categorical CBSD statistics by county. Subsections 5.3 and 5.4 provide analysis on band utilization and DPA-impacted versus non-impacted statistics, respectively.

5.1 Number of CBSDs by County

Figure 29 characterizes the growth in the number of CBSDs per county that occurred from April 1, 2021, to July 1, 2024. The figure provides the percent of counties in which the number of CBSDs is equal to or greater than the value on the x-axis (abscissa). On April 1, 2021, for example, 56.4% of counties had one or more CBSDs. On July 1, 2024, this had increased to 82.7%.

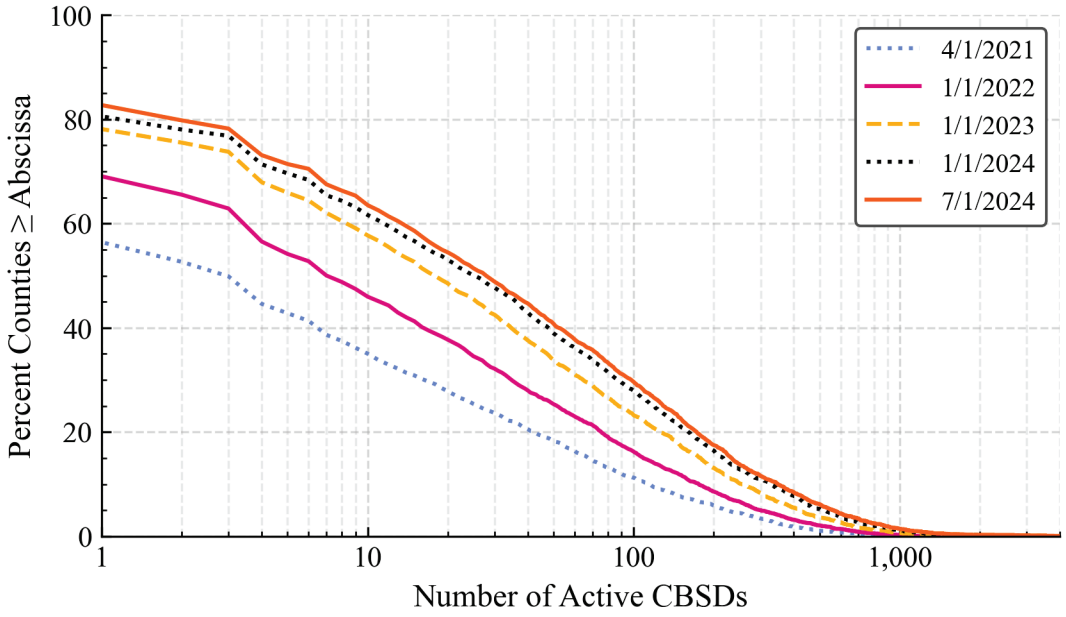


Figure 29: Percent of counties in which the number of CBSDs is equal to or greater than the value on the x-axis, on 4/1/2021, 1/1/2022, 1/1/2023, 1/1/2024, and 7/1/2024.

5.2 Choropleth Maps Illustrating Categorical CBSD Statistics by County

Choropleth maps are provided to illustrate categorical CBSD statistics by county for CONUS and OCONUS on July 1, 2024, and the change in the number of active CBSDs from April 1, 2021, to July 1, 2024. Table 8 provides a summary of maps provided. Along with absolute counts of active CBSDs in each county, we provide figures that normalize the CBSD counts by the total population of each county as the number of active CBSDs per 10,000 people. Data from the 2020 United States Census is used for the normalization. For the same maps from 4/1/2021 and 1/1/2023, see [2].

Table 8: County choropleth map descriptions.

Figure	Description
Figures 30 and 31	Number of active CBSDs on 7/1/2024
Figures 32 and 33	Change in number of active CBSDs from 4/1/2021 to 7/1/2024
Figures 34 and 35	Number of active CBSDs per square kilometer on 7/1/2024
Figures 36 and 37	Number of active CBSDs per 10,000 people on 7/1/2024
Figures 38 and 39	Number of active NR CBSDs on 7/1/2024
Figures 40 and 41	Number of active indoor CBSDs on 7/1/2024
Figures 42 and 43	Number of active rural CBSDs on 7/1/2024
Figures 44 and 45	Number of active urban CBSDs on 7/1/2024
Figures 46 and 47	Number of channels granted on 7/1/2024

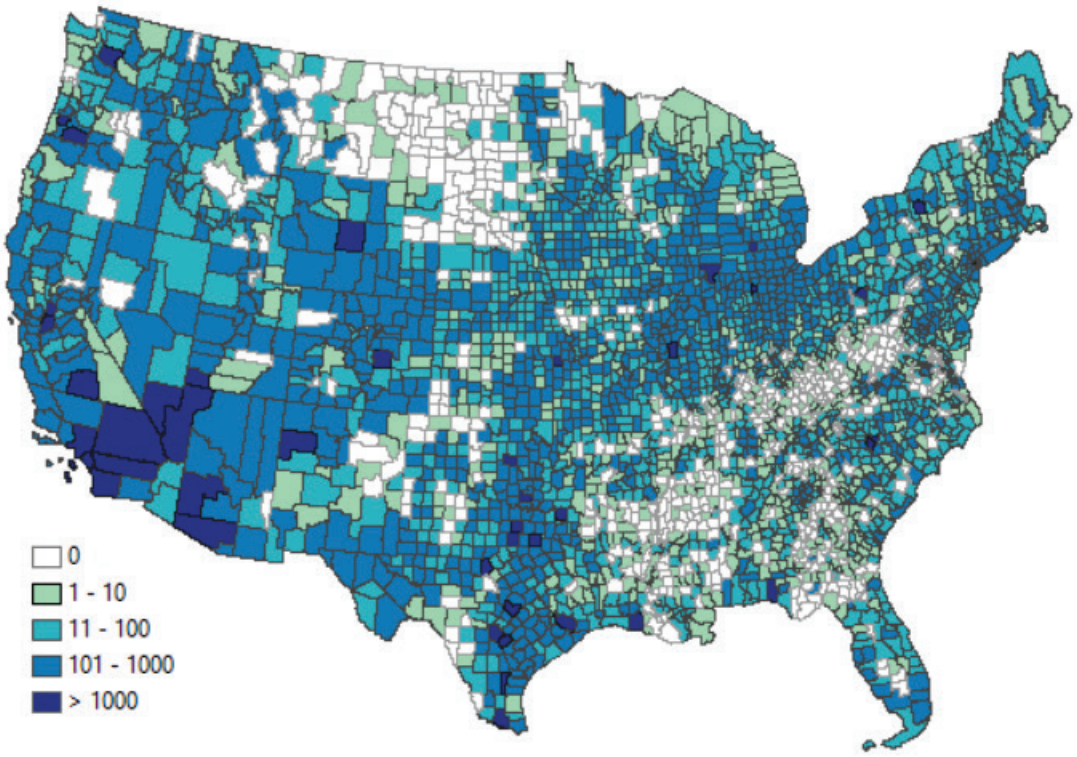


Figure 30: Number of active CBSDs by county for CONUS on 7/1/2024.

Figure 31: Number of active CBSDs by county for OCONUS on 7/1/2024.

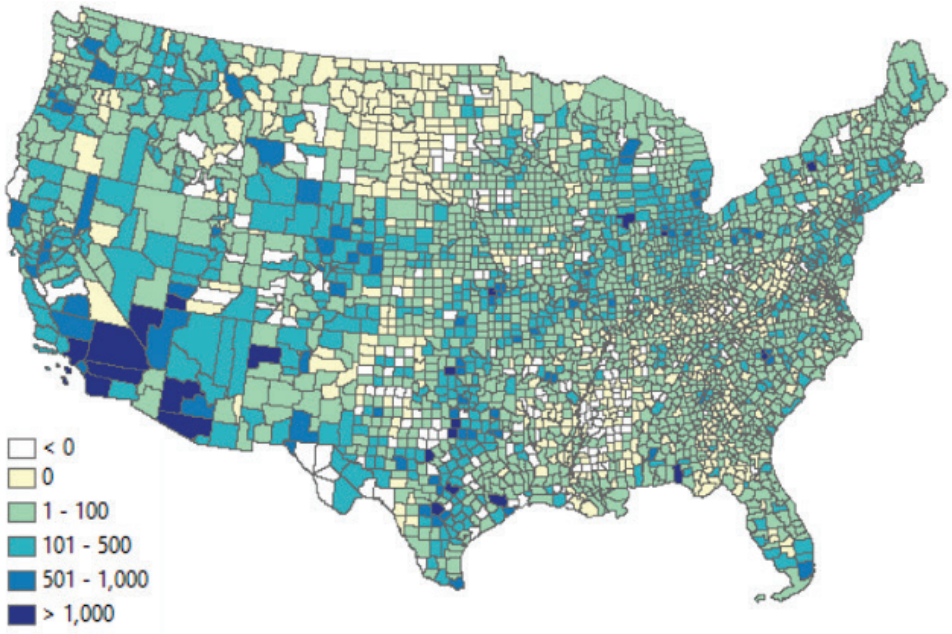


Figure 32: Change in number of active CBSDs by County for CONUS from 4/1/2021 to 7/1/2024.

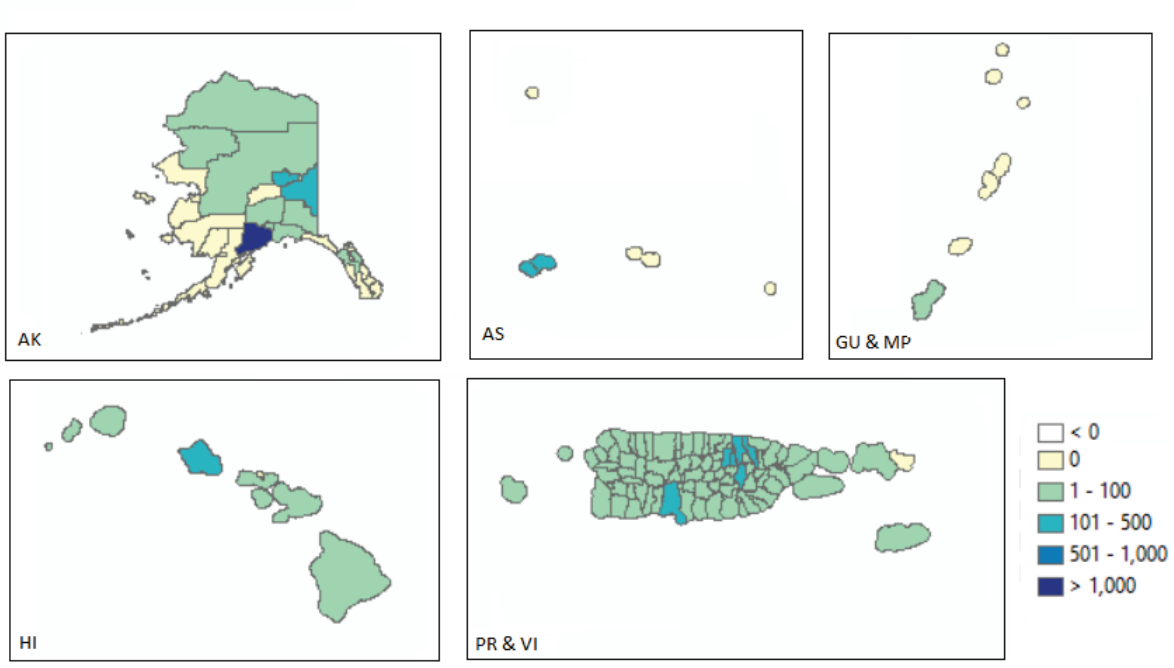


Figure 33: Change in number of active CBSDs by County for OCONUS from 4/1/2021 to 7/1/2024.

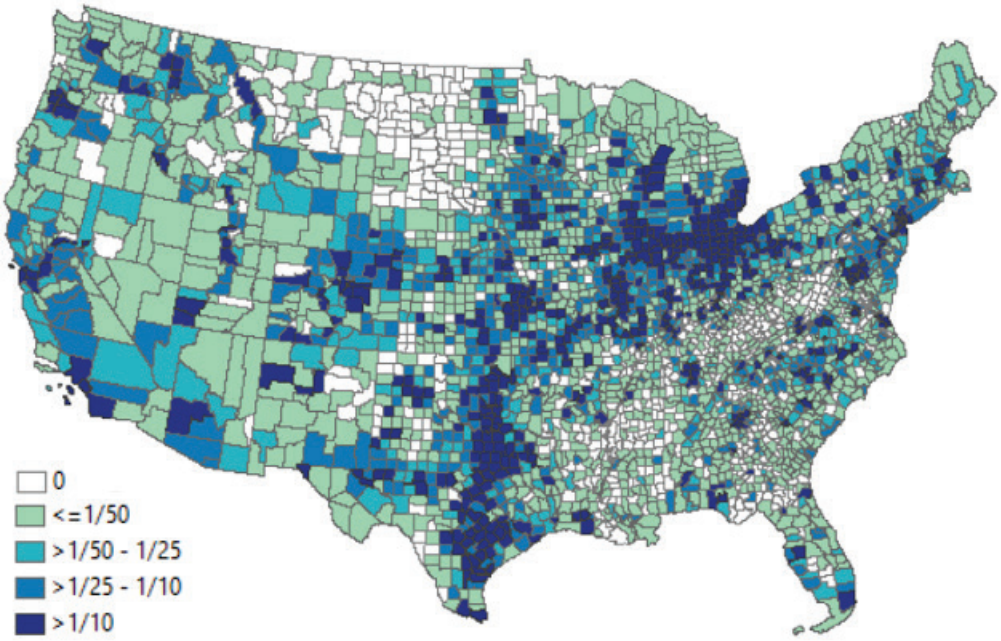


Figure 34: Number of active CBSDs per square kilometer for CONUS on 7/1/2024

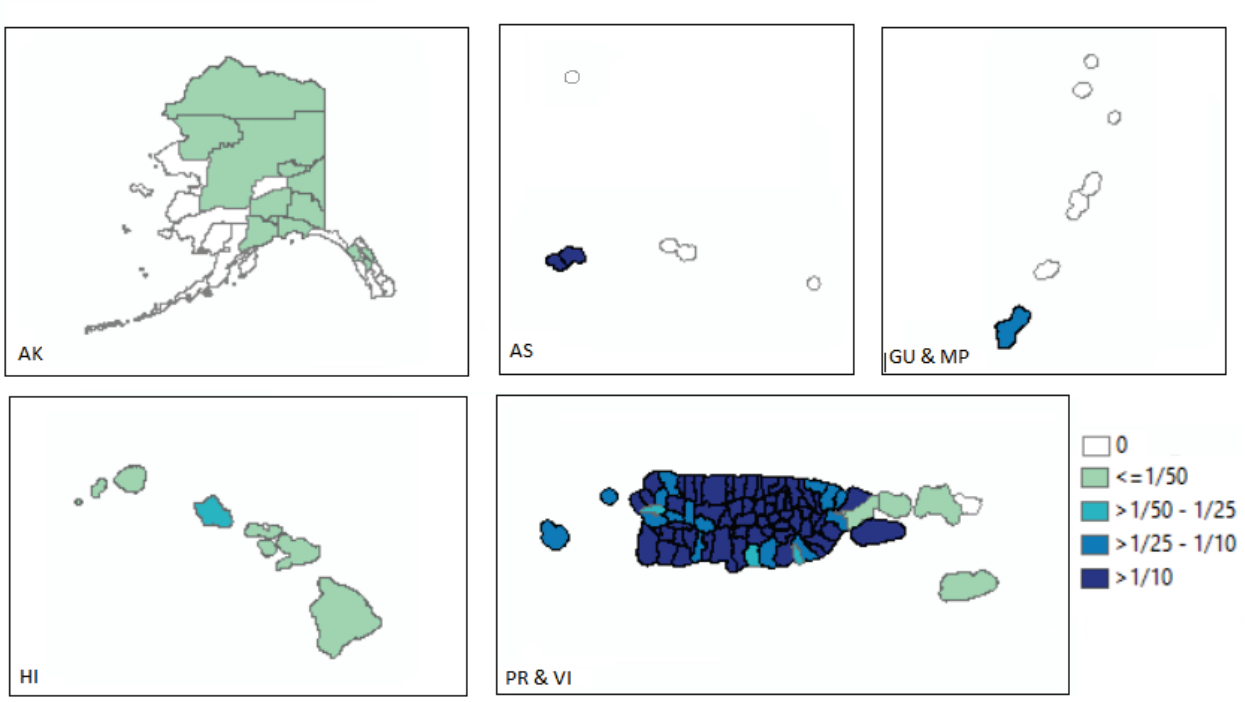


Figure 35: Number of active CBSDs per square kilometer for OCONUS on 7/1/2024

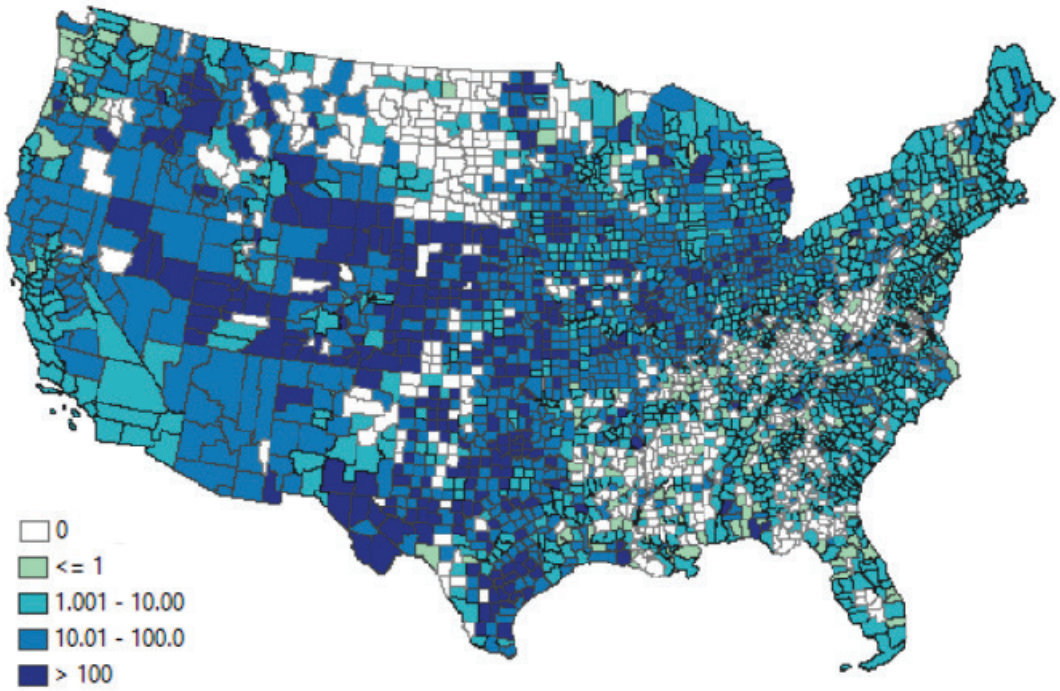


Figure 36: Number of active CBSDs per 10,000 people by county for CONUS on 7/1/2024.

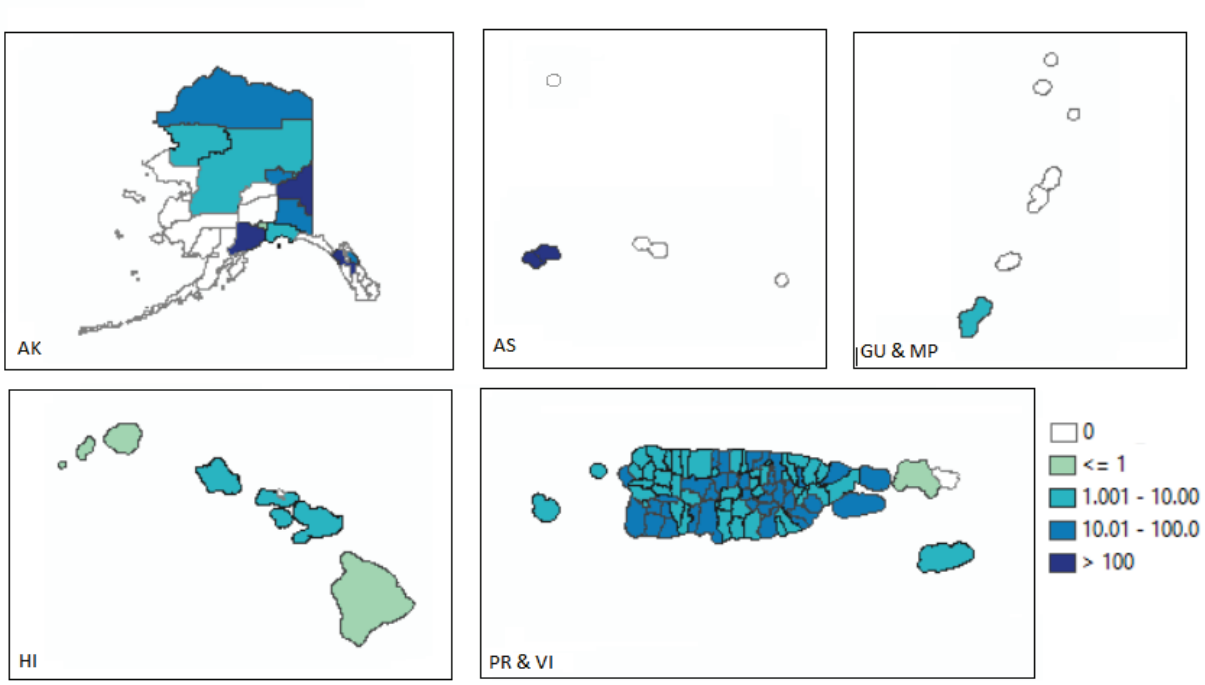


Figure 37: Number of active CBSDs per 10,000 people by county for OCONUS on 7/1/2024.

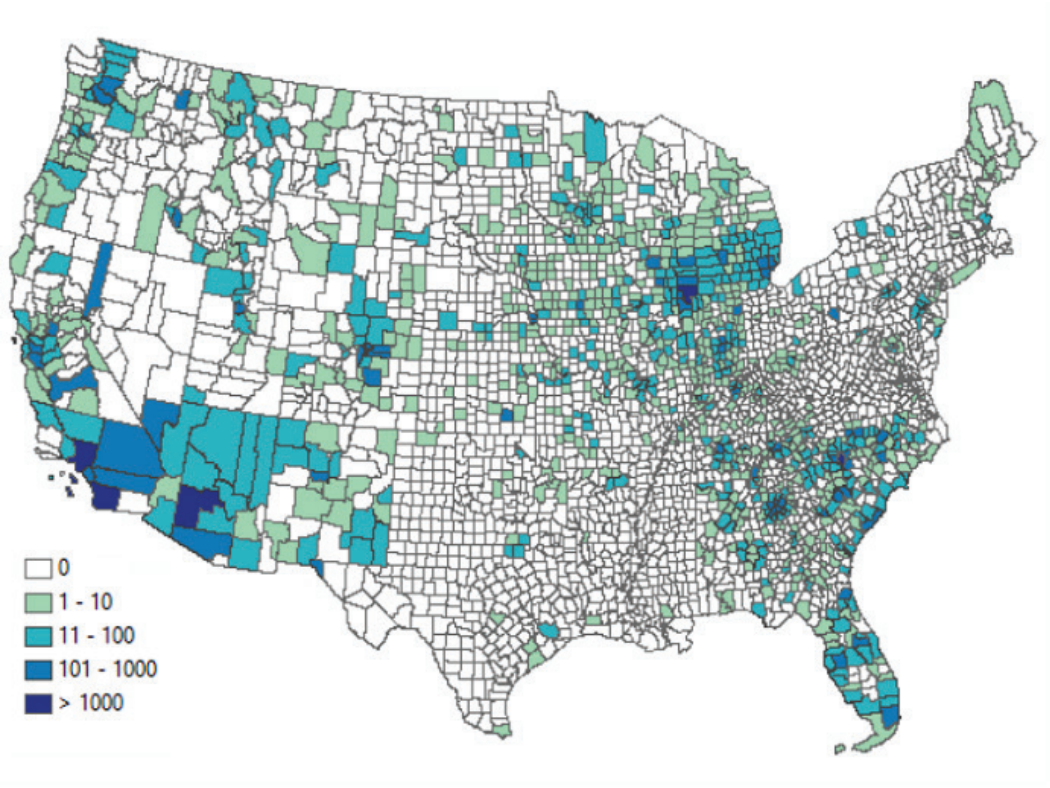


Figure 38: Number of active NR CBSDs by county for CONUS on 7/1/2024.

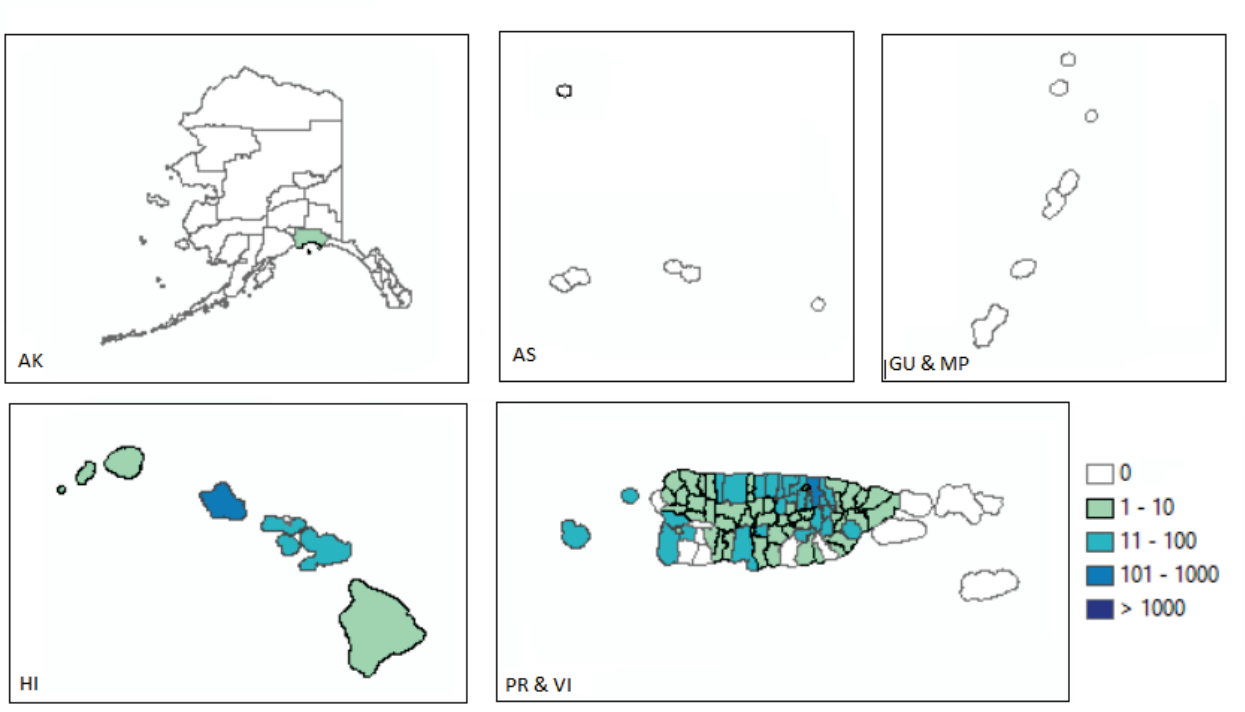


Figure 39: Number of active NR CBSDs by county for OCONUS on 7/1/2024.

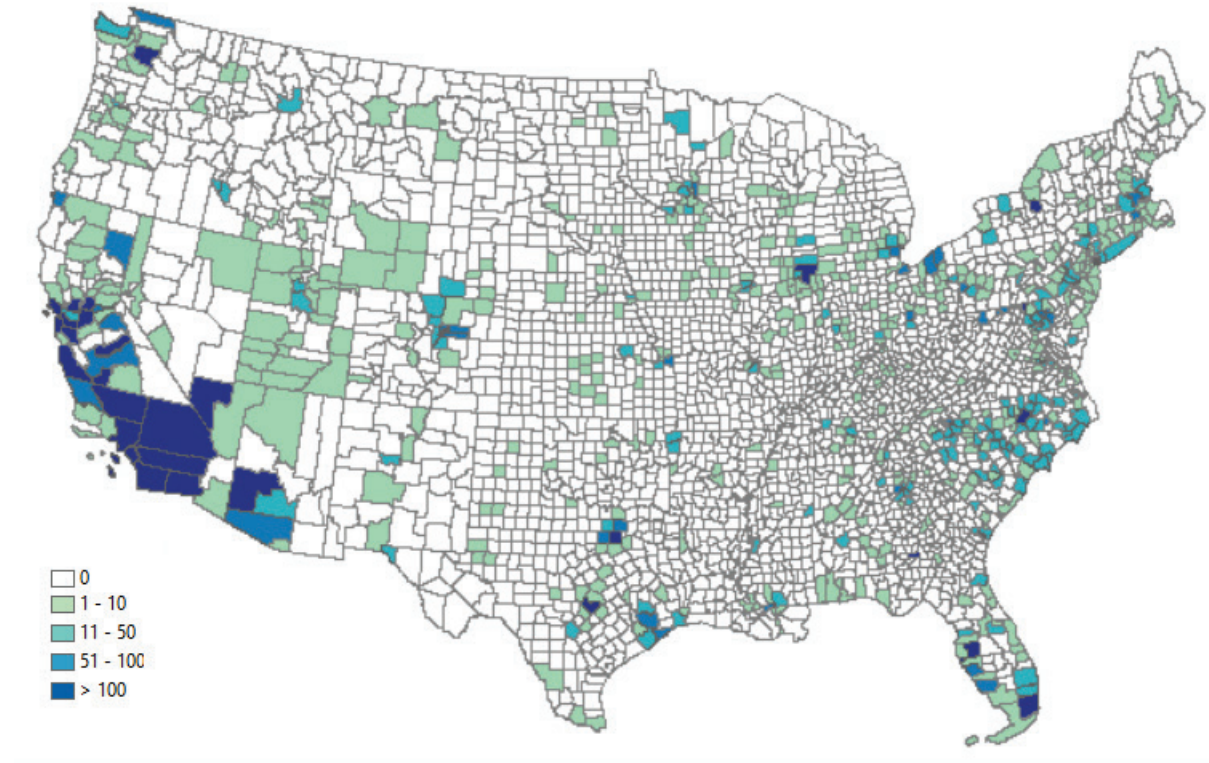


Figure 40: Number of active indoor CBSDs by county for CONUS on 7/1/2024.

Figure 41: Number of active indoor CBSDs by county for OCONUS on 7/1/2024.

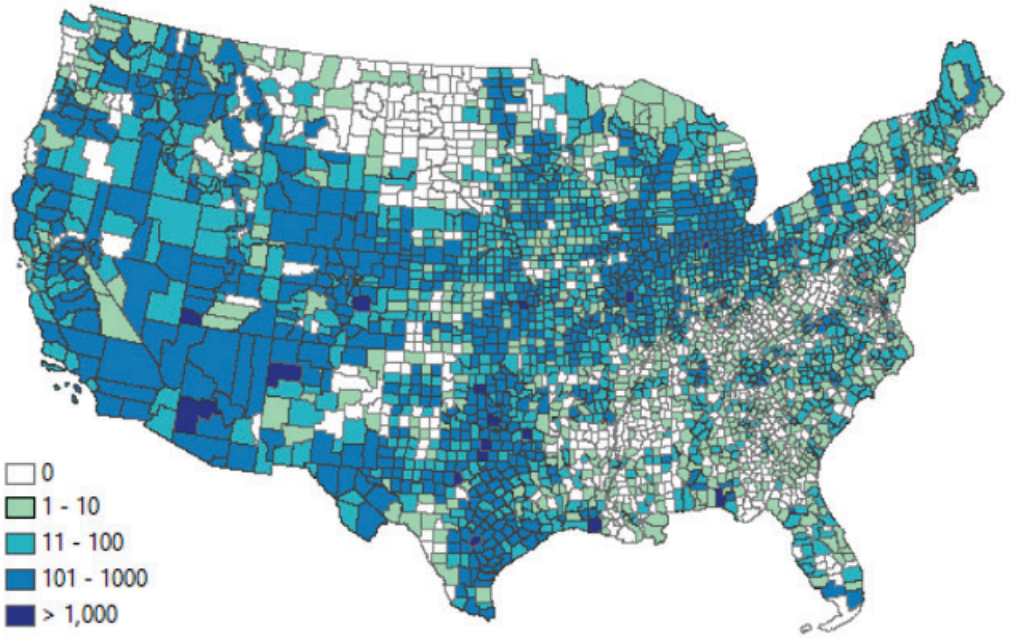


Figure 42: Number of active rural CBSDs by county for CONUS on 7/1/2024.

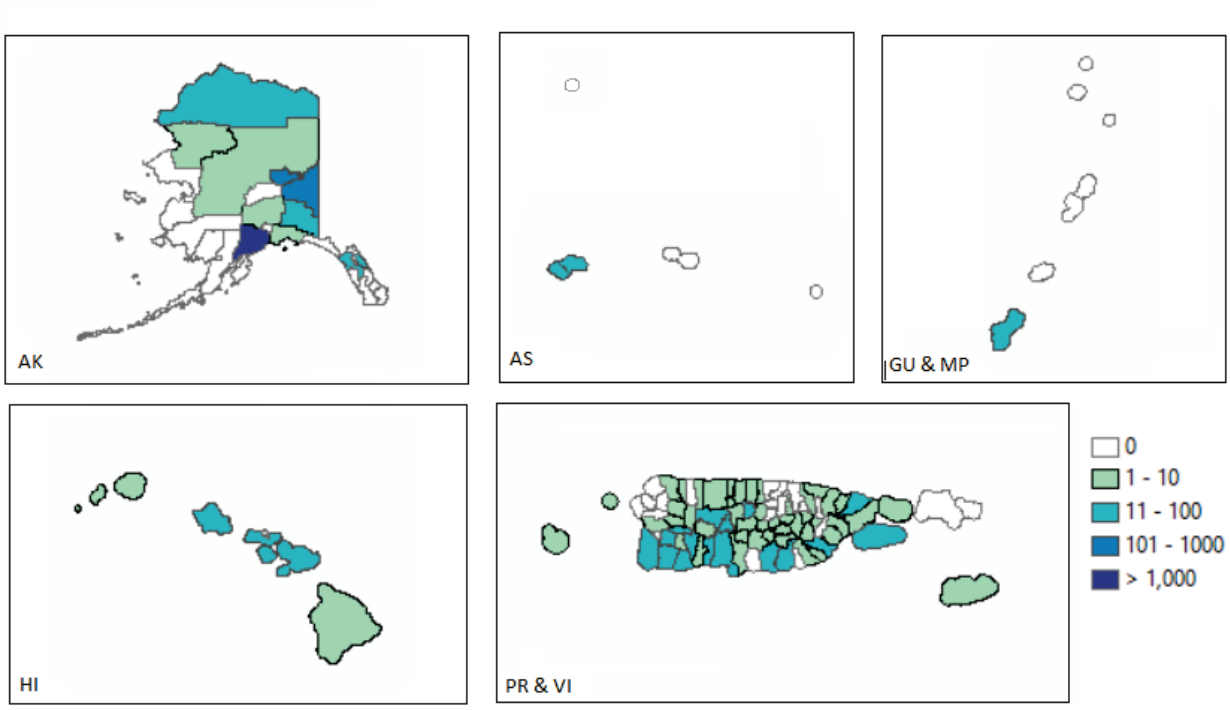


Figure 43: Number of active rural CBSDs by county for OCONUS on 7/1/2024.

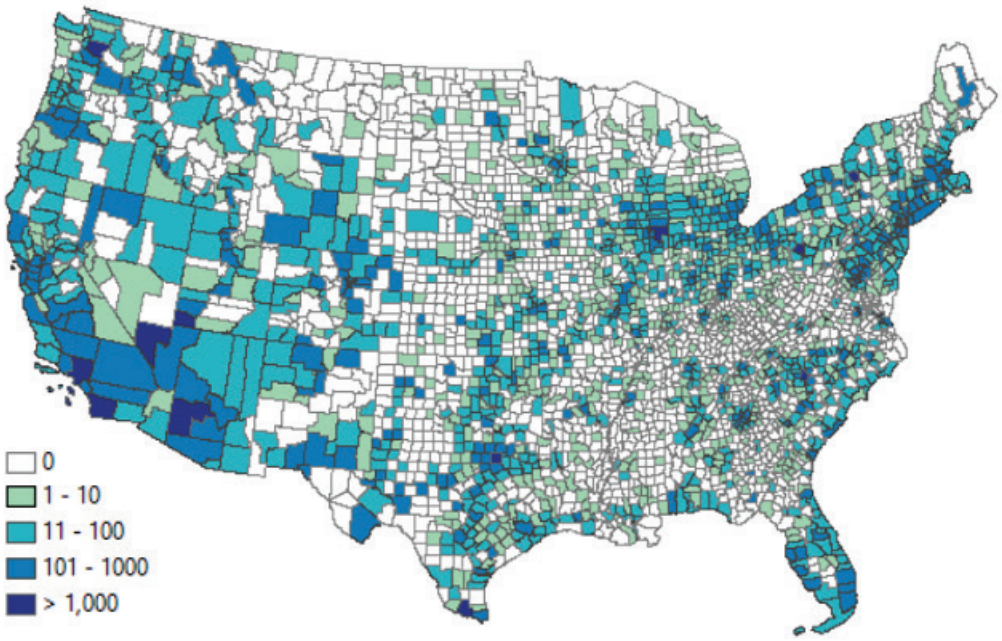


Figure 44: Number of active urban CBSDs by county for CONUS on 7/1/2024.

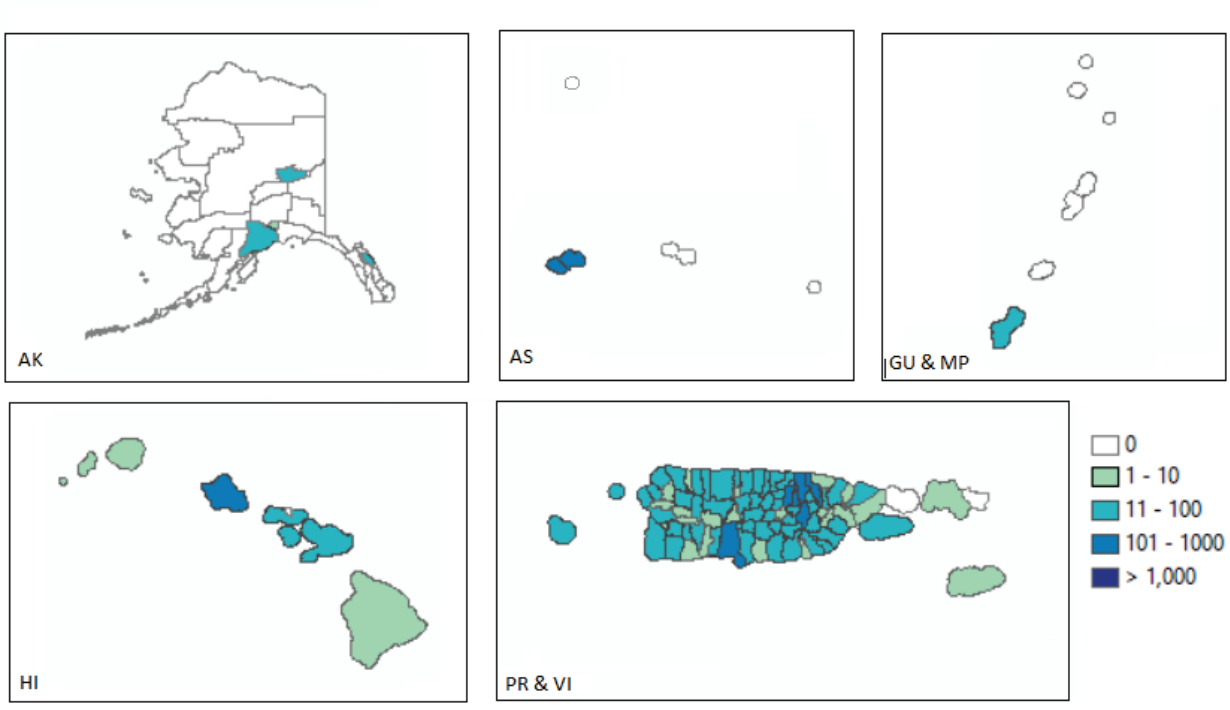


Figure 45: Number of active urban CBSDs by county for OCONUS on 7/1/2024.

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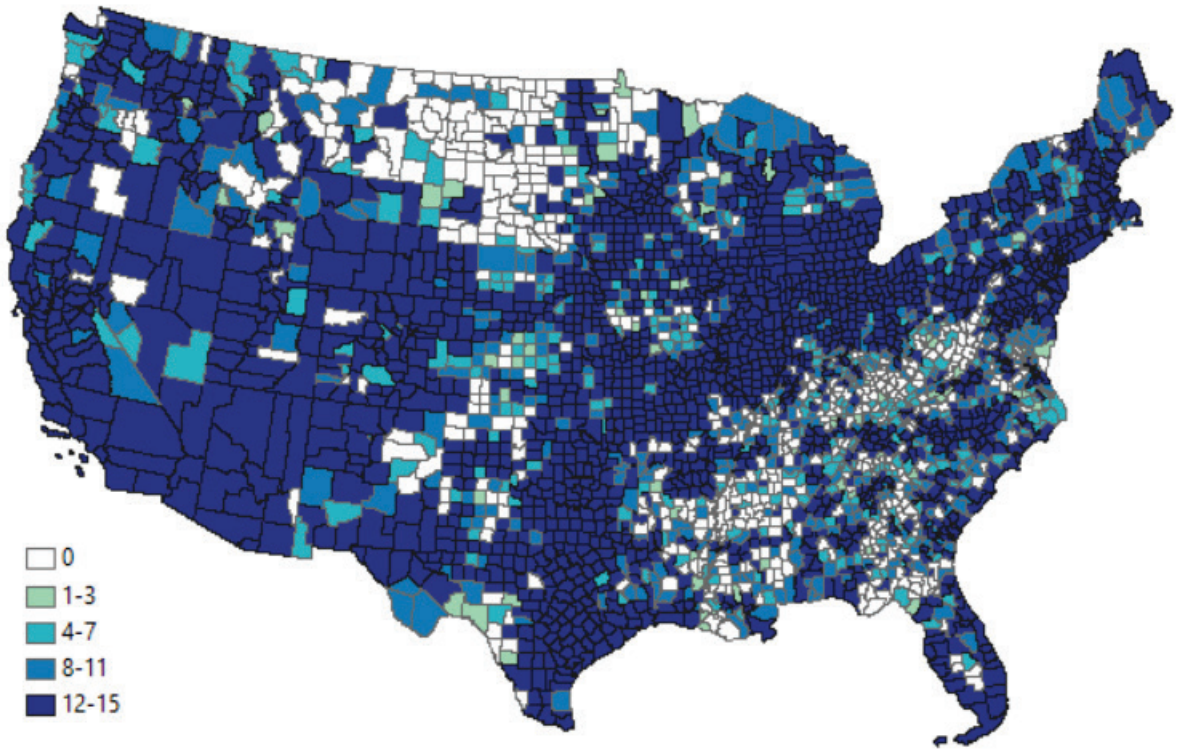

Figure 46: Number of channels granted within each county for CONUS on 7/1/2024.

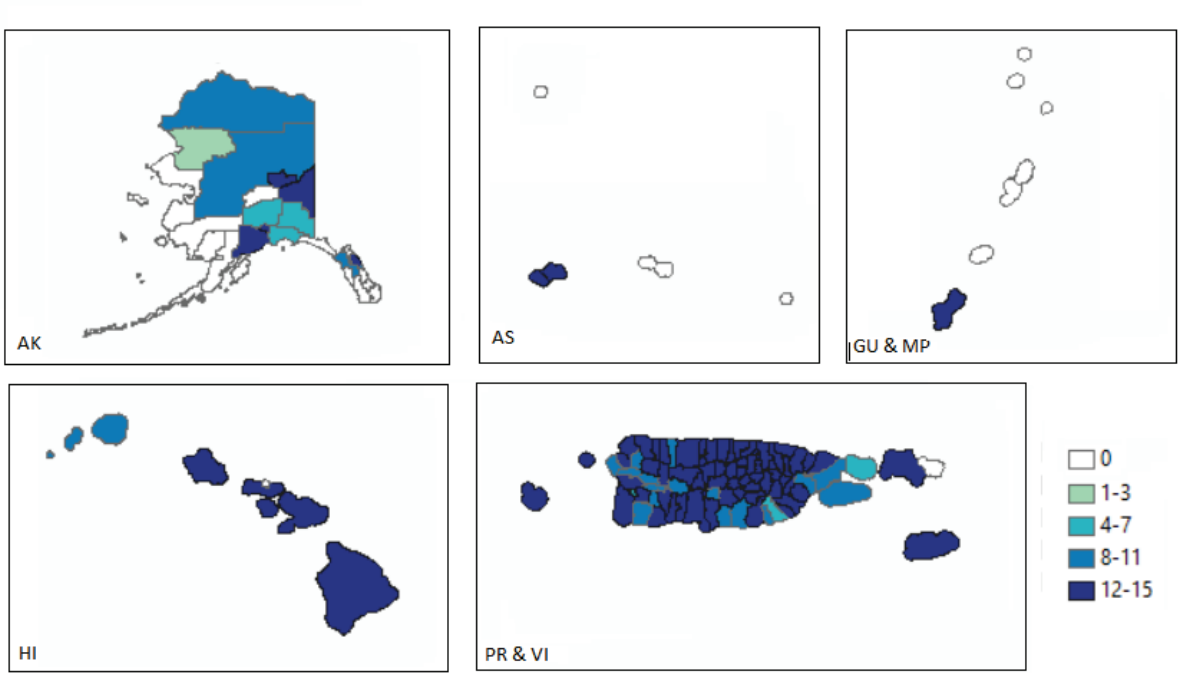

Figure 47: Number of channels granted within each county for OCONUS on 7/1/2024.

5.3 Band Utilization

In this report, band utilization is defined as the number of actively granted 10 MHz channels in each county. Band utilization represents the maximum usage because grants reflect what the CBSDs are authorized to use. The county basis for this analysis was chosen to match the county basis on which PALs were auctioned. In calculating band utilization, a 10 MHz channel is considered actively granted even if its entire bandwidth is not used, e.g., in the case of 5 MHz grants. This is the result of anonymization of the FAD data as described in Section 2. County level maps of the band utilization on July 1, 2024, are provided in Figures 46 and 47.

For each possible value from 1 to 15 channels granted, Figure 48 provides the percent of counties that had at least that many channels actively granted in each quarterly dataset. In each subsequent quarter, more counties used CBRS and counties using CBRS tended to increase the number of channels they used. On April 1, 2021, 56.4% of counties had at least one channel granted while 10% had all 15 channels granted. On July 1, 2024, 82.7% of all counties used at least 1 channel and 41% used all 15 channels.

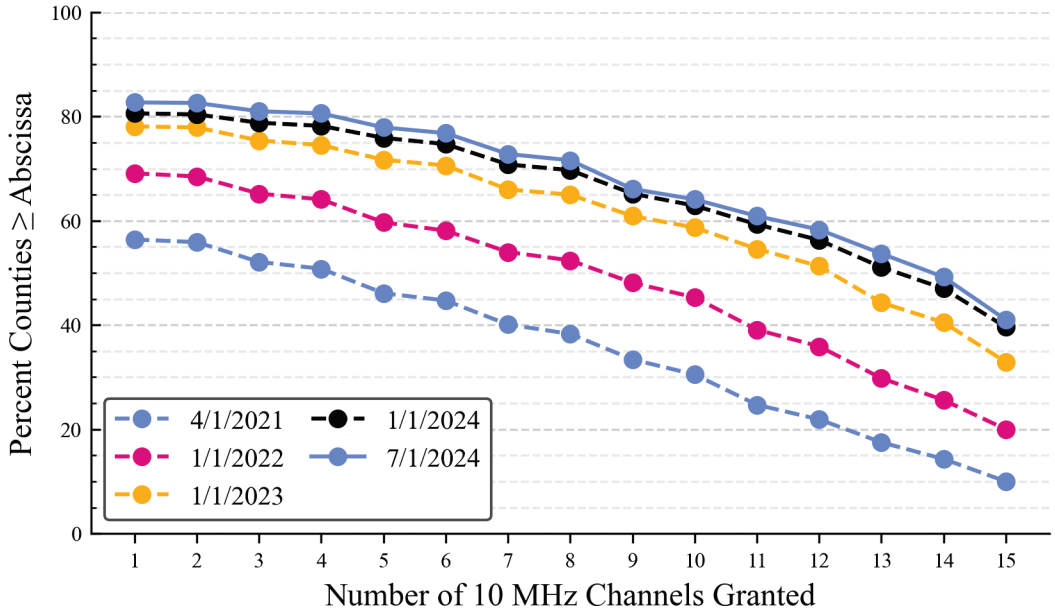

Figure 48: Band utilization from 4/1/2021 to 7/1/2024.

Figure 49 shows the same metrics but excludes all counties in each dataset which have zero active CBSDs. Therefore, in Figure 49, each series indicates that 100% of counties have at least one channel granted. This view of the data also shows that higher utilization has become more common over the analysis period. On April 1, 2021, only 17.7% of counties with at least one active CBSD had all 15 channels granted. This number increased to 49.6% on July 1, 2024.

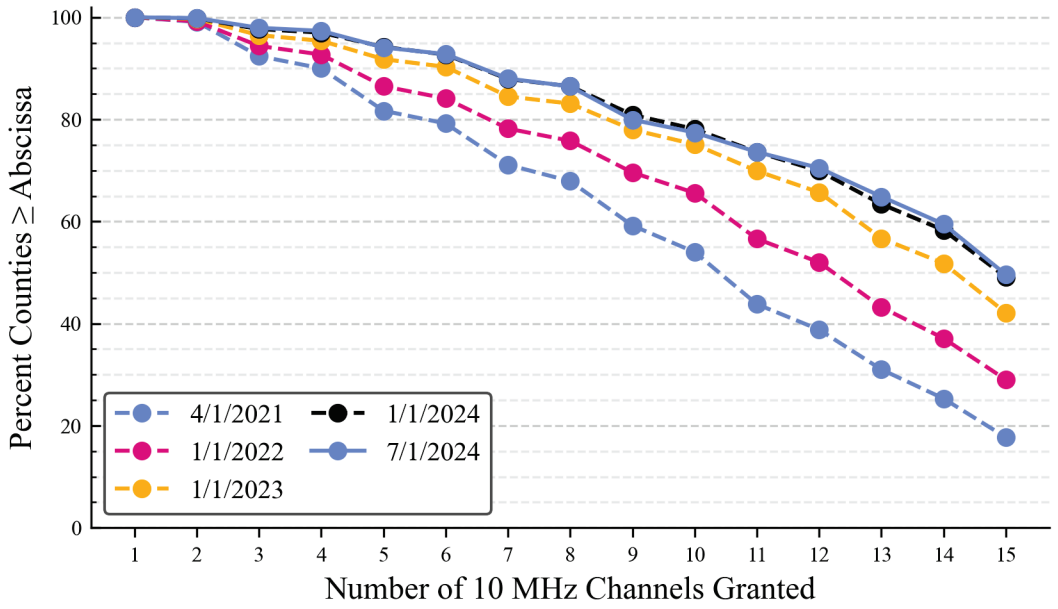

Figure 49: Band utilization for counties with at least one active CBSD from 4/1/2021 to 7/1/2024.

Mean band utilization, i.e., the mean number of 10 MHz channels granted per county, provides a summary of the band utilization within a set of counties. Figure 50 illustrates the mean band utilization for all counties and for only counties with at least one active CBSD. As shown, the mean number of 10 MHz channels granted rose from 5.4 to 10.2 across all counties. The mean number of channels granted in counties with at least one active CBSD rose from 9.5 on April 1, 2021, to 12.3 on July 1, 2024. After steadily increasing from April 1, 2021, to July 1, 2023, growth in the mean number of channels granted has slowed. In the most recent year of data, from July 1, 2023, to July 1, 2024, the mean across all counties increased from 9.7 to 10.2. In counties with at least one active CBSD, the mean increased from 12.1 to 12.3.

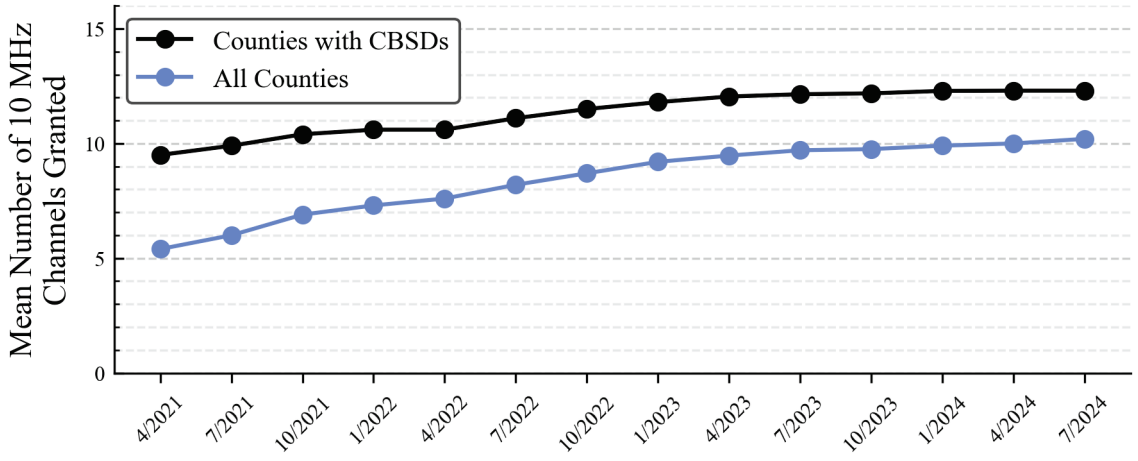

Figure 50: Mean band utilization in each quarterly dataset from 4/1/2021 to 7/1/2024.

5.4 Dynamic Protection Area Neighborhoods

DPAs allow new entrants to share spectrum with incumbents. This subsection investigates the impact of DPAs by examining the increase in the number of active CBSDs and the increase in band utilization for DPA-impacted versus non-impacted counties, where a county is considered DPA-impacted if it intersects with any DPA neighborhood specified by [11] and [12].[3] All other counties are considered non-impacted. For additional information regarding CBRS incumbent protections and encumbrances see [13].[4]

Table 9 provides nationwide counts of active CBSDs in DPA-impacted and non-impacted counties, and Figure 51(a) illustrates these numbers. Both county types experienced significant and steady increases in CBSD deployments. Over the analysis period, the number of CBSDs in non-impacted counties increased by 124,037 (160.1%) compared to an increase of 146,573 (280.3%) in DPA-impacted counties. Figure 51(b) illustrates these CBSD counts as percentages of the total number of active CBSDs on each date. CBSDs in DPA-impacted counties increased as a percentage of the total, from 40.3% on April 1, 2021, to 49.7% on July 1, 2024. On that date there were 198,864 CBSDs in DPA-impacted counties with a total population of 232,348,897 residents. Had DPA neighborhoods been designated as exclusion zones, those CBSDs could not have been deployed.

Table 9: Nationwide counts of active CBSDs in DPA-impacted and non-impacted counties.

County Type	4/1/2021	1/1/2022	1/1/2023	4/1/2023	7/1/2023	10/1/2023	1/1/2024	4/1/2024	7/1/2024
DPA-impacted	52,291	80,438	128,351	137,460	151,223	164,195	174,934	185,759	198,864
Non-impacted	77,473	110,867	158,646	164,583	176,256	183,623	190,128	195,642	201,510
Unknown	18	36	36	35	34	30	29	28	29

[3] The neighborhoods defined by ground-based DPAs (GB-DPAs) are entirely encompassed by those defined by the portal and environmental sensing capability (ESC)-controlled DPAs specified by [11] and [12].
[4] In 2024, substantial changes to DPA neighborhoods were proposed and approved. As of July 1, 2024, these changes had not yet been implemented. Therefore, the previous DPA neighborhoods were used in all calculations.

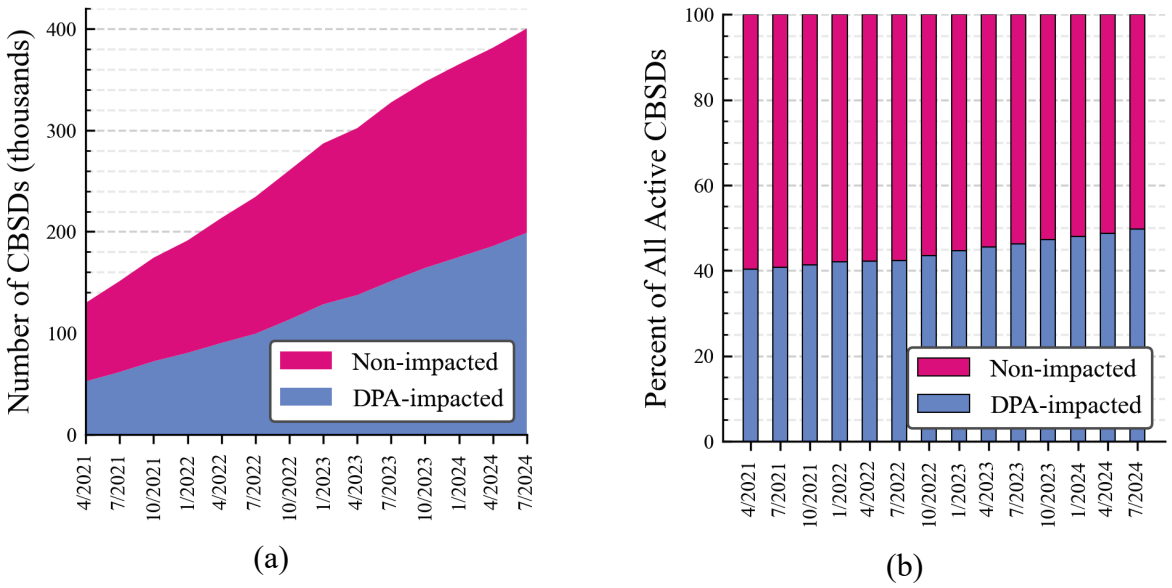

Figure 51: Nationwide number (a) and percentage (b) of CBSDs in DPA-impacted and non-impacted counties from 4/1/2021 to 7/1/2024.

Figure 52 provides the percent of DPA-impacted and non-impacted counties in which the number of CBSDs is equal to or greater than the value on the x-axis (abscissa) on April 1, 2021, and July 1, 2024. During the early stages of CBRS deployment, there was a greater likelihood that non-impacted counties were using CBRS, compared to DPA-impacted counties. On April 1, 2021, 62.5% of non-impacted counties contained at least one active CBSD, compared to 49.8% of DPA-impacted counties. Over the analysis period, this gap narrowed. On July 1, 2024, 82.5% of non-impacted counties had at least one active CBSD, compared to 83.1% of DPA-impacted counties. While non-impacted counties tended to have more active CBSDs than DPA-impacted counties, growth occurred in both categories, and the county with the most CBSDs is within a DPA neighborhood.

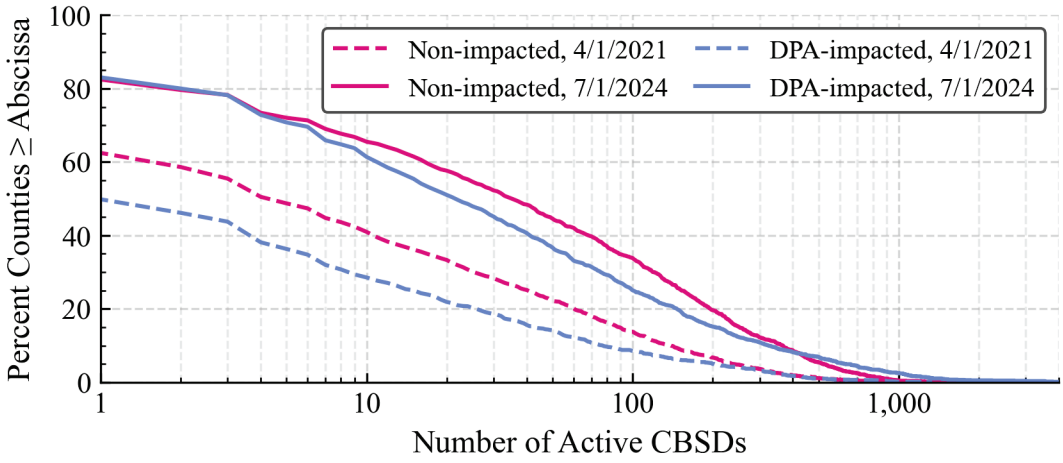

Figure 52: Percent of DPA-impacted and non-impacted counties in which the number of CBSDs is equal to or greater than the value on the x-axis on 4/1/2021 and 7/1/2024.

Figure 53 illustrates the mean number of active CBSDs per county for DPA-impacted counties and non-impacted counties. As shown, there is a small difference in the mean number of active CBSDs per county between these two categories. In each quarterly dataset before January 1, 2024, non-impacted counties had a slightly higher mean number of active CBSDs. However, on January 1, 2024, the mean number of CBSDs per county was the same for DPA-impacted counties and non-impacted counties, and since then DPA-impacted counties have had a higher mean number of CBSDs per county.

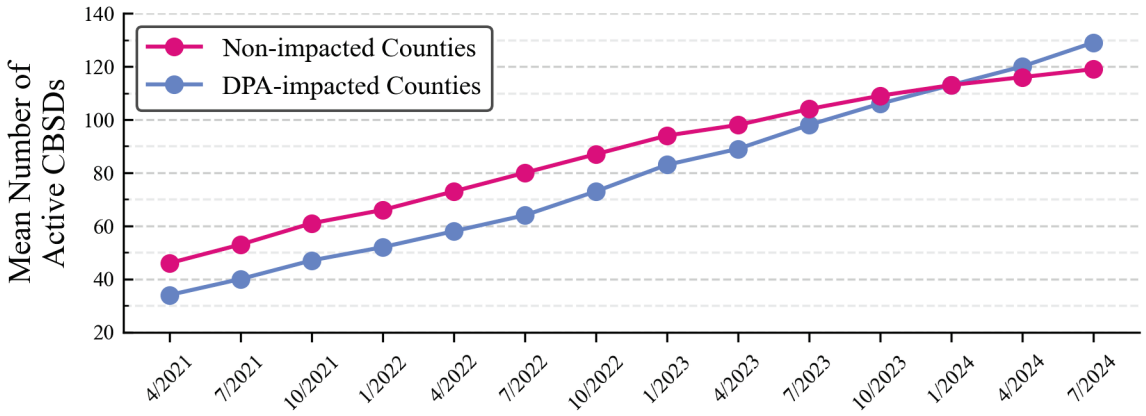

Figure 53: Mean CBSDs per county for DPA-impacted and non-impacted counties from 4/1/2021 to 7/1/2024.

Figure 54 illustrates mean band utilization for CBSDs in DPA-impacted and non-impacted counties. Non-impacted counties are shown to have slightly more 10 MHz channels granted on average in every quarterly dataset. The mean number of channels granted increased for both categories every quarter and the slight difference between the two decreased over time. On April 1, 2021, on average, non-impacted counties had 1.2 more channels granted in a county. The most recent dataset indicates the smallest difference observed over the analysis period, with non-impacted counties having only 0.12 more 10 MHz channels granted, on average.

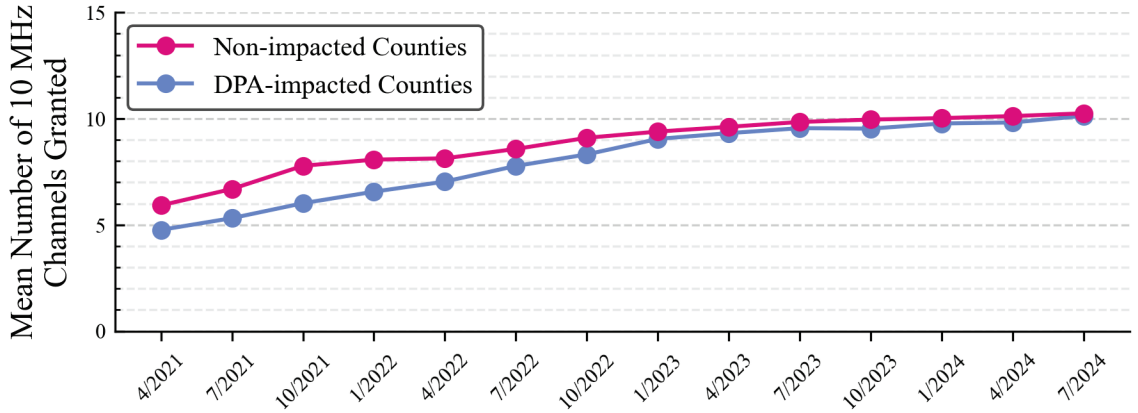

Figure 54: Mean band utilization in DPA-impacted and non-impacted counties from 4/1/2021 to 7/1/2024.

6. SUMMARY

This report presents and analyzes aggregated and anonymized quarterly SAS FAD data from April 1, 2021, to July 1, 2024. The goal was to gain insight into the current state and growth of CBRS. Since its start, CBRS deployments increased at a steady rate. Over the analysis period, the total number of CBSDs with active grants increased by 270,621 CBSDs (208.5%) to 400,403. On July 1, 2024, 82.7% of all counties nationwide had at least one active CBSD, up from 56.4% on April 1, 2021. Both types of CBSDs, Category A and Category B, increased in number over the analysis period. In all quarterly datasets, Cat B CBSDs account for more than 95% of all active CBSDs. From April 1, 2021, to July 1, 2024, the number of active Cat B CBSDs increased by 253,692 (197.2%). Over the same period, Cat A CBSDs increased by 16,929 (1519.7%). Due to this greater relative growth the percentage of all active CBSDs which are Cat A has grown over time, from 0.9% on April 1, 2021, to 4.5% on July 1, 2024.

The percentage of CBSDs using an air interface other than E_UTRA or NR declined from 62.9% to 52.8% over the analysis period. E_UTRA declined from 37.1% of all active CBSDs on April 1, 2021, to 35.4% on July 1, 2024, and NR CBSDs increased from 0.0% to 11.9% over the same period. In addition to growth in the number of active CBSDs, CBRS also demonstrates growth in band utilization at the county level. Across all counties, the mean band utilization increased over the analysis period from 5.4 to 10.2 10 MHz channels granted. On July 1, 2024, 82.7% of all counties used at least 1 channel and 41% used all 15 channels.

A comparison of CBSD counts and channel grants between DPA-impacted and non-impacted counties revealed only small differences between the two groups. Both groups experienced steady growth in the mean number of CBSDs per county. Prior to January 1, 2024, non-impacted counties tended to have a slightly higher number of active CBSDs. However, this has reversed, as shown in the latest datasets from April and July 2024. On April 1, 2021, non-impacted counties had 1.2 more channels granted, on average, than DPA-impacted counties. On July 1, 2024, this difference was reduced to 0.12 more channels granted, on average. On July 1, 2024, there were 198,864 active CBSDs in DPA-impacted counties with a total population of 232,348,897 residents.

Notably, Priority Access spectrum usage increased steadily. In 2022, CBSDs with PAL grants increased by 27,185 and 2023 had a greater increase of 38,812. Continued growth in the first two quarters of 2024 brought the total number of CBSDs with a PAL to 114,682 (28.6% of the total) on July 1, 2024. However, GAA grants represented more than 82% of all active grants each quarter and 57.6% of the increase in CBSDs is due to GAA-only CBSDs. On July 1, 2024, 71.4% of CBSDs were GAA only, 94.9% of all CBSDs had GAA grants, and 82.2% of all active CBSDs using PAL grants were also granted at least one GAA grant.

Numbers of CBSDs in both urban and rural areas experienced steady increases. Over the analysis period, rural CBSDs more than doubled with an increase of 166,650 CBSDs (160.6%) over the 103,768 observed on April 1, 2021. On July 1, 2024, the 270,418 rural CBSDs represented 67.5% of all active CBSDs. While the majority of active CBSDs are deployed in rural areas, urban CBSDs also increased significantly. An increase of 103,960 urban CBSDs (399.9%) brought the total number of urban CBSDs to 129,956 (32.5% of the total) on July 1, 2024.

7. ACKNOWLEDGEMENTS

The authors and NTIA would like to thank the SAS Administrators and the FCC for their cooperation and assistance facilitating the analysis provided in this report. Without their support, this report would not have been possible.

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14. SUPPLEMENTARY NOTES

15. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

This report presents an analysis of aggregate Citizens Broadband Radio Service (CBRS) Spectrum Access System (SAS) data reported quarterly from April 1, 2021, to July 1, 2024. The data provide valuable insights into the growth of CBRS, the impact of dynamic spectrum sharing, the role of General Authorized Access (GAA) spectrum usage, and CBRS's role in rural wireless connectivity. From April 1, 2021, to July 1, 2024, the total number of active CBSDs nationwide increased by 270,621 (208.5%). Over this same period, more CBSDs were deployed within Dynamic Protection Area (DPA)–impacted counties than non-impacted counties increasing the total number of active CBSDs in DPA-impacted counties to 198,864 (49.7%). The number of CBSDs with Priority Access License (PAL) grants grew to 114,682, but GAA CBSDs dominated deployments. On July 1, 2024, 71.4% of active CBSDs were GAA-only, 82.25% of the active grants were GAA, and 82.2% of the 114,682 CBSDs with a PAL also had at least one active GAA grant. Finally, on July 1, 2024, 67.5% of all active CBSDs were deployed in rural census blocks.

16. Key Words (Alphabetical order, separated by semicolons)
3550–3700 MHz; 5G; cellular; Citizens Broadband Radio Service (CBRS); Citizens Broadband Radio Service Device (CBSD); rural connectivity; Spectrum Access System (SAS); spectrum management; spectrum sharing; spectrum utilization; urban connectivity

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