



# U.S. Department of the Interior Unmanned Aircraft Systems (UAS) Program 2018 Use Report



**Table of Contents**

Background..... 4

    2018 Program Highlights ..... 4

    Report Structure and Content..... 7

Reporting DOI UAS Adoption, Application and Integration ..... 8

    Measuring DOI UAS Program Success ..... 9

2018 Statistical Overview and Discussion..... 11

    Geographic Analysis ..... 12

        By State..... 12

        Geographic Area Coordination Centers (GACC)..... 16

        Unified Regional Boundaries ..... 18

A Break-Down of FY 2018 DOI UAS Missions ..... 20

    Interior DOI Missions by Bureau ..... 22

    Fire and Incident Response..... 22

Pilot and Aircraft Utilization..... 25

Remote Pilot Training..... 26

    Aircraft Utilization ..... 27

    DOI Remote Pilot Utilization ..... 29

DOI UAS Data Management and Risk Mitigation Strategy ..... 30

    Elements of DOI’s UAS Data Management and Risk Mitigation Strategy ..... 30

2019 Outlook ..... 33

Appendix A: Detailed Geographic Analysis Maps..... 35

## Table of Figures

Figure 1. Annual growth of DOI UAS flights, 2010 – 2018. ....	4
Figure 2. The “Four Outcome S’s” of DOI’s “Drones for Good” UAS Program. ....	10
Figure 3. Number of DOI flights in fiscal year 2018 by state with project type. ....	13
Figure 4. Interior flights by project type and Geographic Area Coordination Center (GACC). ..	16
Figure 5. The Great Basin Geographic Area Coordination Center (GACC) with fiscal year 2018 Interior missions (color coded by mission type (inner dot) and bureau (outer ring)) and Call When Needed (CWN) fire incident locations. ....	18
Figure 6. Interior flights by project type and Unified Regional Boundary (URB). ....	19
Figure 7. Percent of UAS flights by incident / project type for DOI in fiscal year 2018. ....	20
Figure 8. Flight count for UAS activities by Interior bureau / office for fiscal year 2018. ....	22
Figure 9. Count of UAS flights by incident / project type and bureau for DOI in fiscal year 2018. .....	23
Figure 10. UAS Cost vs. Other Methods Across 543 DOI Projects in 2018. ....	25
Figure 11. Percent distribution of FY2018 flights by Aircraft Type. ....	27
Figure 12. There were a total of 531 Interior fleet aircraft at the end of fiscal year 2018 (end of calendar year additions in parentheses). ....	28
Figure 13. Elements of Interior’s UAS Data Management and Risk Mitigation Strategy. ....	32
Figure 14. <i>Metrics that matter</i> for DOI’s UAS program. ....	34

## Table of Tables

Table 1. The 2018 DOI UAS report examines program activity across several variables listed here. ....	8
Table 2. Overall DOI small UAS flight statistics for fiscal years 2017 and 2018. ....	11
Table 3. Call When Needed (CWN) contractor flights for fiscal year 2018. ....	11
Table 4a. Total and percent flights by Bureau and State, fiscal year 2018. ....	14
Table 4b. Total and percent flights by Bureau and State comparison between fiscal years 2017 and 2018. ....	15
Table 5a. Total flights and percent FY 17 and FY18 by Bureau and Geographic Area Coordination Center. ....	17
Table 5b. Flight count change between fiscal years 2017 and 2018 by Geographic Area Coordination Center (GACC). ....	17
Table 6. Total flights and percent FY18 by Bureau and Unified Regional Boundary. ....	19
Table 7. Fiscal year 2018 flights by Use Code. ....	21
Table 8. DOI UAS training courses held in fiscal year 2018. ....	26
Table 9. Department of Interior remote pilots by Bureau. ....	29

## Background

[The U.S. Department of the Interior \(DOI\)](#) is the largest land steward in the United States, responsible for management of [500M acres](#) (~1 in 5) across the U.S and its territories and [1.7B acres on the Outer Continental Shelf](#). DOI manages resources that supply [30 percent of the Nation’s energy supplies, manages water in 17 Western States and supplies 15 percent of the Nation’s hydropower energy](#). The “*people’s land*,” which DOI manages on behalf of the American Taxpayer annually hosts more than [450M visits annually](#).

In carrying out its extensive responsibilities on behalf of the American Public, DOI utilizes a wide variety of [aircraft](#), including [unmanned aircraft systems](#) (UAS, aka drones). DOI missions, often conducted in remote areas, severe terrain, and weather conditions can be hazardous to personnel. These missions often require persistent presence and responsive deployment to address emergent events (e.g. wildfires, earthquakes, volcanos, floods, animal migrations, search and rescues, etc.). Mission goals include conducting them with no/minimal disturbance to native species and visitors to the lands that DOI stewards, while making the best use of appropriated funds to fulfill its chartered obligations for managing the “*people’s land*.” [Since the initiation of DOI’s current UAS program in 2006, the Department has realized significant benefits from the safe and responsible integration of drone technology.](#)

**2018 Program Highlights** - In 2018, the DOI UAS program continued its tradition of innovation, collaboration, and leadership in the drone space. Adoption and integration of UAS in missions by DOI’s nine bureaus continued to grow with **10,342** UAS flights conducted across more than 25 mission applications in 42 States and U.S. Territories in 2018; a **108% increase** in DOI UAS flights over 2017’s record setting year.

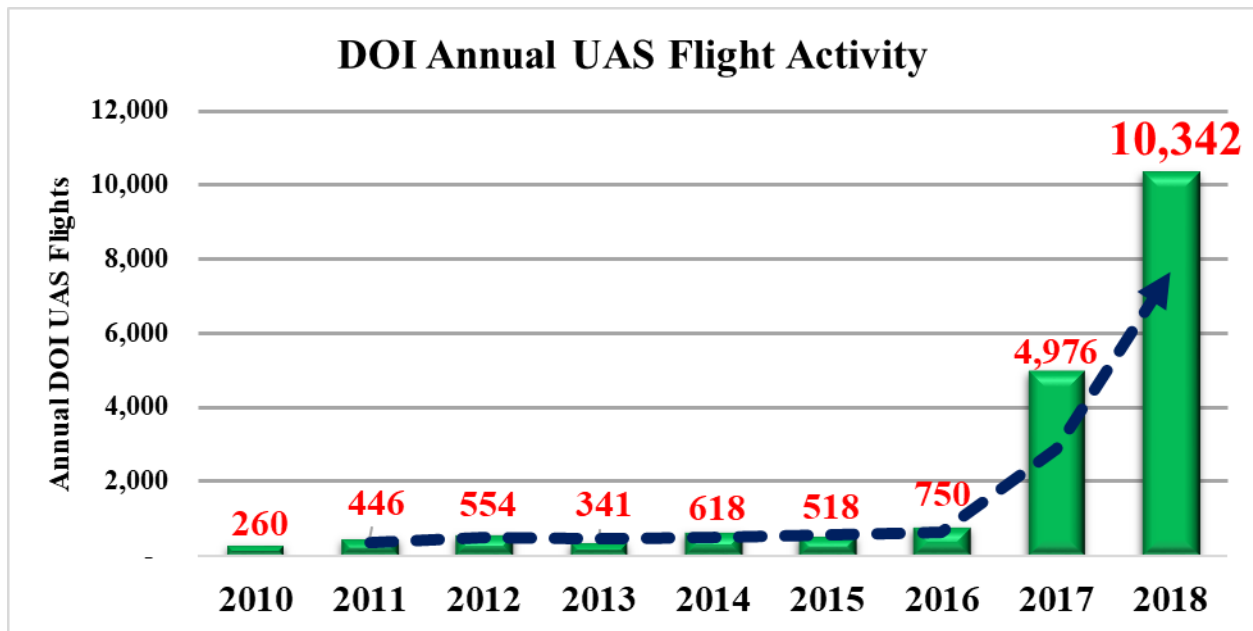


Figure 1. Annual growth of DOI UAS flights, 2010 – 2018.

The number of Interior owned UAS and Interior and FAA trained and certified operators also grew to meet the increasing bureau demand for UAS in 2018 with **531 drones** and **359 operators** distributed across 42 states and territories to include seven of Interior's nine bureaus.

[Notable 2018 accomplishments and reports](#), also highlighted in [35 news articles published in 2018](#) included:

1. [First-Ever Comprehensive DOI Drone Mission Report Released](#) – In keeping with Interior's commitment to public transparency in its drone program and commitment to safeguarding [privacy](#), civil rights, and civil liberties, as directed in the [2015 Presidential Memorandum: Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems](#), DOI was the first federal agency to publish a comprehensive report of its drone utilization in 2017.
2. [Interior Expands Capabilities with Vertical Take Off and Landing Fixed Wing Small UAS](#) – Interior continued work to meet DOI bureau defined UAS requirements with the addition of a vertical takeoff and landing fixed wing drone. Capable of carrying a variety of modular sensors and with extended range and endurance, these aircraft provided Interior land managers, emergency managers, firefighters, and scientists with expanded aviation capabilities that continue to reduce the risk and cost of carrying out critical missions.
3. [DOI Awards First Contract for Small UAS Services](#) – As part of a broader strategy to aggressively combat wildfires, the U.S. Department of the Interior awarded a Call When Needed contract to four U.S. companies for small-unmanned aircraft systems services. The contract, which was Interior's first of its kind, allowed the agency to obtain fully contractor-operated and maintained small drones, ready when needed to support wildland fire operations, search and rescue, emergency management and other resource missions. Details of UAS contract usage are included in the data contained later in this report.
4. [DOI UAS Team Selected as a Finalist for the Partnership for Public Service, Samuel J. Heyman Service to America Medal](#) – Without the benefit of any additional funding or staffing Interior's Office of Aviation Services (OAS) built the largest civilian drone program in the world to help Interior and other agencies fight wildfires, inspect infrastructure, monitor wildlife and natural resources, halt pollution, and conduct search and rescue operations. Selected from over 300 nominations from across government, OAS was the only Interior entry selected as a finalist.
5. [DOI UAS Teams Quickly Respond to Support Kilauea Volcano Emergency Response, Rescue, and Monitoring](#) –DOI teams of UAS operators from USGS and OAS rapidly deployed and provided extended support for the monitoring of the Kilauea Volcano eruptions in Hawaii. The UAS teams monitored volcanic activity using thermal video imagery and on-board gas sensors, able to provide never before acquired data. In addition, [the Interior UAS team assisted the local county and fire emergency managers in support of monitoring lava movement and on May 27<sup>th</sup> were instrumental in directing the rescue of a stranded resident from fast-moving lava that had rapidly inundated their neighborhood.](#)

6. [DOI Conducts Operational Testing and Fielding of Groundbreaking UAS Aerial Ignition Capability](#) – [Continuing development that began in 2016](#), Interior conducted operational testing and [initial fielding of the first-ever drone based aerial ignition capability, including the first-ever night aerial ignition](#). Aerial ignition is an important tool in the reduction of hazardous fuels ahead of the fire year and in conducting burnout operations during a wildfire. [Traditional aerial ignition methods are hazardous and have resulted in numerous fatalities](#). Drones promise safer ignition operations and expanded utilization opportunities.
7. [DOI Contracted UAS Locates Spot Fires, Directs Firefighters to Extinguish, Prevents Spread](#)  
A DOI contracted UAS demonstrated the capacity of drones to provide persistent situational awareness and using infrared sensor technology to detect otherwise hidden spot fires and then direct firefighters to their location before they have a chance to grow larger or start new undetected wildfires.
8. [DOI Gains Expanded Operating Authorities from FAA](#) – Building on a long history of collaboration on unmanned aircraft systems integration, the FAA updated and expanded DOI’s UAS operating authorities to include expanded provisions for Extended Visual Line of Sight (EVLOS) and Beyond Visual Line of Sight (BVLOS) operations. [These expanded authorities provided Interior with several orders of magnitude increases in single flight coverage area including opening 12.9 million acres in six national parks to BVLOS operations](#).
9. [DOI Office of Aviation Services \(OAS\) Development and Testing of Emergency Equipment Delivery](#) – In carrying out its responsibility to [“conduct DOI aircraft and equipment research and development efforts”](#) and leveraging resident para-cargo expertise, OAS developed and tested the release and safe delivery of emergency equipment (i.e. automated external defibrillator – AED).
10. [DOI Drone Incursion Prevention Program Achieves Significant Results](#) – In 2018, the [Interior-led interagency program of initiatives to prevent drone incursions on wildfires](#) resulted in a 26% reduction over 2017 (2017 experienced a 14% reduction over 2016 levels).
11. [Optionally Piloted Helicopters – A Primer on a Potentially Game-Changing Technology](#) – Although aircraft have been attacking wildfires for nearly 89 years, available technology and concerns for safety have limited their use to only about 1/3<sup>rd</sup> of the day (~8hrs). [This primer discusses the opportunity to leverage DOD developed and fielded technology that allows a helicopter to be flown from the cockpit or alternatively, from the ground](#). Developed using a helicopter model regularly contracted for wildland firefighting, DOD successfully used this technology to safely deliver millions of pounds of cargo in thousands of flights, mostly at night.
12. [“In Your Hand and On Demand” – A Concept for Enhanced Firefighter Awareness, Effectiveness, and Safety](#) – We live in a highly connected world, with a wealth of information and connectivity at our fingertips. This concept paper discusses the opportunities to leverage proven [airborne cellular / broadband technology](#) and [ubiquitous cell phones](#) and tablets to put critical information in the hands of our firefighters, enhancing their safety and effectiveness.

13. [Relationship of Fire Discovery Times on the Timeliness of Aerial Firefighting Support](#) – This paper, posted in 2018 examines historical fire discovery time data and its relationship to the availability of aerial initial and extended attack support.
14. [Bureau of Land Management \(BLM\) UAS Cultural Resource Summary](#) – This report details BLM’s experience in using UAS from 2014-2017 across a number of cultural resource applications.
15. [DOI UAS Field Report – Henry Smith Site, Montana](#) – This report outlines the results of a UAS-based aerial inventory of cultural resources at the Henry Smith site (BLM) in North Central Montana.

## Report Structure and Content

This report is structured to provide insight for the public, high-ranking government officials, internal managers, pilots, and employees alike. Following this introduction, methods of data collection and analysis are provided, followed by a presentation of data results from FY 2018, a discussion of what the results mean, interpretations and a look to the future in conclusion.



*Department of Interior remote pilots Chris Holmquist-Johnson (USGS) and Rich Thurau (OAS) prepare for UAS night operations near “fissure eight” on Hawaii’s big island. DOI conducted more than 1,200 flights between May and September of 2018 to support tracking eruption activities (photo credit, Mark Bauer, USGS).*

## Reporting DOI UAS Adoption, Application and Integration

The adoption, application, and integration of UAS by DOI bureaus can be measured by the continued expansion of the number of bureaus engaged in the program, the number of pilots trained, the diversity of vehicles, payloads, and software available to the Department’s remote pilots, and the expansion of the types of missions being completed for the Department. The goal of the Office of Aviation Services (OAS) and Departmental managers is to empower Interior remote pilots with the most advanced innovations being developed by the UAS industry. Leveraging nearly 1,000 cumulative years’ experience in aviation and related management and decades of experience in UAS, OAS collaborates with bureaus to field new capabilities that meet current and projected future mission needs as well as the Department’s legal, regulatory, policy, and safety obligations as a Public Aircraft Operator.

At the core of the Department’s ability to quantify annual program activity, are the thousands of flight use reports (online form OAS-2u) provided by DOI remote pilots. The “2u” entries are required after every flight and capture information about the pilot, aircraft, payloads and mission objectives, and provide a snapshot of flights as they occur throughout the year. At the end of the fiscal year, 2u entries are formatted for entry into Geographic Information Systems (GIS) and statistical analysis software. Flight information is then summarized according to metrics of interest to inform DOI senior leadership, managers, and field personnel through summaries such as this report. The 2u entries provide an incredibly powerful set of metrics to examine how the department is using drones.

Table 1. The 2018 DOI UAS report examines program activity across several variables listed here.

<b>Summary Variable</b>	<b>Description</b>	<b>Associated Tables / Figures</b>
Remote Pilots	Remote pilot counts, activities, and utilization.	Table 9
UAS Training	Classes conducted and pilots trained.	Table 8
UAS Flights	Number and location of flights and flight hours.	Tables 2, 3, 4a, 4b, 5a, 5b, 6, 7 / Figures 3, 4, 5, 6
Missions	Mission types, locations, incident support and project activities.	Table 7 / Figures 3, 4, 5, 6, 7, 9
UAS Fleet	Aircraft types and activities of each.	Figures 11, 12
Participating Bureaus	The number of DOI bureaus with an active UAS program and associated activities.	Figure 8
Geographic Analysis	U.S. States and territories, Geographic Area Coordination Centers, Unified Regional Boundaries.	Figures 3, 4, 5, 6 & Appendix A



## Measuring DOI UAS Program Success

Program success is best measured by measurable, **relevant outcomes**, not outputs. For UAS, these outcomes can be “bucketed” into DOI’s “Four S’s” of drone program success metrics;” ***Sensing, Safety, Savings, Service.***

***Sensing*** is critical to fulfilling the Department’s commitment to base its decisions on the best available science. UAS offer incredible enhancement opportunities relative to the amount, resolution, persistence, and analytics applied to collected data. Drones can be less disruptive to sensitive animal species than manned aircraft. They can carry sophisticated, high resolution sensors and possess the ability to transmit real-time data that can be recorded for future analysis or shared with the public for increased transparency. Drone borne sensors currently operated by Interior have provided image resolution improvements of **1,200%** over Landsat 8 satellite and **400%** better than manned aircraft acquired data. These unique sensing characteristics enable drones to gather repeatable, scientifically valid observations leading to better policy decisions, benefiting all Americans.

***Safety*** is a priority in all DOI operations. DOI missions often expose personnel to significant safety hazards including severe terrain, adverse weather conditions, and hazards core to many of these missions (fire, flood, earthquake, landslide, etc.). **From 1937 to 2000, 66% of all field biologist fatalities in DOI were aviation-related.** Drones offer multiple opportunities to enhance employee and public safety by reducing requirements for manned aircraft flight in particularly hazardous mission situations. Additionally, drones have also been used to replace ground personnel in certain missions, reducing their risk to injury. Use of drones can increase the level of safety for personnel both on the ground and in the air by reducing their exposure to hazardous situations. Interior has also employed UAS to save lives, [notably initiating the evacuation of a neighborhood threatened by fast moving lava flows and then helping to direct a stranded resident to safety on May 27, 2018.](#)

***Savings*** achieved by Interior through the integration of drones has included the cost to procure, train to, operate, support, and maintain these aircraft. As an example, the total acquisition cost of DOI’s current fleet of 563 UAS was less than the cost of several individual DOI manned fleet aircraft. Where drones can adequately replace manned aircraft or significantly reduce other costs (i.e. replacing many man hours on the ground to perform the same mission), the savings to the Department and the American taxpayer is significant. Across nearly 19,000 drones flights flown to date, DOI has observed a rule of thumb that a drones can complete a given task in 1/7th the time and at 1/10th the cost of traditional means of accomplishing the same task. Savings also come from reduced loss. DOI UAS have been credited with saving \$50M in property and infrastructure when one discovered and undetected spot fire and directed firefighters to extinguish it. Significant future savings are also expected with the proposed use of Optionally Piloted Aircraft (OPA), operated in both onboard-piloted and remote-piloted modes in wildland fire during the ~16 hours each day when night and periods of reduced visibility currently prevent manned aerial firefighting support.

Responsive, agile, and flexible ***Service*** is critical to aviation’s ability to support Interior bureau missions. Wildfire, floods, earthquakes, wildlife migrations, injured or lost guests, etc. don’t

occur on fixed or predictable schedules or locations. Drones provide service enhancements over traditional manned aviation. Small drones can easily be integrated with field personnel, enabling them to quickly react to emergent DOI/Bureau mission needs. They can often be deployed more quickly than traditional manned aircraft and their lower acquisition cost and operator training requirements provides the opportunity to deploy them more widely than possible with traditional manned aircraft. UAS have “democratized” the third-dimension for Interior bureaus and personnel, improving the Department’s ability to adequately service the 500 million acres of the “Peoples’ Lands” it is responsible for stewarding.

Figure 2. The “Four Outcome S’s” of DOI’s “Drones for Good” UAS Program.



## 2018 Statistical Overview and Discussion

Overall trends point to continued growth in the adoption and utilization of UAS for all of the Department’s diverse missions. The power of the “Four S’s” is exemplified in Table 2 by growth in every variable measured in 2018.

Table 2. Overall DOI small UAS flight statistics for fiscal years 2017 and 2018.

	<u>Total 2u</u> <u>Entries</u>	<u>Total</u> <u>Flights</u>	<u>Non-</u> <u>Incident</u> <u>Flights</u>	<u>*Incident</u> <u>Flights</u>	<u>Flight</u> <u>Hours</u>	<u>**Total</u> <u>Remote</u> <u>Pilots</u> <u>Reporting</u>	<u>States</u> <u>Flown In</u>	<u>Aircraft</u> <u>Types</u> <u>Flown</u>	<u>Calendar</u> <u>Days</u> <u>Flown</u>
<b>FY 2017</b>	1,617	4,976	1,388	229	803	435	33	3	204
<b>FY 2018</b>	4,313	10,342	2,551	1,762	1,785	527	42	8	312
<b>Increase</b>	2,696	5,366	1,163	1,533	982	92	9	5	108
<b>Percent Increase</b>	<b>166.7%</b>	<b>107.8 %</b>	<b>83.8%</b>	<b>669.4%</b>	<b>122.4%</b>	<b>21.1%</b>	<b>27.3%</b>	<b>166.7%</b>	<b>52.9%</b>

\* Incident flights include support for fire, hurricanes and the Kilauea volcano eruption.

\*\* Total remote pilots reporting includes non-DOI cooperators conducting DOI flights.

In addition to internal growth, the effectiveness of UAS for Interior operations also expanded in 2018 with the first implementation of commercial UAS for wildland firefighting. On May 15, 2018, as part of a broader strategy to aggressively combat wildfires, DOI awarded a Call When Needed (CWN) contract to four U.S. companies for small-unmanned aircraft systems services. This first of its kind contract enabled Interior and its interagency partners to obtain fully contractor-operated and maintained small drones that are ready when needed to support wildland fire operations, search and rescue, emergency management and other resource missions across the U.S. Table 3 summarizes the fiscal year 2018 CWN flights, which proved very effective in detection and suppression activities. More detailed information regarding the CWN flights is available through [this September 19<sup>th</sup>, 2018 briefing paper on the OAS website](#).

Table 3. Call When Needed (CWN) contractor flights for fiscal year 2018.

	<u>Total</u> <u>Incident</u> <u>Flights</u>	<u>Number of</u> <u>Fires</u> <u>Supported</u>	<u>Total</u> <u>Flight</u> <u>Hours</u>	<u>States</u> <u>Flown In</u>	<u>Aircraft</u> <u>Types</u> <u>Flown</u>	<u>Total</u> <u>Months</u> <u>Flown</u>
<b>FY 2018 CWN</b>	86	16	382	6	4	4



*The Insitu Scan Eagle (above left) was one of four CWN awarded aircraft to fly in support of interagency wildfire operations in the summer of 2018. Overall, 86 flights were conducted on 16 different fires for more than 382 flight hours. Infrared sensors effectively identify “hot spots” (above right) with accurate geolocation data that is quickly relayed to firefighters on the ground (photo credit, Insitu (left) National Interagency Fire Center (right)).*

## Geographic Analysis

The Department’s UAS activities expanded into more states and territories in 2018. The following section breaks down project and incident flights across key coordination regions, states and territories. Detailed maps of specific regions are available in the appendices.

### By State

Interior UAS flight activities were conducted in 42 states and territories in 2018, with eight more new states over the previous year (Delaware, Hawaii, Maryland, Ohio, Puerto Rico, South Dakota, the U.S. Virgin Islands, and Virginia). Figure 3 maps the distribution of projects (white) and incident response missions (black – fire, red – volcano, blue – hurricane) across U.S. states and territories with new areas in 2018 with yellow boundaries. This map illustrates that the majority of UAS flights are conducted in the western half of the U.S. Tables 4a and 4b illustrate the number of flights in each state or territory broken down by bureau (Table 5a) and DOI overall with new areas in 2018 bolded (Table 4b). Interior flights in support of the Kilauea eruption in Hawaii dominated the increase of flights for all states and territories.

Figure 3. Number of DOI flights in fiscal year 2018 by state with project type.

**U.S. Department of the Interior Unmanned Aircraft Systems FY18 Number of Flights by State with Project Locations by Project Type**

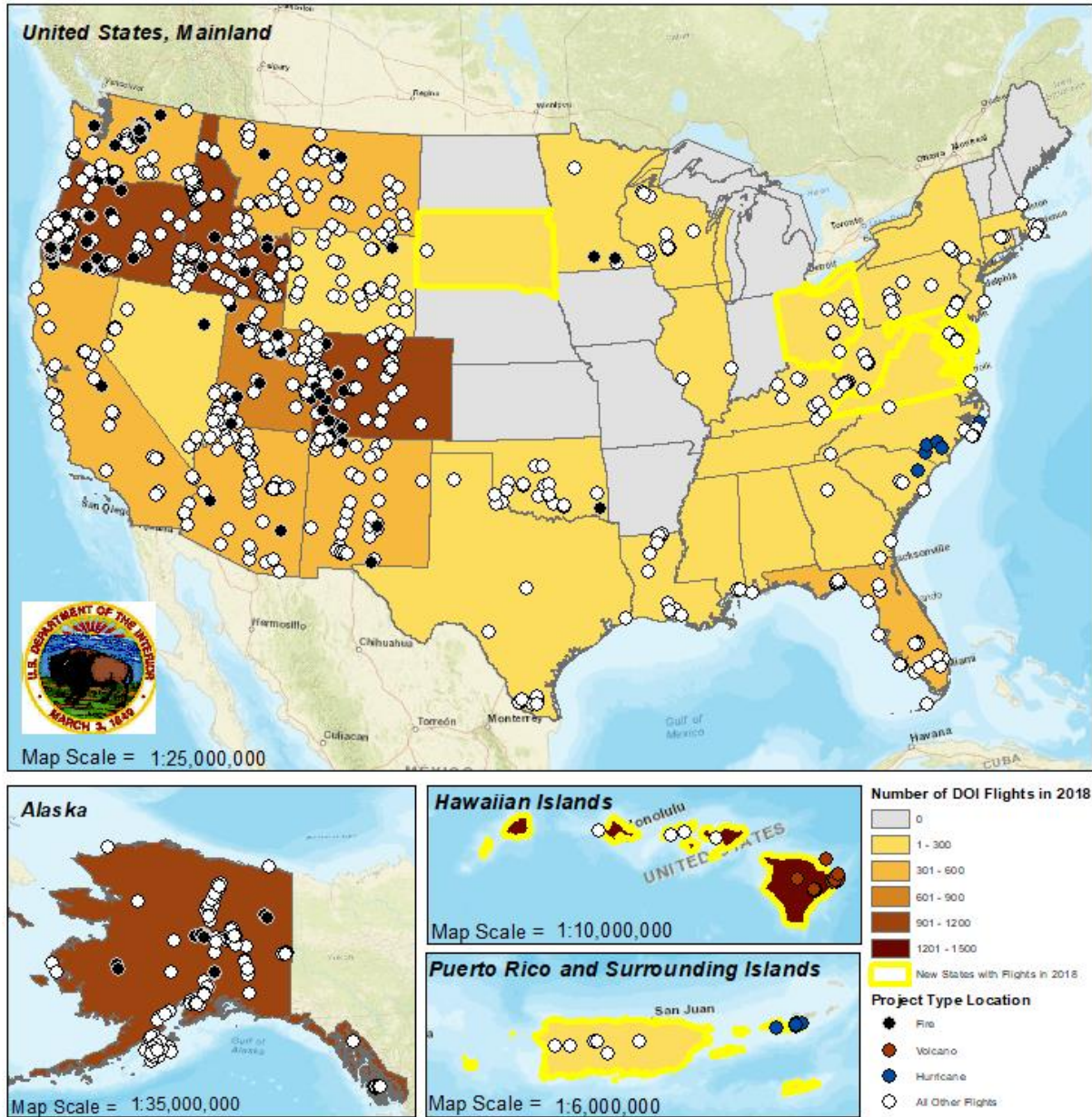


Table 4a. Total and percent flights by Bureau and State, fiscal year 2018.

FY 2018 DOI UAS Flights by Bureau and State																						
State / Region	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other		State Total (FY18)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Alabama	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	28	100%	0	0%	28	0%
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	0	0%	143	15%	114	12%	988	10%
Arizona	15	3%	218	38%	29	5%	15	3%	187	33%	7	1%	0	0%	29	5%	70	12%	0	0%	570	6%
California	0	0%	8	2%	27	7%	0	0%	20	6%	5	1%	0	0%	0	0%	303	84%	0	0%	363	4%
Colorado	0	0%	419	46%	81	9%	17	2%	24	3%	39	4%	0	0%	0	0%	340	37%	0	0%	920	9%
Connecticut	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	5	100%	0	0%	5	0%
Delaware	0	0%	0	0%	0	0%	0	0%	21	100%	0	0%	0	0%	0	0%	0	0%	0	0%	21	0%
Florida	13	4%	0	0%	0	0%	145	44%	0	0%	12	4%	0	0%	48	15%	114	34%	0	0%	332	3%
Georgia	0	0%	0	0%	0	0%	5	50%	0	0%	5	50%	0	0%	0	0%	0	0%	0	0%	10	0%
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Idaho	0	0%	404	44%	112	12%	188	21%	0	0%	47	5%	0	0%	0	0%	167	18%	0	0%	918	9%
Illinois	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	20	87%	0	0%	3	13%	0	0%	23	0%
Kansas	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Kentucky	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	13	42%	0	0%	18	58%	0	0%	31	0%
Louisiana	0	0%	0	0%	0	0%	26	49%	0	0%	0	0%	0	0%	0	0%	27	51%	0	0%	53	1%
Maryland	0	0%	0	0%	0	0%	16	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	16	0%
Massachusetts	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	100	100%	0	0%	100	1%
Minnesota	0	0%	0	0%	0	0%	13	33%	0	0%	0	0%	0	0%	0	0%	27	68%	0	0%	40	0%
Mississippi	0	0%	0	0%	0	0%	30	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	30	0%
Montana	8	2%	415	81%	0	0%	9	2%	0	0%	1	0%	0	0%	1	0%	70	14%	8	2%	512	5%
Nevada	10	9%	24	22%	56	51%	0	0%	0	0%	0	0%	0	0%	0	0%	21	19%	0	0%	111	1%
New Jersey	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	4	100%	0	0%	4	0%
New Mexico	0	0%	401	70%	133	23%	0	0%	0	0%	0	0%	0	0%	0	0%	39	7%	0	0%	573	6%
New York	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	65	100%	0	0%	65	1%
North Carolina	0	0%	3	3%	0	0%	0	0%	36	37%	6	6%	0	0%	0	0%	52	54%	0	0%	97	1%
Ohio	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	32	100%	0	0%	0	0%	0	0%	32	0%
Oklahoma	0	0%	52	45%	53	46%	0	0%	0	0%	0	0%	0	0%	0	0%	10	9%	0	0%	115	1%
Oregon	0	0%	598	56%	7	1%	23	2%	8	1%	240	23%	0	0%	0	0%	73	7%	119	11%	1,068	10%
Pennsylvania	0	0%	0	0%	0	0%	0	0%	19	45%	0	0%	23	55%	0	0%	0	0%	0	0%	42	0%
Puerto Rico	0	0%	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%	0	0%	47	98%	0	0%	48	1%
South Carolina	0	0%	0	0%	0	0%	22	76%	0	0%	4	14%	0	0%	0	0%	3	10%	0	0%	29	0%
South Dakota	0	0%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%
Tennessee	0	0%	0	0%	0	0%	0	0%	0	0%	3	100%	0	0%	0	0%	0	0%	0	0%	3	0%
Texas	4	2%	27	16%	0	0%	74	44%	0	0%	0	0%	0	0%	0	0%	62	37%	0	0%	167	2%
U.S. Virgin Islands	0	0%	0	0%	0	0%	0	0%	10	100%	0	0%	0	0%	0	0%	0	0%	0	0%	10	0%
Utah	0	0%	413	63%	218	33%	0	0%	2	0%	14	2%	0	0%	0	0%	9	1%	0	0%	656	6%
Virginia	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	100%	0	0%	26	0%
Washington	10	2%	230	56%	34	8%	60	15%	0	0%	2	1%	0	0%	0	0%	76	18%	0	0%	412	4%
West Virginia	0	0%	0	0%	0	0%	0	0%	0	0%	19	38%	31	62%	0	0%	0	0%	0	0%	50	1%
Wisconsin	0	0%	5	5%	0	0%	57	59%	0	0%	0	0%	0	0%	0	0%	35	36%	0	0%	97	1%
Wyoming	0	0%	228	83%	31	11%	6	2%	0	0%	0	0%	0	0%	0	0%	11	4%	0	0%	276	3%
Other - Minor Island	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%
Bureau Totals (FY18)	60	1%	3,895	38%	781	8%	985	10%	446	4%	722	7%	119	1%	78	1%	3,015	29%	241	2%	10,342	
Bureau Totals (FY17)	0	0%	2,774	56%	332	7%	109	2%	284	6%	307	6%	86	2%	0	0%	1,084	22%	0	0%	#	%
Change (+/-)	60	1%	1,121	-18%	449	1%	876	7%	162	-1%	415	1%	33	-1%	78	1%	1,931	7%	241	2%	State Total (FY18)	
State	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other			

Table 4b. Total and percent flights by Bureau and State comparison between fiscal years 2017 and 2018.

State / Territory	State Total (FY18)		State Total (FY17)		State Total (Change + -)		State / Territory
	#	%	#	%	#	%	
Alabama	28	0%	4	0%	24	0%	Alabama
Alaska	988	10%	601	12%	387	-3%	Alaska
Arizona	570	6%	310	6%	260	-1%	Arizona
California	363	4%	355	7%	8	-4%	California
Colorado	920	9%	391	8%	529	1%	Colorado
Connecticut	5	0%	24	1%	-19	-1%	Connecticut
<b>Delaware</b>	<b>21</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>21</b>	<b>0%</b>	<b>Delaware</b>
Florida	332	3%	147	3%	185	0%	Florida
Georgia	10	0%	25	1%	-15	0%	Georgia
<b>Hawaii</b>	<b>1,474</b>	<b>14%</b>	<b>0</b>	<b>0%</b>	<b>1,474</b>	<b>14%</b>	<b>Hawaii</b>
Idaho	918	9%	557	11%	361	-2%	Idaho
Illinois	23	0%	6	0%	17	0%	Illinois
Kansas	0	0%	4	0%	-4	0%	Kansas
Kentucky	31	0%	16	0%	15	0%	Kentucky
Louisiana	53	1%	46	1%	7	0%	Louisiana
<b>Maryland</b>	<b>16</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>16</b>	<b>0%</b>	<b>Maryland</b>
Massachusetts	100	1%	62	1%	38	0%	Massachusetts
Minnesota	40	0%	7	0%	33	0%	Minnesota
Mississippi	30	0%	29	1%	1	0%	Mississippi
Montana	512	5%	13	0%	499	5%	Montana
Nevada	111	1%	156	3%	-45	-2%	Nevada
New Jersey	4	0%	42	1%	-38	-1%	New Jersey
New Mexico	573	6%	165	3%	408	2%	New Mexico
New York	65	1%	85	2%	-20	-1%	New York
North Carolina	97	1%	83	2%	14	-1%	North Carolina
<b>Ohio</b>	<b>32</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>32</b>	<b>0%</b>	<b>Ohio</b>
Oklahoma	115	1%	7	0%	108	1%	Oklahoma
Oregon	1,068	10%	734	15%	334	-5%	Oregon
Pennsylvania	42	0%	13	0%	29	0%	Pennsylvania
<b>Puerto Rico</b>	<b>48</b>	<b>1%</b>	<b>0</b>	<b>0%</b>	<b>48</b>	<b>1%</b>	<b>Puerto Rico</b>
South Carolina	29	0%	1	0%	28	0%	South Carolina
<b>South Dakota</b>	<b>1</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>1</b>	<b>0%</b>	<b>South Dakota</b>
Tennessee	3	0%	0	0%	3	0%	Tennessee
Texas	167	2%	44	1%	123	1%	Texas
<b>U.S. Virgin Islands</b>	<b>10</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>10</b>	<b>0%</b>	<b>U.S. Virgin Islands</b>
Utah	656	6%	495	10%	161	-4%	Utah
<b>Virginia</b>	<b>26</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>26</b>	<b>0%</b>	<b>Virginia</b>
Washington	412	4%	79	2%	333	2%	Washington
West Virginia	50	1%	79	2%	-29	-1%	West Virginia
Wisconsin	97	1%	10	0%	87	1%	Wisconsin
Wyoming	276	3%	310	6%	-34	-4%	Wyoming
Other - Minor Island	26	0%	4	0%	22	0%	Other - Minor Island
	10,342		4,976		5,366		
State / Territory	#	%	#	%	#	%	State / Territory
	State Total (FY18)		State Total		State Total (Change)		

## Geographic Area Coordination Centers (GACC)

Geographic Area Coordination Center areas represent key geographic areas drawn for the “purpose of incident management and mobilization of resources (people, aircraft, ground equipment)”. The “About Us” narrative from the GACC website further describes GACCs:

The Geographic Area Coordination Centers (GACC) is a result of an interagency agreement established by the respective Geographic Area Coordinating Group. The primary mission of the GACC is to serve Federal and State wildland fire agencies through logistical coordination and mobilization of resources (people, aircraft, ground equipment) throughout the geographical area, and with other geographic areas, as necessary. This is generally done through coordinating the movement of resources between the many Dispatch Centers within the geographic area and, as necessary, with the National Interagency Coordination Center (NICC) when resources are unavailable within the Area or when mobilization support is needed in other geographic areas. - <https://gacc.nifc.gov/> (accessed online 12/19/2018).

Tables 5a and 5b and Figure 4 break out project and incident response missions by DOI bureau for each GACC. Table 5b illustrates the number of flights increased in 2018 for every GACC except *Northern California*. Figure 5 highlights the *Great Basin* GACC which contained the majority UAS activity in both 2017 and 2018 (including four 2018 CWN fire incidents). Individual GACC maps of flights by bureau are available in Appendix A.

Figure 4. Interior flights by project type and Geographic Area Coordination Center (GACC).

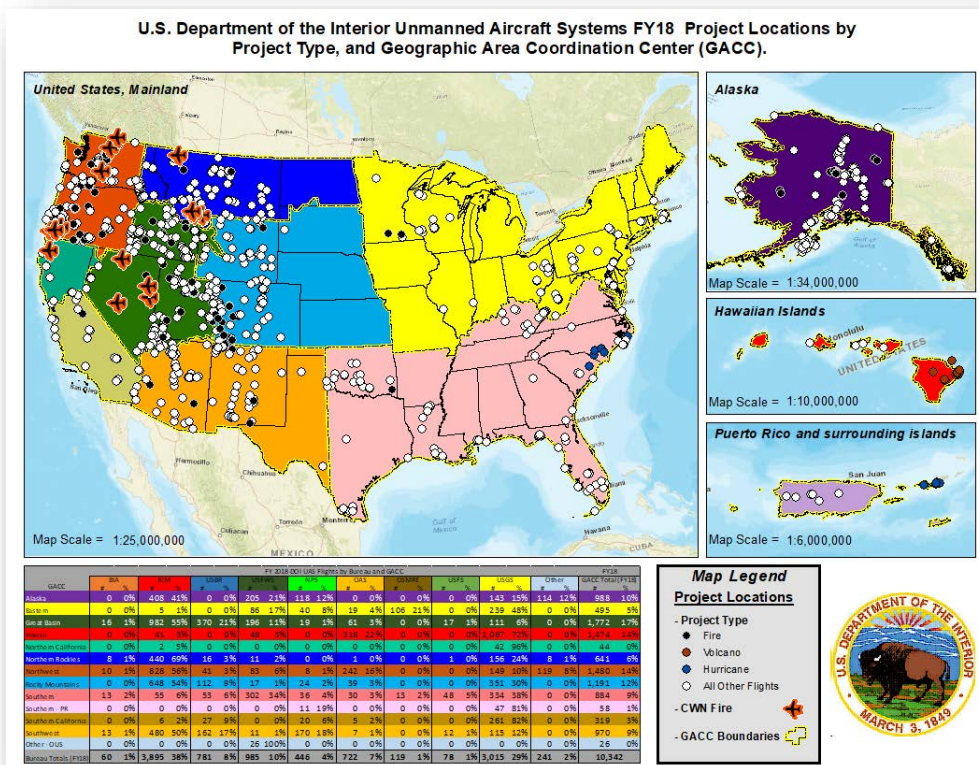




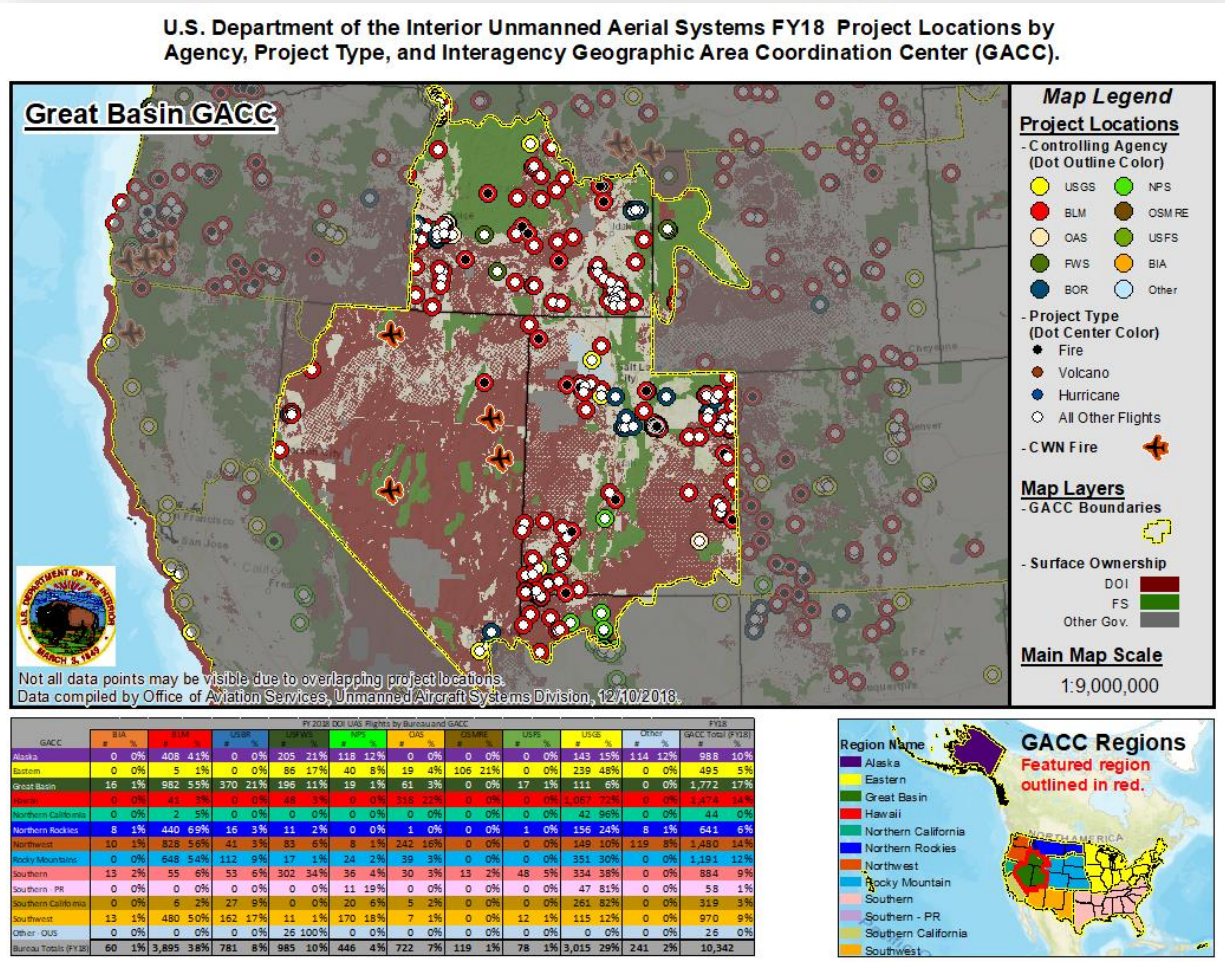
Table 5a. Total flights and percent FY 17 and FY18 by Bureau and Geographic Area Coordination Center.

GACC	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other		GACC Total (FY18)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	0	0%	143	15%	114	12%	988	10%
Eastern	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Northern California	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	44	0%
Northern Rockies	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%
Northwest	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%
Rocky Mountains	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%
Southern	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%
Southern - PR	0	0%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%
Southern California	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%
Southwest	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%
Other - OUS	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%
Bureau Totals (FY18)	60	1%	3,895	38%	781	8%	985	10%	446	4%	722	7%	119	1%	78	1%	3,015	29%	241	2%	10,342	
Bureau Totals (FY17)	0	0%	2,774	56%	332	7%	109	2%	284	6%	307	6%	86	2%	0	0%	1,080	22%	0	0%	4,976	
Change (+ -)	60	1%	1,121	-18%	449	1%	876	8%	162	-2%	415	1%	33	-1%	78	1%	1,935	7%	241	2%	5,366	

Table 5b. Flight count change between fiscal years 2017 and 2018 by Geographic Area Coordination Center (GACC).

FY18		FY17		Change (+ -)		GACC
GACC Total (FY18) # %	GACC Total (FY18) # %	GACC Total (FY17) # %	GACC Total (FY17) # %	GACC Total (Change) # %	GACC Total (Change) # %	
988 10%	601 12%	387 -2%	Alaska			
495 5%	391 8%	104 -3%	Eastern			
1,772 17%	1,118 22%	654 -5%	Great Basin			
1,474 14%	0 0%	1,474 14%	Hawaii			
44 0%	105 2%	-61 -2%	Northern California			
641 6%	189 4%	452 2%	Northern Rockies			
1,480 14%	825 17%	655 -3%	Northwest			
1,191 12%	680 14%	511 -3%	Rocky Mountains			
884 9%	382 8%	502 1%	Southern			
58 1%	0 0%	58 1%	Southern - PR			
319 3%	250 5%	69 -2%	Southern California			
970 9%	431 9%	539 0%	Southwest			
26 0%	0 0%	26 0%	Other - OUS			

Figure 5. The Great Basin Geographic Area Coordination Center (GACC) with fiscal year 2018 Interior missions (color coded by mission type (inner dot) and bureau (outer ring)) and Call When Needed (CWN) fire incident locations.



### Unified Regional Boundaries

Unified Regional Boundaries (URB) were developed recently to meet the needs of complex multi-agency interactions for land management. The URB website offers this description of the boundaries:

The unified regional boundaries are primarily based on a science-based approach to promote management efficiencies. The twelve unified regions are based on watersheds and are identified to provide better management on an ecosystem basis to include critical components such as wildlife corridors, watersheds, and trail systems. Boundaries were adjusted to follow state lines where possible based on feedback from DOI's career senior executive staff, Congress, governors, and external stakeholders.

Accessed online 12/19/2018 at: [Unified Regional Boundaries](http://www.doi.gov/employees/reorg/unified-regional-boundaries)

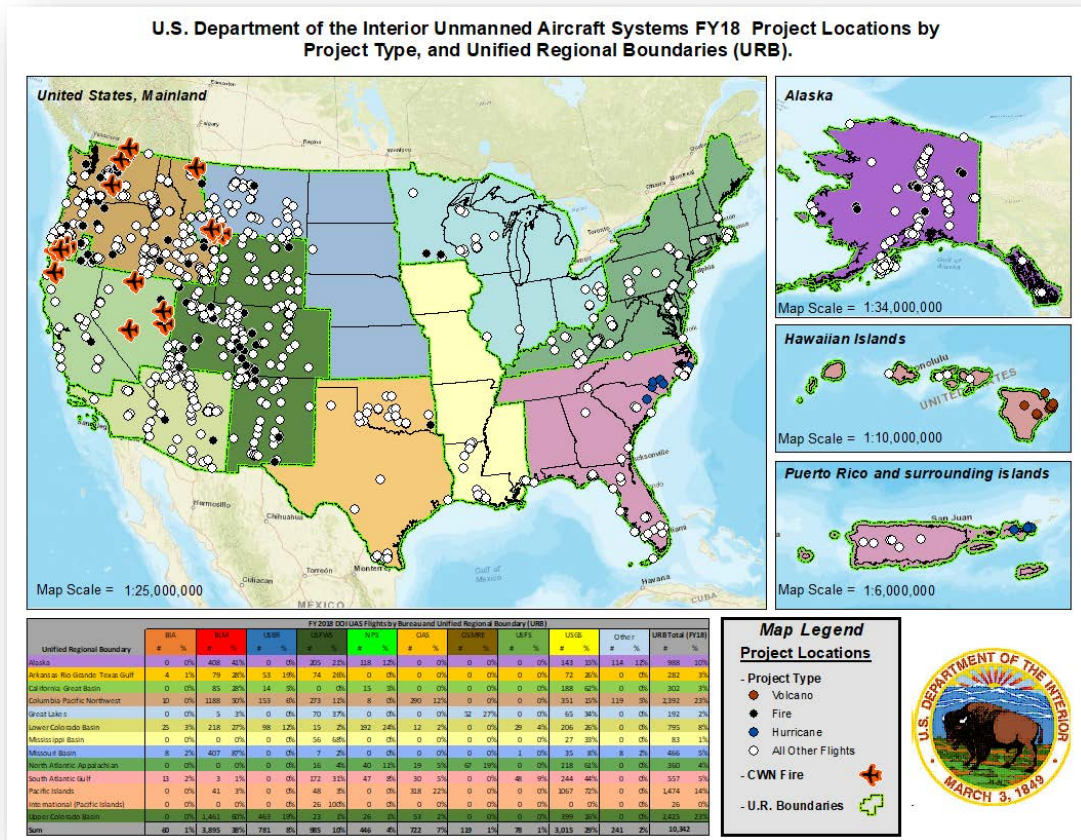
<https://www.doi.gov/employees/reorg/unified-regional-boundaries>

Table 6 summarizes DOI UAS flights and Figure 6 maps mission locations by URB and bureau. As these boundaries were introduced this year as an administrative measure of coordinating multi-agency resources, their importance and legacy will be determined in the years to come.

Table 6. Total flights and percent FY18 by Bureau and Unified Regional Boundary.

Unified Regional Boundary	FY 2018 DOI UAS Flights by Bureau and Unified Regional Boundary (URB)														URB Total (FY18)							
	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%		
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	0	0%	143	15%	114	12%	988	10%
Arkansas-Rio Grande-Texas Gulf	4	1%	79	28%	53	19%	74	26%	0	0%	0	0%	0	0%	0	0%	72	26%	0	0%	282	3%
California-Great Basin	0	0%	85	28%	14	5%	0	0%	15	5%	0	0%	0	0%	0	0%	188	62%	0	0%	302	3%
Columbia-Pacific Northwest	10	0%	1188	50%	153	6%	273	11%	8	0%	290	12%	0	0%	0	0%	351	15%	119	5%	2,392	23%
Great Lakes	0	0%	5	3%	0	0%	70	37%	0	0%	0	0%	52	27%	0	0%	65	34%	0	0%	192	2%
Lower Colorado Basin	25	3%	218	27%	98	12%	15	2%	192	24%	12	2%	0	0%	29	4%	206	26%	0	0%	795	8%
Mississippi Basin	0	0%	0	0%	0	0%	56	68%	0	0%	0	0%	0	0%	0	0%	27	33%	0	0%	83	1%
Missouri Basin	8	2%	407	87%	0	0%	7	2%	0	0%	0	0%	0	0%	1	0%	35	8%	8	2%	466	5%
North Atlantic-Appalachian	0	0%	0	0%	0	0%	16	4%	40	11%	19	5%	67	19%	0	0%	218	61%	0	0%	360	4%
South Atlantic Gulf	13	2%	3	1%	0	0%	172	31%	47	8%	30	5%	0	0%	48	9%	244	44%	0	0%	557	5%
Pacific Islands	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1067	72%	0	0%	1,474	14%
International (Pacific Islands)	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%
Upper Colorado Basin	0	0%	1,461	60%	463	19%	23	1%	26	1%	53	2%	0	0%	0	0%	399	16%	0	0%	2,425	23%
<b>Bureau Totals (FY18)</b>	<b>60</b>	<b>1%</b>	<b>3,895</b>	<b>38%</b>	<b>781</b>	<b>8%</b>	<b>985</b>	<b>10%</b>	<b>446</b>	<b>4%</b>	<b>722</b>	<b>7%</b>	<b>119</b>	<b>1%</b>	<b>78</b>	<b>1%</b>	<b>3,015</b>	<b>29%</b>	<b>241</b>	<b>2%</b>	<b>10,342</b>	

Figure 6. Interior flights by project type and Unified Regional Boundary (URB).



## A Break-Down of FY 2018 DOI UAS Missions

Department of the Interior employees are tasked with fulfilling an extremely diverse set of missions. Across Interior’s nine bureaus active in the UAS program, UAS missions range from providing situational awareness through video or still photos, integration of precise landscape survey instruments to create centimeter-level accuracy 3-dimensional models, to using drones to position sensors where no other means exist. The combination of DOI mission diversity and a UAS industry poised with ingenuity has fueled the program expansion.

Interior UAS missions are reported by *Project Flights* (planned or one-off missions) or *Incident Support* (for unforeseen missions including fires, hurricanes, and the Kilauea volcano in 2018). Figure 7 illustrates 72% of DOI flights in 2018 were project flights either as mission execution or training flights. Table 7 illustrates all DOI flights by “Use Code” selected by remote pilots designating each individual flight to a particular purpose. Project coding can differ from individual flight coding by the pilot.

Figure 7. Percent of UAS flights by incident / project type for DOI in fiscal year 2018.

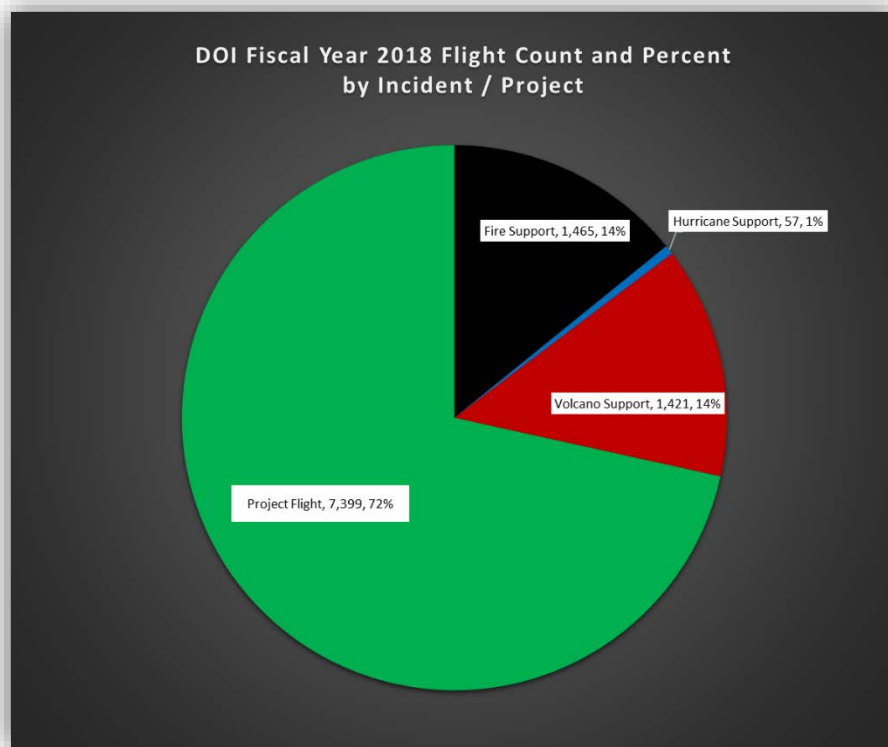


Table 7. Fiscal year 2018 flights by Use Code.

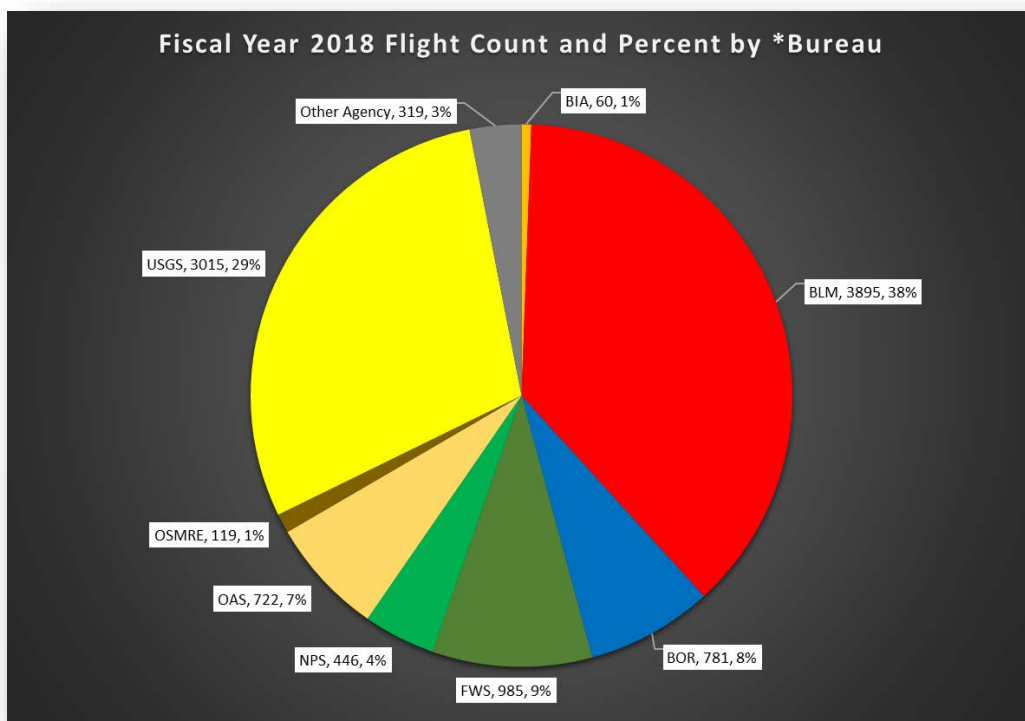
Use Code	Interagency Fire		Landscape Monitoring		Law Enforcement		Maintenance and Inspection		Mapping		Recon		Search and Rescue		Training and Proficiency		Wildlife Survey		Total Number of Flights by Bureau	% of Total Flights by Bureau	
	Number of Flights	% of Flights for Fire	Number of Flights	% of Flights for Monitoring	Number of Flights	% of Flights for Law Enforcement	Number of Flights	% of Flights for Maintenance and Inspection	Number of Flights	% of Flights for Mapping	Number of Flights	% of Flights for Recon	Number of Flights	% of Flights for SaR	Number of Flights	% of Flights for Training	Number of Flights	% of Flights for Wildlife			
<b>Bureau</b>																					
BLM	361	63%	346	28%	11	8%	79	63%	771	33%	671	46%	0	0%	1,620	40%	36	8%	3,895	38%	
USGS	0	0%	473	39%	11	8%	9	7%	945	40%	328	22%	4	18%	1,012	25%	233	55%	3,015	29%	
USFWS	12	2%	90	7%	82	63%	6	5%	124	5%	74	5%	1	5%	443	11%	153	36%	985	10%	
NPS	1	0%	40	3%	15	12%	5	4%	51	2%	35	2%	17	77%	282	7%	0	0%	446	4%	
OSMRE	0	0%	10	1%	4	3%	2	2%	22	1%	4	0%	0	0%	77	2%	0	0%	119	1%	
USBR	0	0%	174	14%	0	0%	20	16%	350	15%	48	3%	0	0%	184	5%	5	1%	781	8%	
OAS	157	28%	92	7%	7	5%	5	4%	101	4%	174	12%	0	0%	186	5%	0	0%	722	7%	
BIA	0	0%	0	0%	0	0%	0	0%	4	0%	0	0%	0	0%	56	1%	0	0%	60	1%	
Other Agencies	38	7%	3	0%	0	0%	0	0%	1	0%	134	9%	0	0%	143	4%	0	0%	319	3%	
Flights by Use Code Totals	569	6%	1,228	12%	130	1%	126	1%	2,369	23%	1,468	14%	22	0%	4,003	39%	427	4%	10,342		

Flight use codes are entered by the pilot following a flight and subject to their interpretation of the predominant purpose of each flight.

### Interior DOI Missions by Bureau

The number of flights and UAS Mission diversity varies greatly according to the size, overall mission, and level of UAS program engagement of individual bureaus. Figure 8 illustrates FY18 UAS flight activities across DOI's nine bureaus and offices. For example, the Bureau of Land Management's (BLM) large contribution stems from their large land holdings, diverse scientific and firefighting missions, and legacy of involvement with the UAS program since its beginnings in 2006.

Figure 8. Flight count for UAS activities by Interior bureau / office for fiscal year 2018.

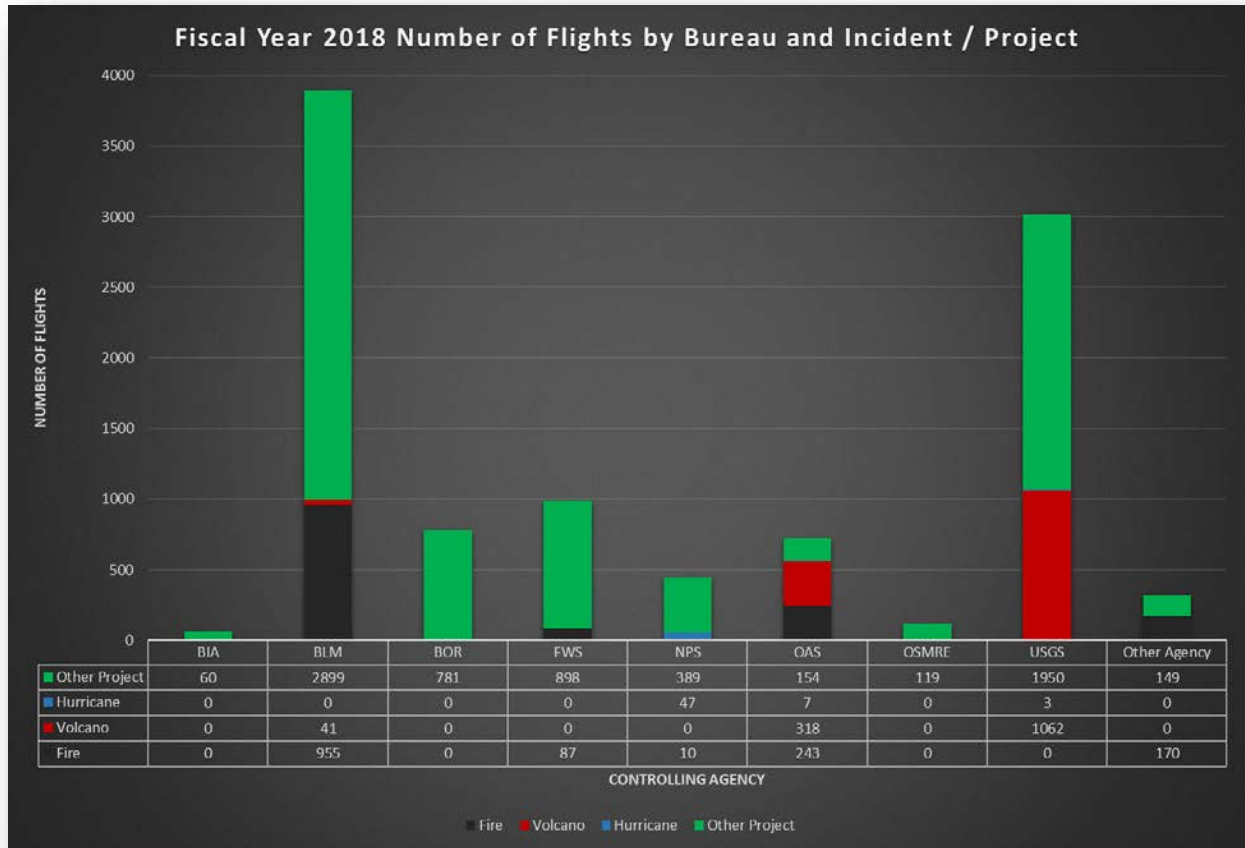


\* Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Bureau of Reclamation (BOR), Fish and Wildlife Service (FWS), National Park Service (NPS), Office of Aviation Services (OAS), Office of Surface Mining Reclamation and Enforcement (OSMRE), Geological Survey (USGS). "Other Agency" includes USDA Forest Service, federal and state cooperators.

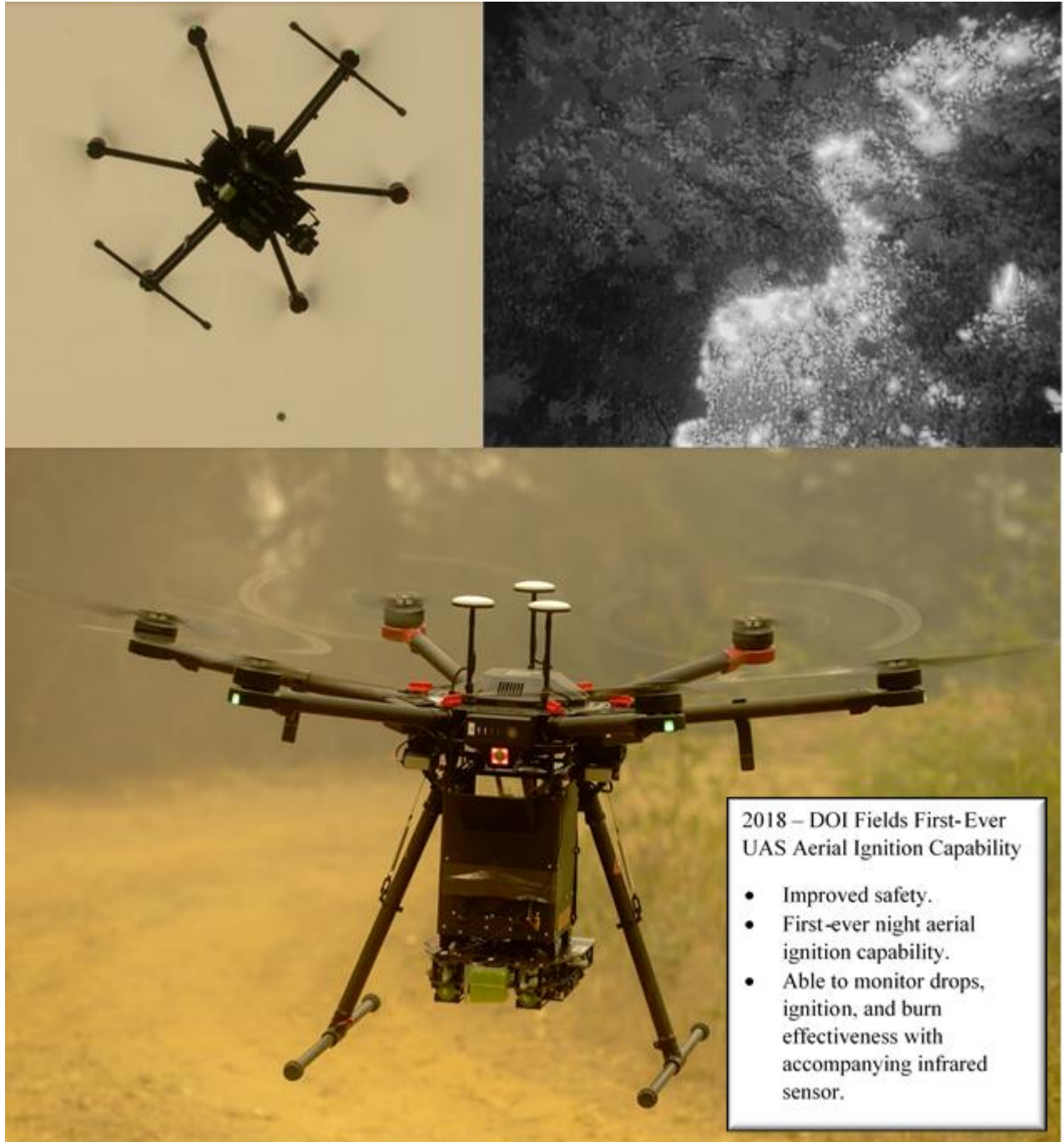
### Fire and Incident Response

Fire and incident response is a central focus of DOI UAS program managers and leadership as a means to increase safety and effectiveness while reducing costs. Figure 9 provides a break-down of UAS flight activities by bureau and flight type (project flights and incidents). Interior pilots have been involved with hurricane response since 2017 and National Park Service (NPS) pilots were involved with damage assessment activities for hurricanes Michael and Florence in 2018. Interior remote pilots conducted unprecedented activities in support of the Kilauea eruption in May of 2018 on Hawaii's big island to include several firsts in human history of volcano eruption monitoring.

Figure 9. Count of UAS flights by incident / project type and bureau for DOI in fiscal year 2018.



UAS activity in support of fire response has received particular interest due to increasing costs and industry innovations.



2018 – DOI Fields First-Ever UAS Aerial Ignition Capability

- Improved safety.
- First-ever night aerial ignition capability.
- Able to monitor drops, ignition, and burn effectiveness with accompanying infrared sensor.

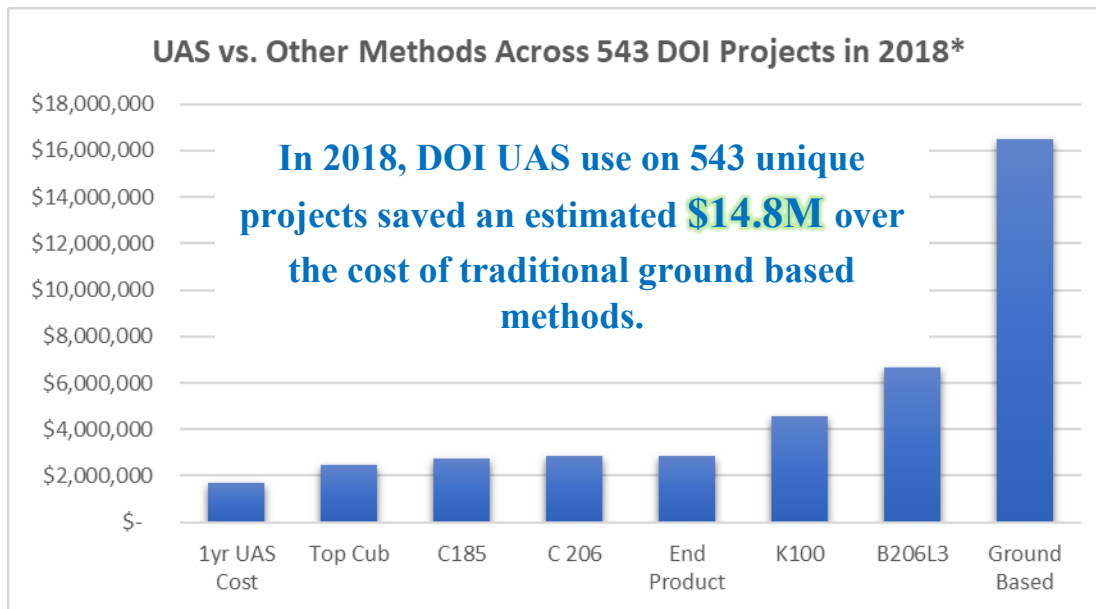
*The Drones Amplified Ignis plastic sphere dispenser (PSD) provided firefighting UAS remote pilots with a new tool in 2018. The UAS-mounted PSD payload (lower center image) reduces risks to personnel who would otherwise create backing fires (viewed through the on-board infrared camera in the upper right image) by walking with a drip-torch or by flying manned helicopters in hazardous conditions. This payload was flown 177 times for more than 50 hours in fiscal year 2018. The aircraft and payload can be seen in action in the upper left image.*



## Pilot and Aircraft Utilization

During FY 2018 the **359 active DOI UAS pilots conducted 543 unique projects not including training and proficiency missions**. The estimated in-house costs for these projects including, equipment, training, travel, and salary was **\$1.67M**. Modeling and analysis indicates the cost of in-house UAS operations is to be **~41% less than the cost of doing the same number of projects utilizing end-product contracts**, based on the average price per end-product contract DOI completed in FY18. This is not to say that end-product contracts are not appropriate, but that managers should consider whether in-house operators would be more cost effective for a given project. Analysis also indicates that if the same 543 projects had been completed using manned aircraft that the cost to department would have been significantly higher. When compared to using a Top Cub for example (one of our lowest cost fleet aircraft), the operating cost of using UAS is approximately **32% less for a given project**. Compared to utilizing a larger aircraft like the Kodiak K100, UAS operating costs are approximately **63% less for a given project**. Using a Bell 206 Jet Ranger, operations would have cost **4 times more than using UAS**. This is not to say UAS are appropriate in all situations, but that a consideration must be made during project planning as to whether a project could be done by a UAS in a more cost effective manner. UAS are particularly well suited for smaller scale projects when compared with manned aviation. For landscape scale projects, manned aircraft are still likely the most efficient method of collecting data. **One area in DOI that UAS have proven especially useful is using UAS to capture data that is traditionally captured using employees on foot**. For projects such as those, **UAS have proven to be 7 times faster and roughly 1/10 the cost of traditional ground based methods**. The following chart depicts the estimated cost to DOI if the **543 projects** completed using UAS in 2018 were transitioned to other aircraft, contracts or to ground based data collection.

Figure 10. UAS Cost vs. Other Methods Across 543 DOI Projects in 2018.



\*Assuming all missions completed by UAS in 2018 were transitioned to the other method.

## Remote Pilot Training

At the core of DOI’s UAS program are the hundreds of dedicated remote pilots who have committed to expand their own capabilities through the UAS program. Different classes are offered through OAS and individual bureaus catering to their own pilot needs.

Table 8. DOI UAS training courses held in fiscal year 2018.

<b>Course Description</b>	<b>Bureau / Office Lead</b>	<b>Classes held in FY18</b>	<b>Remote Pilot Attendees FY18</b>
A-450 Basic Remote Pilot Training	OAS, BLM, FWS, USFS	16	197
Incident Response Training	BLM	6	79
Advanced Processing and Planning	OAS, BLM, FWS, USGS	6	73
A-452R – Basic Refresher	OAS, BLM	4	65

There are several different training courses in DOI related to the use of UAS. First is the A-450 Basic unmanned aircraft operator’s course. This class is designed to take the employee from just having a the minimum FAA certification to understanding all of the DOI specific rules for the use of UAS and also helps prepare them for successful completion of UAS missions. The course is 32 hours of instruction with an average class size of 14. It can be offered in any part of the country depending on the requirements of the bureau.

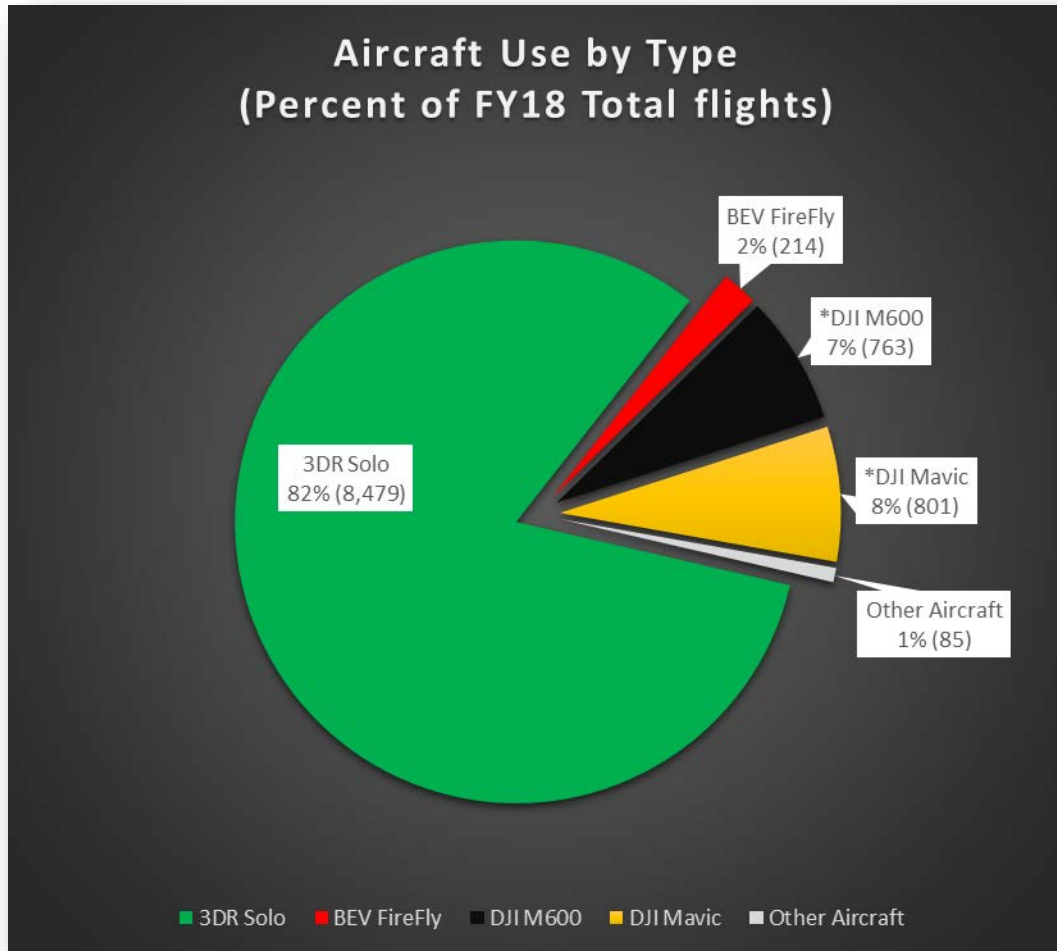
The second course offered is the advanced processing and planning course. This course goes into much deeper detail on how to collect good imagery and the tools used to process that imagery into various data products. This course is 32 hours of instruction with average class size of 15.

There is also a course designed to prepare remote pilots in the use of UAS for firefighting. This course is designed to take trained UAS pilots and educate them on the specific operational requirements for safely using UAS in support of fire suppression operations. This course was developed by various SME’s from OAS and the Bureaus and is the foundation for the future success in the integration of UAS on wildfires. This is a 40-hour course with an average class size 15.

DOI remote pilots are required to take a refresher course once every 2 years. This course is designed to give the employee the most up-to-date information on the UAS program and prove them with the opportunity to learn best practices and to provide feedback on how their use of UAS going. This 2-hour course is offered as a webinar or in person, class size varies.

## Aircraft Utilization

Figure 11. Percent distribution of FY2018 flights by Aircraft Type.



\*See "DOI UAS Data Management and Risk Mitigation Strategy" for more information about DOI's use of DJI aircraft in 2018.

Figure 12. There were a total of 531 Interior fleet aircraft at the end of fiscal year 2018 (end of calendar year additions in parentheses).

# of AC	Type of Aircraft	
486	3DR Solo	
20	FireFly	
10 (38)	Mavic	
6 (20)	M600	
5	MLB Super Bat	
2	Evo	
1	H10	
1	Vapor 55	

**NOTE:** Aircraft and fleet cost comparisons are for illustrative purposes only. UAS are not currently fully integrated into the National Airspace System. This places some limits on their present applications. Manned aircraft will likely always have a role in DOI, as they have in DOD.

COMPARATIVE FLEET COSTS

The acquisition cost of the entire DOI fleet of **531 UAS** was **\$1.9M.**

This is less than the cost of several **single** aircraft in the **93** aircraft manned fleet.

- AS350 Helicopter: **\$2.0M.**
- King Air Airplane: **\$3.0M.**
- Bell 412 Helicopter: **\$6.3M.**





## DOI Remote Pilot Utilization

Table 9. Department of Interior remote pilots by Bureau.

Bureau	Number of Carded Pilots in FY18	Pilots who flew in 2018 (Including Training)	% Pilots who flew in 2018 (Including Training)	Pilots Who Flew in 2018 Outside of Training	% Pilots Who Flew in 2018 Outside of Training	Pilots Carded Prior to 2018	Pilots Carded Prior to 2018 Who Flew in 2018	% Pilots Carded Prior to 2018 Who Flew Non-Training Flights in 2018	Carded in 18	Carded in 19
BLM	150	134	89%	92	61%	74	47	64%	76	0
USGS	89	68	76%	46	52%	39	23	59%	49	1
USFWS	47	43	91%	23	49%	7	5	71%	39	1
NPS	26	25	96%	13	50%	11	7	64%	15	0
OSMRE	24	18	75%	10	42%	10	6	60%	9	5
USBR	17	17	100%	17	100%	11	11	100%	5	0
OAS	11	11	100%	8	73%	7	6	86%	4	0
BIA	3	3	100%	0	0%	0	0	NA	3	0
USFS	10	7	70%	1	10%	3	0	0%	5	2
Sum	377	326	86%	210	56%	162	105	65%	205	9

As bureaus ramp up their UAS integration, it is expected they will train new remote pilots in anticipation of growing future needs.



**FAA & DOI certified UAS remote pilots in 2018 field operations**

Photo credit, Kari Greer, Kari Greer Photography.

## DOI UAS Data Management and Risk Mitigation Strategy

For most UAS applications, acquired data and the products derived from it which enable better, more agile, and transparent action are central to mission success. Effective management of UAS acquired data and mitigation of the risks of unintended distribution is a characteristic of a professional UAS program. Public experience with government and private sector data breaches and privacy concerns related to drones reinforce the importance of having a data management and risk mitigation strategy for all UAS programs. Although DOI has longstanding policy and procedures for the management of collected data within traditional IT systems and mission methods, UAS present additional, non-traditional challenges and vulnerabilities.

Unlike manned aircraft, most UAS and their sensors are controlled through active links with a ground control station (GCS). If the vehicle and/or sensor control link is overtaken by an unauthorized operator and the drone is flown outside the intended area of operations (or the sensor is slewed to where it should not be pointed), significant security, safety, or privacy incidents could result.

Likewise, unlike manned aircraft, most UAS actively transmit data from the vehicle/payload system to the GCS. If the payload data link is intercepted by unauthorized parties similarly significant security, safety, or privacy incidents could result which could cause embarrassment or damage to the operating organization.

Lastly, unlike manned aircraft conducting similar missions, some UAS automatically collect flight and payload data, which is often shared with the manufacturer through flight control and/or data acquisition/processing applications that connect to the internet through the GCS or other means. UAS programs unaware of whether their data is being collected, where it is going and for what purposes it is being used also risk exposure to security and privacy incidents.

### Elements of DOI's UAS Data Management and Risk Mitigation Strategy

Interior's UAS data management and risk mitigation strategy is founded, like the rest of its program in solid, mission-focused requirements determination and adherence. From 2010-2014, OAS leveraged a diverse array of excess DOD small UAS (valued at \$25M, but acquired at no cost) to conduct hundreds of operational test and evaluation (OT&E) flights across dozens of Interior mission applications. Based on experience and data collected during this OT&E program, over 300 Interior bureau and OAS subject matter experts came together to develop a series of Master UAS Requirements that continue to guide Interior fleet and contract UAS acquisitions (Block 1 on Figure 10).

Common across the Interior Master UAS Requirements for various small UAS were three data management and risk mitigation requirements: encrypted control link, encrypted payload link, and enterprise level data sharing control (Blocks 2, 3, and 4 on Figure 10). Subsequent market research indicated that outside the military UAS market, there were few consumer/professional UAS that met all three of these requirements. Unfortunately, tested military UAS did not meet other critical Interior mission requirements (e.g. sensor resolution, versatility) and were cost prohibitive for Interior bureaus' available funding levels (military drones are up to 10X the price of similarly capable consumer models). Interior identified and acquired an initial inventory UAS

that met the three data management and risk mitigation requirements, but for only two of the UAS types identified in the Interior master UAS requirement.

In 2015, OAS began working with federal partners and the drone industry to develop solutions that met Interior's three data management and risk mitigation requirements for other small UAS types listed in DOI's Master UAS Requirement. OAS also engaged relevant industry and government partners to assess the security of UAS that claimed to meet these three requirements.

In 2017, OAS was approached by Da Jiang Innovations (DJI) with an offer to collaborate with DOI on the development, testing and potential fielding of a customer-focused enterprise solution that would meet Interior's UAS data management and risk mitigation requirements with respect to encrypted control and payload links, and enterprise level managed data sharing controls. Specifications for the new "Private Edition" (later referred to as "Government Edition") included custom software, firmware, and UAS hardware editions of Interior selected DJI drones. Leveraging resident military flight test and evaluation and program management experience, OAS developed a flight test plan to conduct functional mission assessments of Government Edition equipped DJI test articles. The three-phase flight test plan incorporated an industry standard build-up methodology. Flights were restricted to those that met test plan objectives. Only specially selected FAA and DOI certified UAS operators who had read and signed the test plan were permitted to operate the DJI test articles. Mission functionality and vehicle and payload system performance data from flight tests informed subsequent modifications to achieve desired performance. Flight test phases one and two were completed and met all required exit criteria. Phase three flight testing is ongoing.

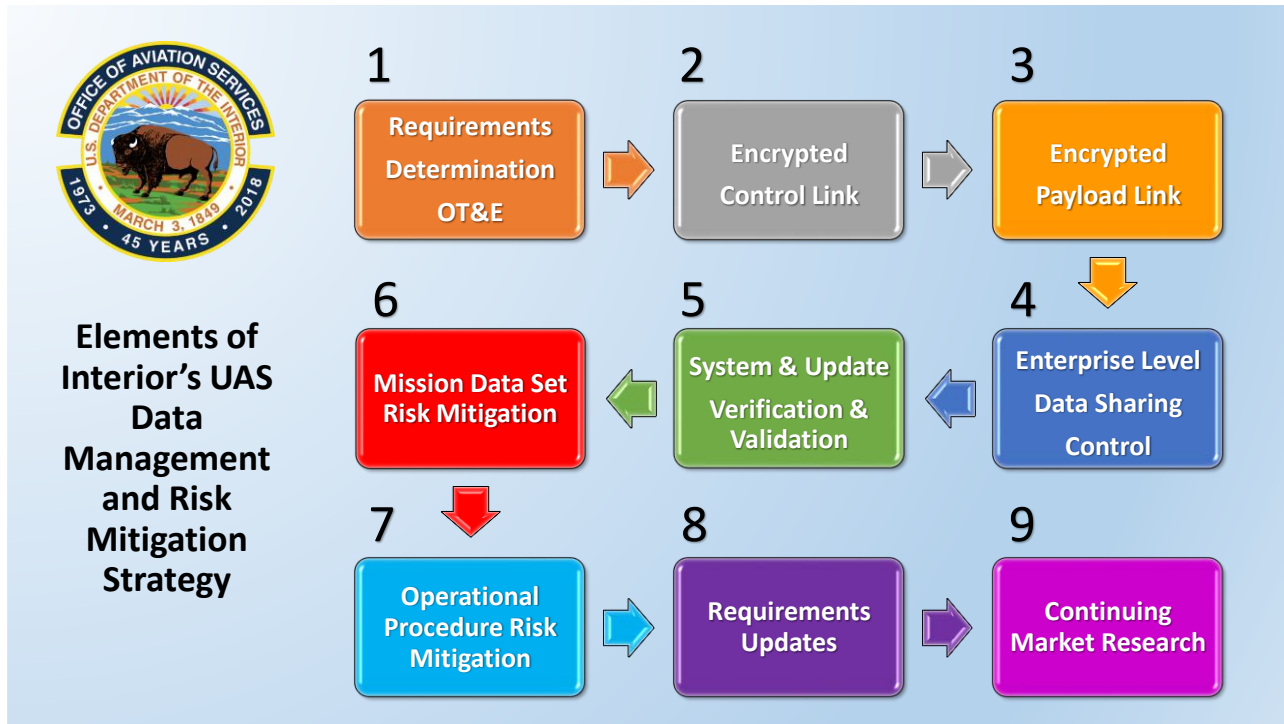
To date there have been 1,510 flights during the testing of the DJI Mavic Pro and M600 Pro test aircraft; 829 flights for the Mavic Pro and 681 flights for the M600 Pro.

To adequately assess Government Edition's data management enterprise control and security measures, OAS enlisted the help of industry and government partners experienced in this testing. To date, OAS has received positive reports of data security testing from one industry and one government partner. OAS has offered the opportunity for additional government agencies to conduct similar evaluations. As part of Interior's overarching UAS data management and risk mitigation strategy, Interior will subject all subsequent updates to Government Edition to enterprise data control and security assurance testing through at least one trusted partner (Block 5 on Figure 10).

Interior's UAS data management and risk mitigation strategy also includes "non-material" measures. Interior subject matter experts will develop mission data sets that include (a) publicly releasable, (b) sensitive, and (c) law enforcement/security sensitive data. Government Edition equipped UAS will only be employed on DOI missions that collect publicly releasable data (Block 6 on Figure 10). Interior will also employ a system of operational training and procedural risk mitigation measures that will ensure certified DOI UAS operators employing Government Edition equipped drones are trained in their use and follow strict protocols designed to support the embedded enterprise data management functionality (Block 7 on Figure 10). Lastly, Interior continues to update its UAS requirements based on mission experience and to

collaborate with industry to ensure mutual understanding of current and emerging requirements and available technology (Blocks 8 and 9 on Figure 10).

Figure 13. Elements of Interior’s UAS Data Management and Risk Mitigation Strategy.





## 2019 Outlook

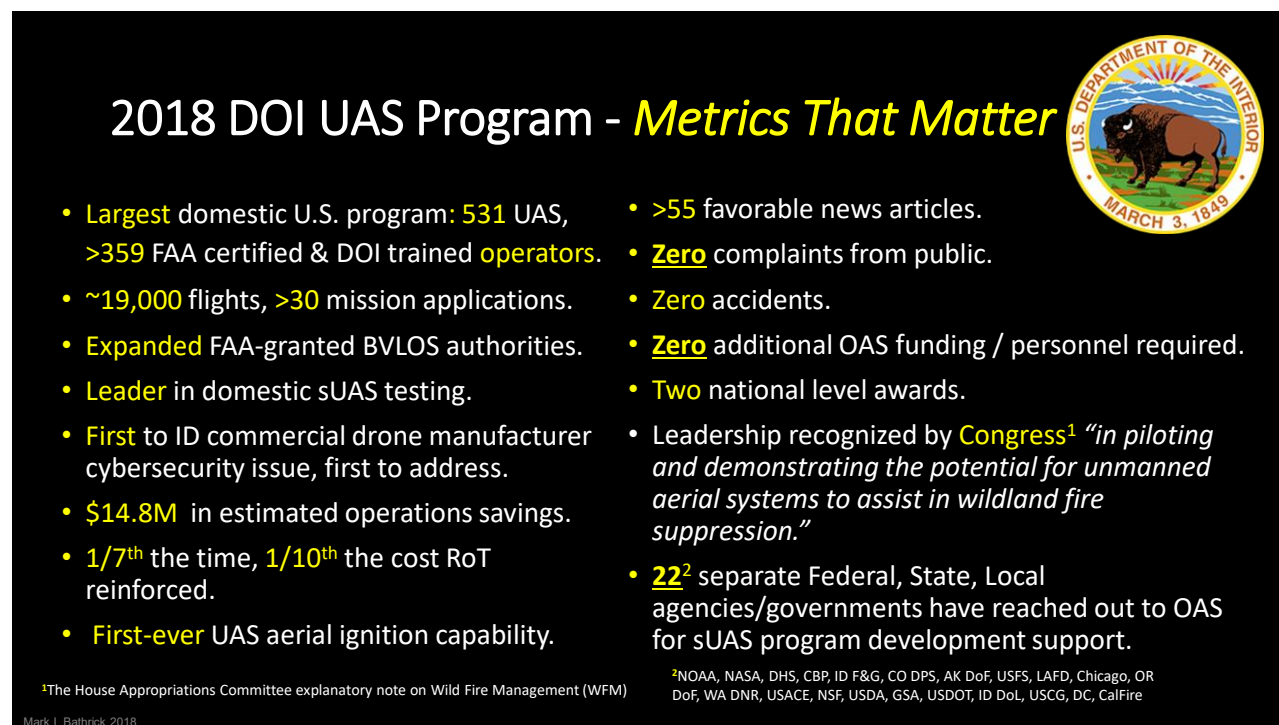
As was the case in 2017, 2018 was another record setting year for the Department's ["Drones for Good"](#) UAS program. A few of the many notable 2018 accomplishments included:

1. 108% increase in DOI UAS flights over 2017's record setting year.
2. Awarded the [first commercial contract for small UAS services](#).
3. Expanded the fleet to meet bureau-defined requirements with [the addition of a vertical takeoff and land capable UAS](#).
4. Demonstrated the [quick response and sustained natural disaster deployment capability of DOI UAS teams](#) in reaction to the Kilauea volcano eruption.
5. Developed and tested the first [DOI drone-based emergency equipment delivery](#).
6. Fielded the [first drone-based aerial ignition capability for wildland fire, enhancing firefighter safety and effectiveness through firsts in nighttime application and real time monitoring and outcome assessment](#).
7. Achieved [a 26% reduction in drone incursions on wildfire \(on top of a 14% reduction in 2017\) through an integrated interagency strategy](#).
8. Granted [expanded operating authorities from FAA, opening up an additional 12.9M acres to beyond visual line of sight \(BVLOS\) operations and increasing available visual line of sight \(VLOS\) and extended visual line of sight \(EVLOS\) coverage areas by orders of magnitude](#).
9. Continued to formalize interagency collaboration with the U.S. Department of Agriculture Forest Service (USDA-FS) with [USDA-FS acceptance of OAS carded UAS, remote pilots, and inspectors](#).
10. First federal agency to publish a comprehensive [Drone Mission Report](#).

In 2019, Interior will continue its tradition of adherence to rigorous, [mission-driven requirements](#), [disciplined program execution](#), continual improvement, [broad collaboration](#), [public transparency](#), and a [forward-leaning vision](#) that has served to solidify the Department's leadership in the domestic application of UAS technology.

In 2019, Interior will also continue its focus on the development and application of relevant, outcome-based metrics that matter.

Figure 14. *Metrics that matter* for DOI's UAS program.



The infographic features a black background with white and yellow text. The title '2018 DOI UAS Program - Metrics That Matter' is at the top left. The U.S. Department of the Interior seal is on the top right. A list of 15 metrics is arranged in two columns. At the bottom left, there is a small text credit: 'Mark L. Bathrick 2018'. At the bottom right, there are two footnotes: one for a House Appropriations Committee explanatory note and another for a list of agencies including NOAA, NASA, DHS, etc.

## 2018 DOI UAS Program - *Metrics That Matter*

- **Largest** domestic U.S. program: **531** UAS, **>359** FAA certified & DOI trained **operators**.
- **~19,000** flights, **>30** mission applications.
- **Expanded** FAA-granted BVLOS authorities.
- **Leader** in domestic sUAS testing.
- **First** to ID commercial drone manufacturer cybersecurity issue, first to address.
- **\$14.8M** in estimated operations savings.
- **1/7<sup>th</sup>** the time, **1/10<sup>th</sup>** the cost RoT reinforced.
- **First-ever** UAS aerial ignition capability.
- **>55** favorable news articles.
- **Zero** complaints from public.
- **Zero** accidents.
- **Zero** additional OAS funding / personnel required.
- **Two** national level awards.
- Leadership recognized by **Congress<sup>1</sup>** *"in piloting and demonstrating the potential for unmanned aerial systems to assist in wildland fire suppression."*
- **22<sup>2</sup>** separate Federal, State, Local agencies/governments have reached out to OAS for sUAS program development support.

<sup>1</sup>The House Appropriations Committee explanatory note on Wild Fire Management (WFM)

<sup>2</sup>NOAA, NASA, DHS, CBP, ID F&G, CO DPS, AK DoF, USFS, LAFD, Chicago, OR DoF, WA DNR, USACE, NSF, USDA, GSA, USDOT, ID DoL, USCG, DC, CalFire

Mark L. Bathrick 2018

Additional focus areas for Interior's [\*"Drones for Good"\*](#) UAS program in 2019 include:

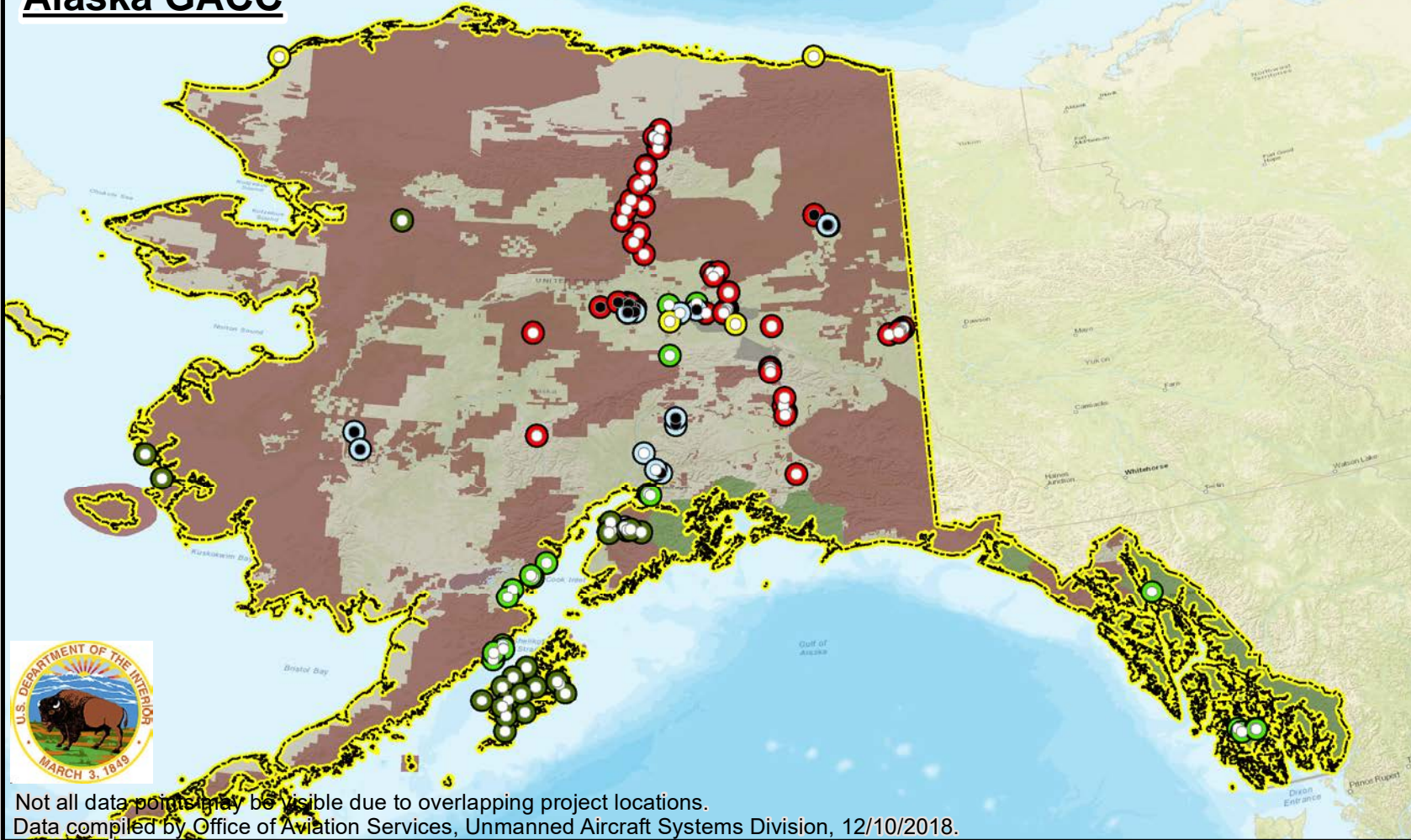
1. Continuing efforts to expand wildland fire UAS capabilities from support instruments for enhanced awareness and better decision making to [active aerial firefighting tools](#), capable of [initial](#) and extended attack during the average two-thirds of each day when traditional aircraft are unable to fly due to nighttime darkness or daytime periods of reduced visibility due to smoke. [Completing the development and testing](#) to effectively integrate [optionally piloted aircraft](#) into wildland firefighting is key to taking UAS to the next level as [direct attack](#) instruments in our firefighters' toolkits. It also addresses an important element called out in the [2019 Wildfire Technology Modernization legislation](#).
2. Collaborating with industry, academic, and interagency partners to continue development of practical, effective, and easily deployable technologies that enhance firefighter awareness and safety by putting critical information ["In Your Hand and On-Demand."](#) This also addresses a key element of [2019 Wildfire Technology Modernization legislation](#).
3. Furthering development of cloud-processing solutions and apply artificial intelligence to analyze data collected by DOI UAS.
4. Transforming fleet management processes to enhance reporting capability and scalability as the DOI UAS fleet continues to grow.
5. Continuing to enhancing the versatility of DOI's fleet through OAS's rapid sensor/payload prototyping and approval process.

## **Appendix A: Detailed Geographic Analysis Maps**

The Geographic Area Coordination Center (GACC) Mapbook can be found on the following 12 pages.

# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

## Alaska GACC



Not all data points may be visible due to overlapping project locations.  
Data compiled by Office of Aviation Services, Unmanned Aircraft Systems Division, 12/10/2018.

### Map Legend

#### Project Locations

- Controlling Agency (Dot Outline Color)

- USGS
- BLM
- OAS
- FWS
- BOR
- NPS
- OSMRE
- USFS
- BIA
- Other

- Project Type (Dot Center Color)

- Fire
- Volcano
- Hurricane
- Other / Project

- CWN Fire

#### Map Layers

- GACC Boundaries

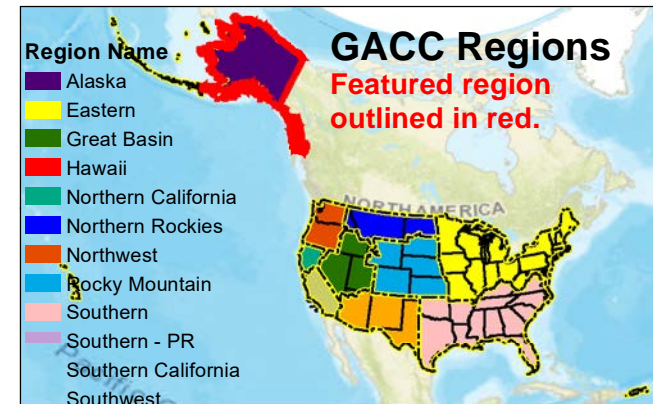
- Surface Ownership

- DOI
- FS
- Other Gov.

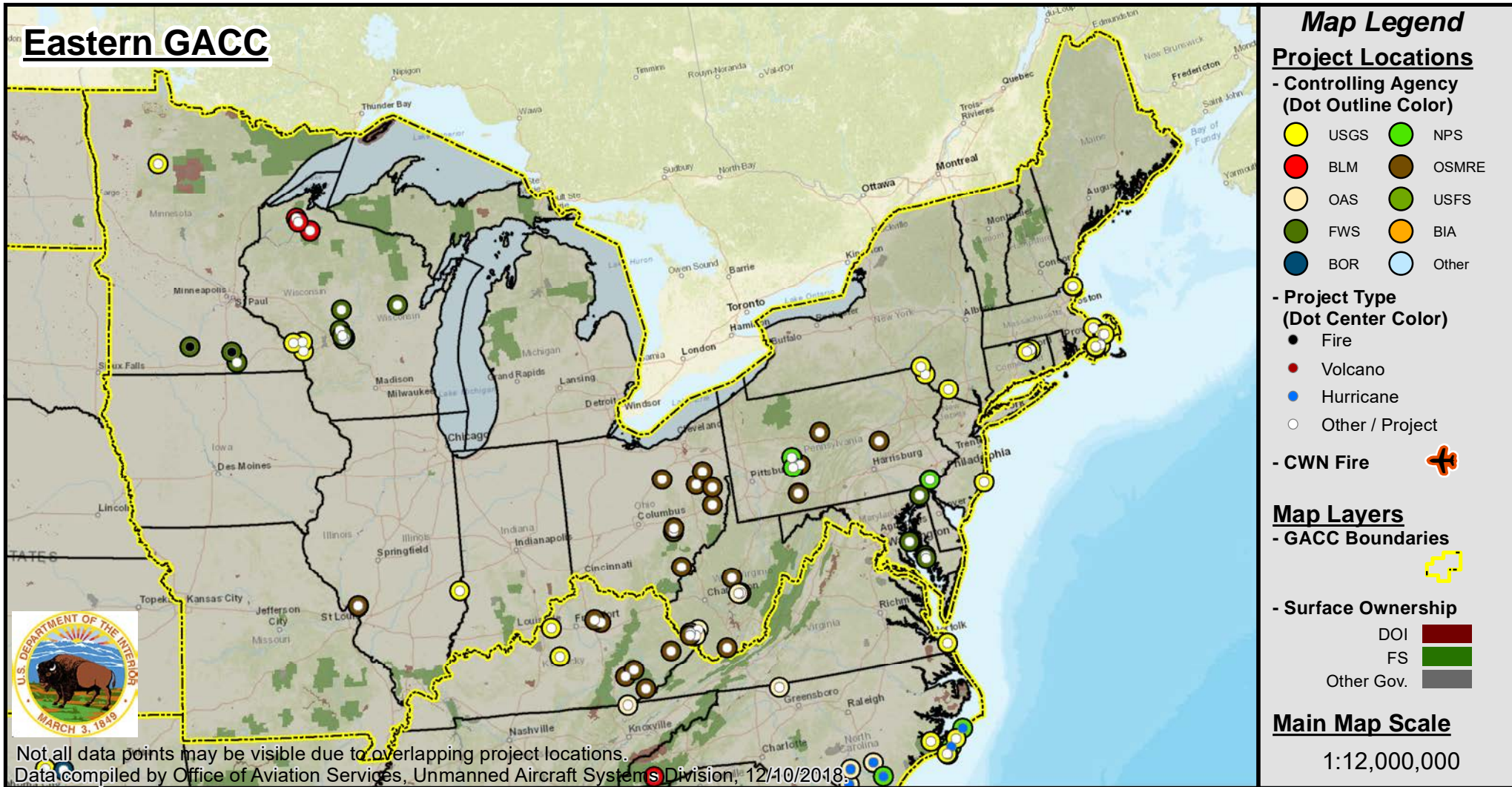
#### Main Map Scale

1:12,000,000

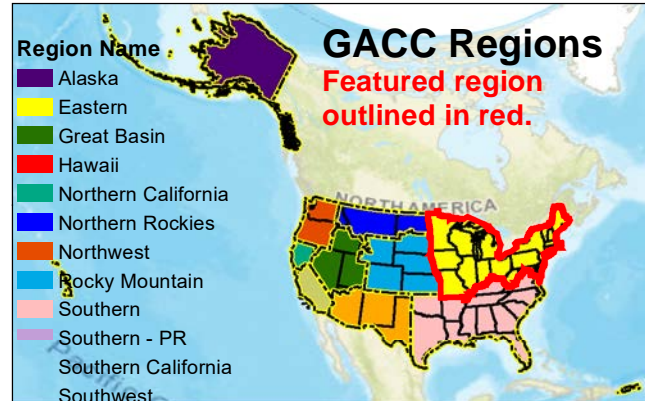
GACC	FY 2018 DOI UAS Flights by Bureau and GACC														FY18							
	BIA	BLM	USBR	USFWS	NPS	OAS	OSMRE	USFS	USGS	Other	GACC Total (FY18)	#	%									
	#	%	#	%	#	%	#	%	#	%	#	%	#	%								
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	143	15%	114	12%	988	10%		
Eastern	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Northern California	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	0	0%	44	0%
Northern Rockies	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%
Northwest	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%
Rocky Mountains	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%
Southern	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%
Southern - PR	0	0%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%
Southern California	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%
Southwest	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%
Other - OUS	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%



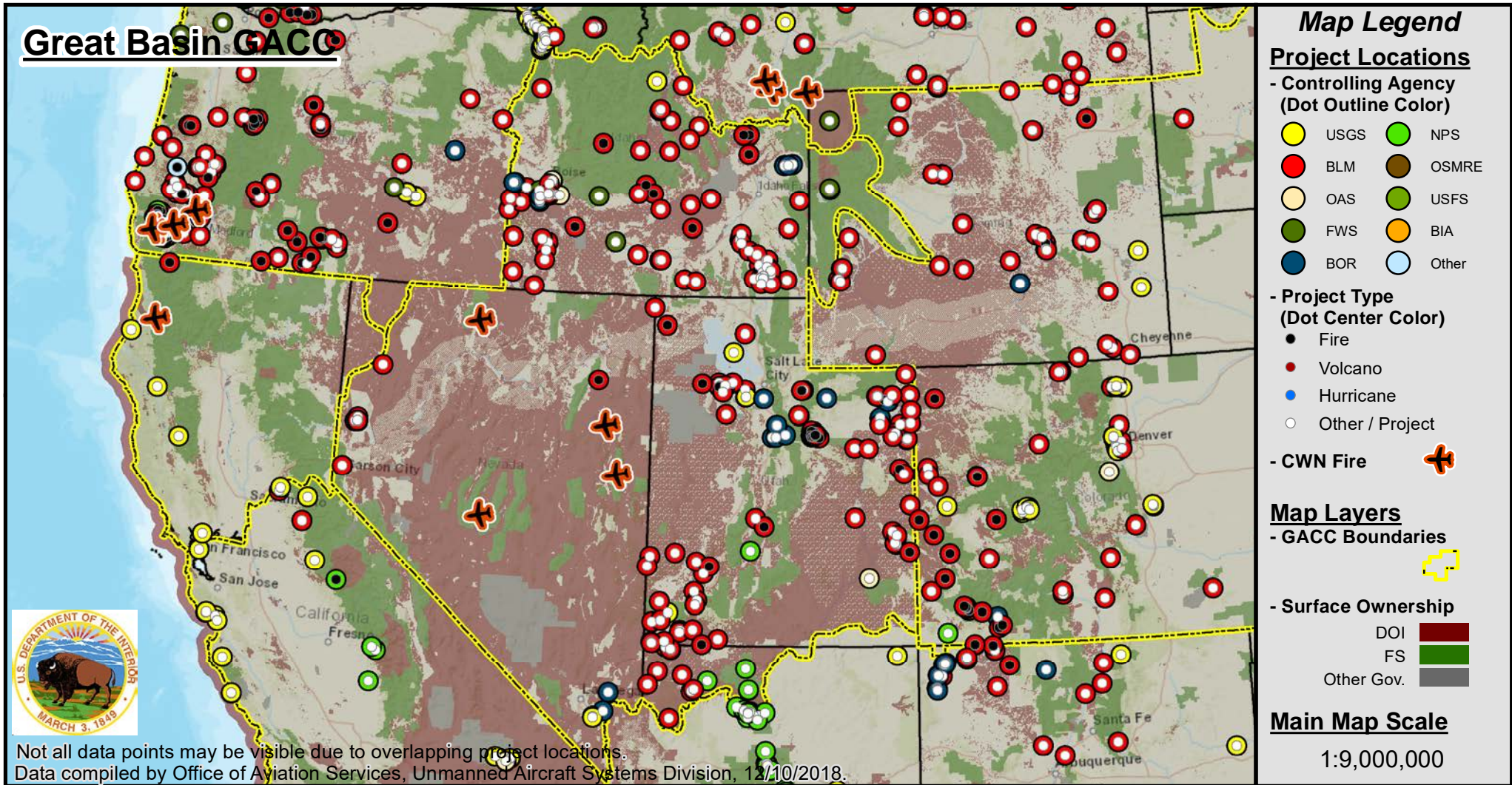
# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).



GACC	FY 2018 DOI UAS Flights by Bureau and GACC												FY18	
	BIA	BLM	USBR	USFWS	NPS	OAS	OSMRE	USFS	USGS	Other	GACC Total	#	%	
Alaska	0 0%	408 41%	0 0%	205 21%	118 12%	0 0%	0 0%	0 0%	143 15%	114 12%	988	10%		
Eastern	0 0%	5 1%	0 0%	86 17%	40 8%	19 4%	106 21%	0 0%	239 48%	0 0%	495	5%		
Great Basin	16 1%	982 55%	370 21%	196 11%	19 1%	61 3%	0 0%	17 1%	111 6%	0 0%	1,772	17%		
Hawaii	0 0%	41 3%	0 0%	48 3%	0 0%	318 22%	0 0%	0 0%	1,067 72%	0 0%	1,474	14%		
Northern California	0 0%	2 5%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	42 96%	0 0%	44	0%		
Northern Rockies	8 1%	440 69%	16 3%	11 2%	0 0%	1 0%	0 0%	1 0%	156 24%	8 1%	641	6%		
Northwest	10 1%	828 56%	41 3%	83 6%	8 1%	242 16%	0 0%	0 0%	149 10%	119 8%	1,480	14%		
Rocky Mountains	0 0%	648 54%	112 9%	17 1%	24 2%	39 3%	0 0%	0 0%	351 30%	0 0%	1,191	12%		
Southern	13 2%	55 6%	53 6%	302 34%	36 4%	30 3%	13 2%	48 5%	334 38%	0 0%	884	9%		
Southern - PR	0 0%	0 0%	0 0%	0 0%	11 19%	0 0%	0 0%	0 0%	47 81%	0 0%	58	1%		
Southern California	0 0%	6 2%	27 9%	0 0%	20 6%	5 2%	0 0%	0 0%	261 82%	0 0%	319	3%		
Southwest	13 1%	480 50%	162 17%	11 1%	170 18%	7 1%	0 0%	12 1%	115 12%	0 0%	970	9%		
Other - OUS	0 0%	0 0%	0 0%	26 100%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	26	0%		

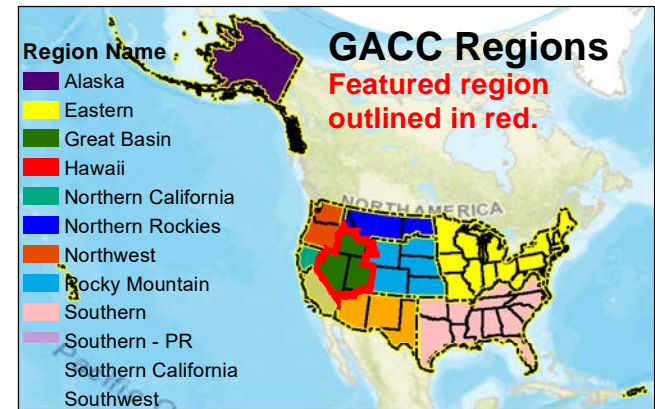


# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).



FY 2018 DOI UAS Flights by Bureau and GACC

GACC	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other		FY18 GACC Total (FY18)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	0	0%	143	15%	114	12%	988	10%
Eastern	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Northern California	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	44	0%
Northern Rockies	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%
Northwest	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%
Rocky Mountains	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%
Southern	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%
Southern - PR	0	0%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%
Southern California	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%
Southwest	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%
Other - OUS	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%



# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

## Hawaii GACC



Not all data points may be visible due to overlapping project locations.  
Data compiled by Office of Aviation Services, Unmanned Aircraft Systems Division, 12/10/2018.

### Map Legend

#### Project Locations

- Controlling Agency (Dot Outline Color)

- USGS
- NPS
- BLM
- OSMRE
- OAS
- USFS
- FWS
- BIA
- BOR
- Other

- Project Type (Dot Center Color)

- Fire
- Volcano
- Hurricane
- Other / Project

- CWN Fire

#### Map Layers

- GACC Boundaries

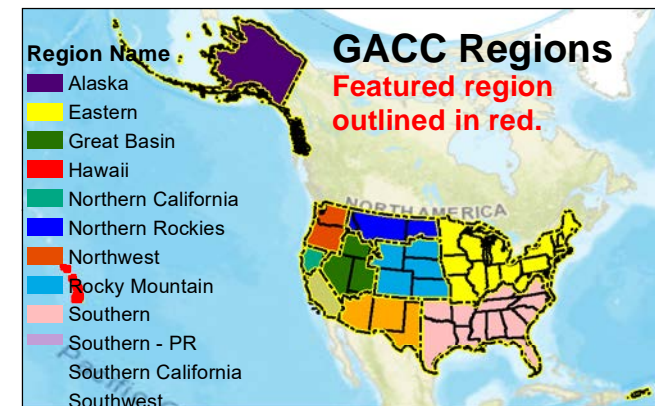
- Surface Ownership

- DOI ■
- FS ■
- Other Gov. ■

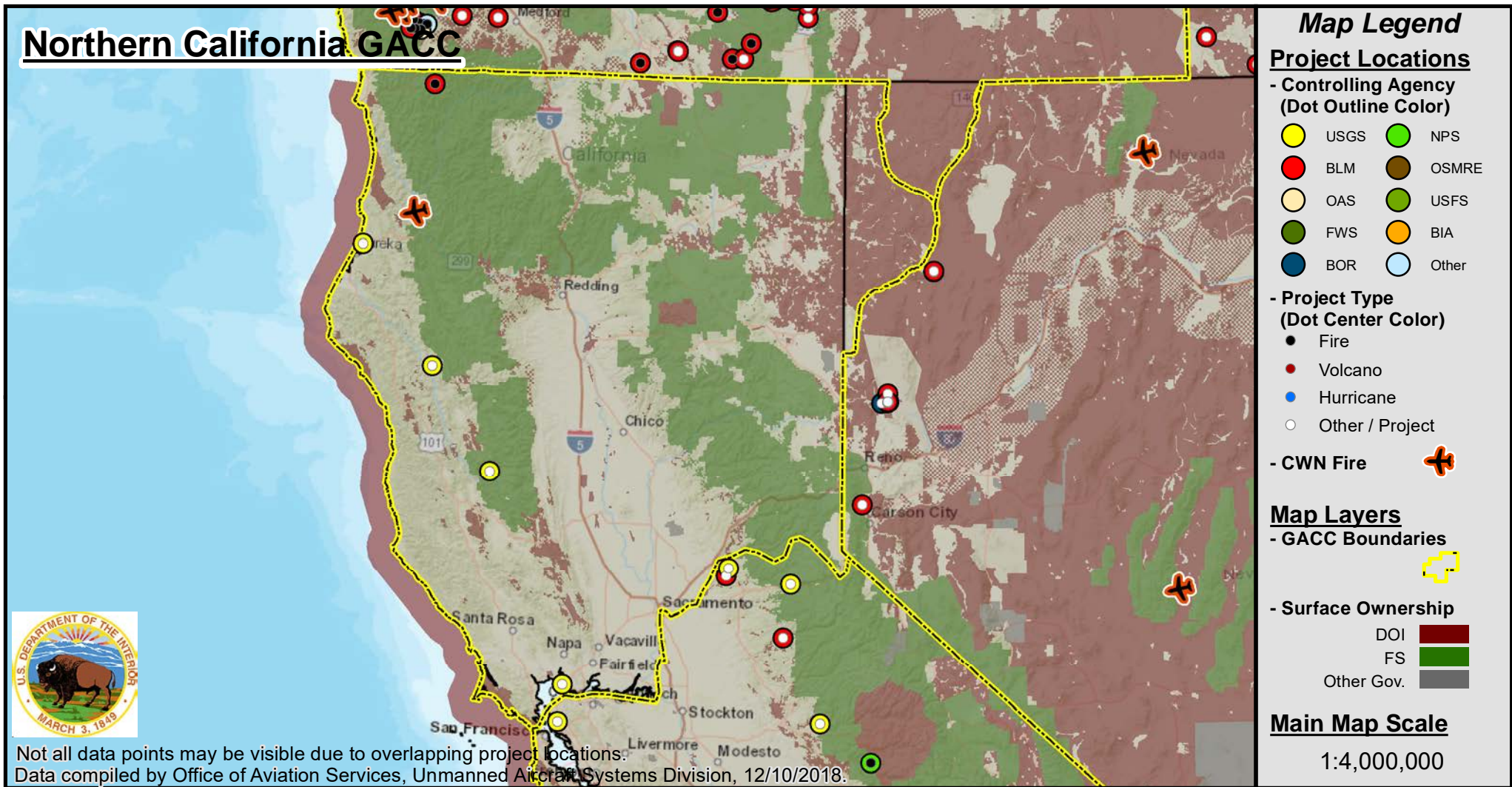
#### Main Map Scale

1:3,500,000

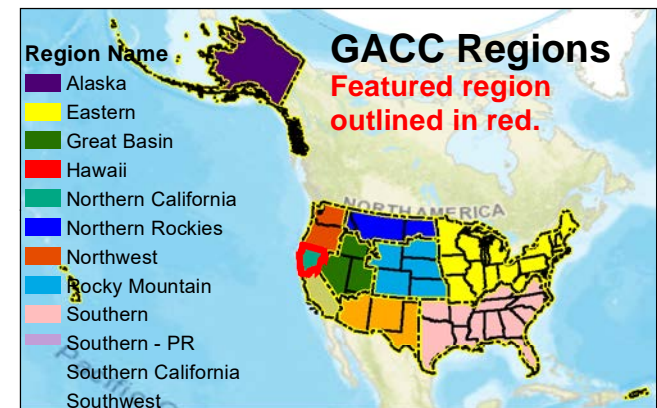
GACC	FY 2018 DOI UAS Flights by Bureau and GACC												FY18	
	BIA # %	BLM # %	USBR # %	USFWS # %	NPS # %	OAS # %	OSMRE # %	USFS # %	USGS # %	Other # %	GACC Total # %	GACC Total # %	GACC Total # %	
Alaska	0 0%	408 41%	0 0%	205 21%	118 12%	0 0%	0 0%	0 0%	143 15%	114 12%	988 10%	988 10%	988 10%	
Eastern	0 0%	5 1%	0 0%	86 17%	40 8%	19 4%	106 21%	0 0%	239 48%	0 0%	495 5%	495 5%	495 5%	
Great Basin	16 1%	982 55%	370 21%	196 11%	19 1%	61 3%	0 0%	17 1%	111 6%	0 0%	1,772 17%	1,772 17%	1,772 17%	
Hawaii	0 0%	41 3%	0 0%	48 3%	0 0%	318 22%	0 0%	0 0%	1,067 72%	0 0%	1,474 14%	1,474 14%	1,474 14%	
Northern California	0 0%	2 5%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	42 96%	0 0%	44 0%	44 0%	44 0%	
Northern Rockies	8 1%	440 69%	16 3%	11 2%	0 0%	1 0%	0 0%	1 0%	156 24%	8 1%	641 6%	641 6%	641 6%	
Northwest	10 1%	828 56%	41 3%	83 6%	8 1%	242 16%	0 0%	0 0%	149 10%	119 8%	1,480 14%	1,480 14%	1,480 14%	
Rocky Mountains	0 0%	648 54%	112 9%	17 1%	24 2%	39 3%	0 0%	0 0%	351 30%	0 0%	1,191 12%	1,191 12%	1,191 12%	
Southern	13 2%	55 6%	53 6%	302 34%	36 4%	30 3%	13 2%	48 5%	334 38%	0 0%	884 9%	884 9%	884 9%	
Southern - PR	0 0%	0 0%	0 0%	0 0%	11 19%	0 0%	0 0%	0 0%	47 81%	0 0%	58 1%	58 1%	58 1%	
Southern California	0 0%	6 2%	27 9%	0 0%	20 6%	5 2%	0 0%	0 0%	261 82%	0 0%	319 3%	319 3%	319 3%	
Southwest	13 1%	480 50%	162 17%	11 1%	170 18%	7 1%	0 0%	12 1%	115 12%	0 0%	970 9%	970 9%	970 9%	
Other - OUS	0 0%	0 0%	0 0%	26 100%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	26 0%	26 0%	26 0%	



# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

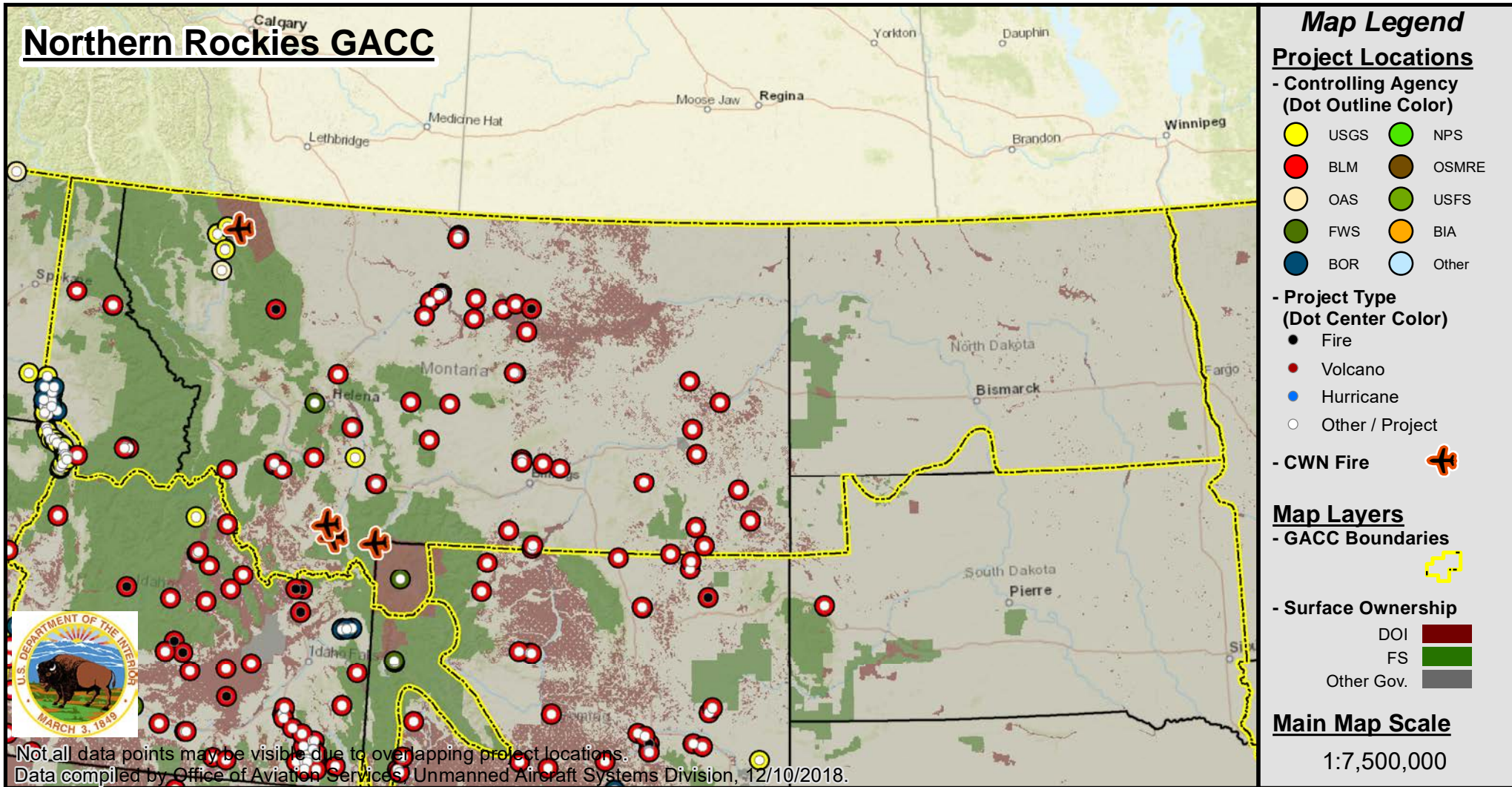


GACC	FY 2018 DOI UAS Flights by Bureau and GACC														FY18							
	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other		GACC Total (FY18)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%		
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	0	0%	143	15%	114	12%	988	10%
Eastern	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Northern California	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	44	0%
Northern Rockies	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%
Northwest	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%
Rocky Mountains	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%
Southern	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%
Southern - PR	0	0%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%
Southern California	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%
Southwest	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%
Other - OUS	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%

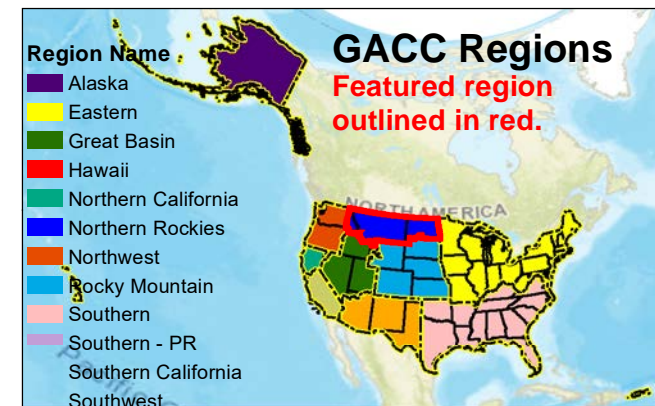




# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

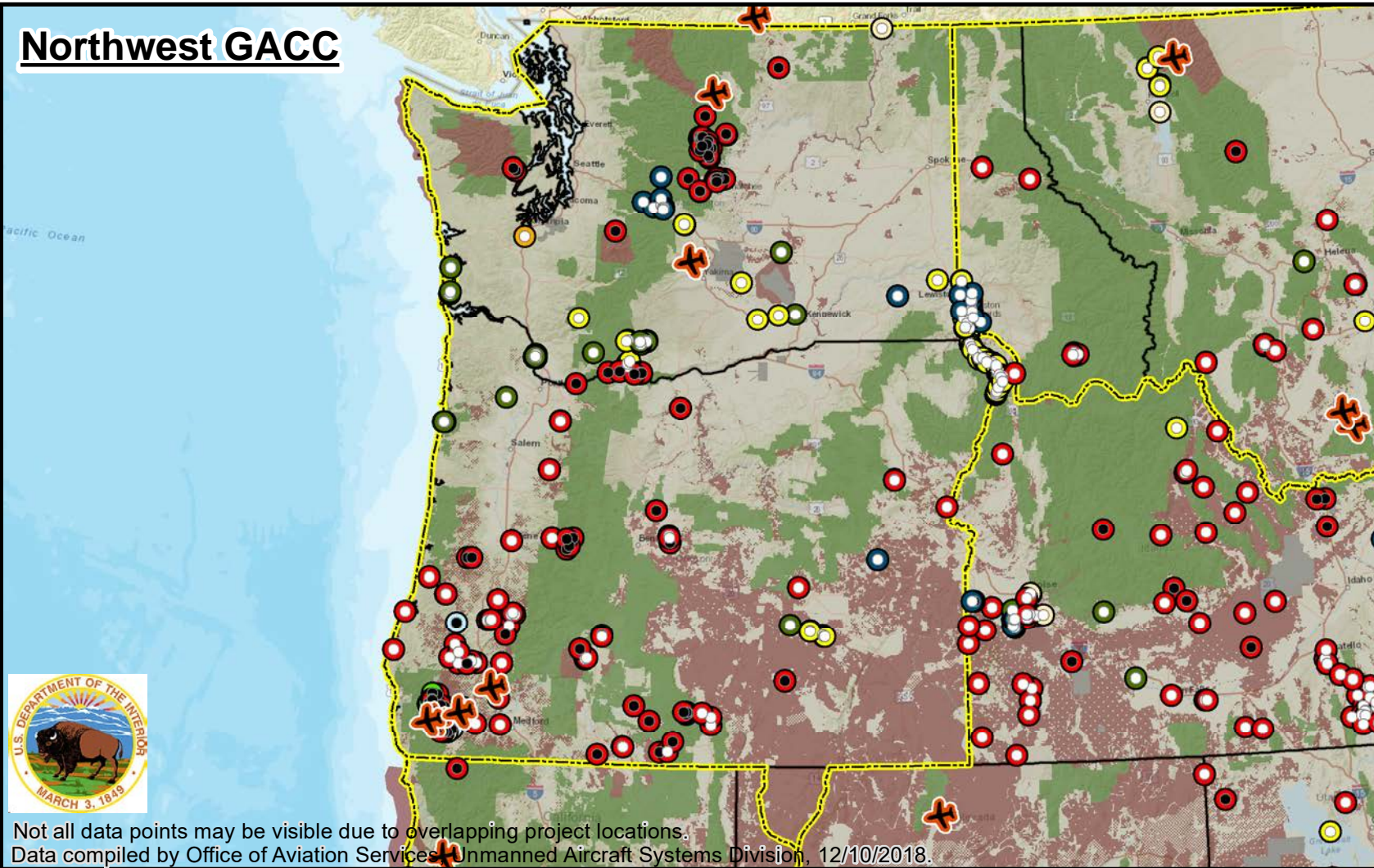


GACC	FY 2018 DOI UAS Flights by Bureau and GACC														FY18							
	BIA	BLM	USBR	USFWS	NPS	OAS	OSMRE	USFS	USGS	Other	GACC Total (FY18)	#	%									
	#	%	#	%	#	%	#	%	#	%	#	%	#	%								
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	143	15%	114	12%	988	10%		
Eastern	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Northern California	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	0	0%	44	0%
Northern Rockies	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%
Northwest	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%
Rocky Mountains	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%
Southern	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%
Southern - PR	0	0%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%
Southern California	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%
Southwest	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%
Other - OUS	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%



# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

## Northwest GACC



### Map Legend

#### Project Locations

- Controlling Agency (Dot Outline Color)

- USGS (Yellow)
- NPS (Light Green)
- BLM (Red)
- OSMRE (Brown)
- OAS (White)
- USFS (Dark Green)
- FWS (Olive)
- BIA (Orange)
- BOR (Blue)
- Other (Light Blue)

- Project Type (Dot Center Color)

- Fire (Black)
- Volcano (Red)
- Hurricane (Blue)
- Other / Project (White)

- CWN Fire (Orange cross symbol)

#### Map Layers

- GACC Boundaries (Yellow dashed line)

- Surface Ownership

- DOI (Dark Red)
- FS (Green)
- Other Gov. (Grey)

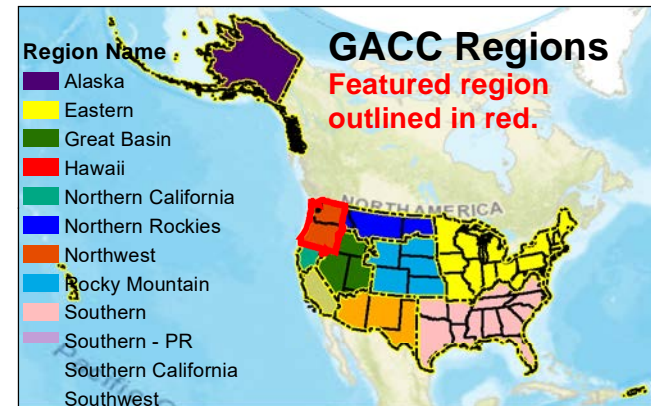
#### Main Map Scale

1:6,500,000

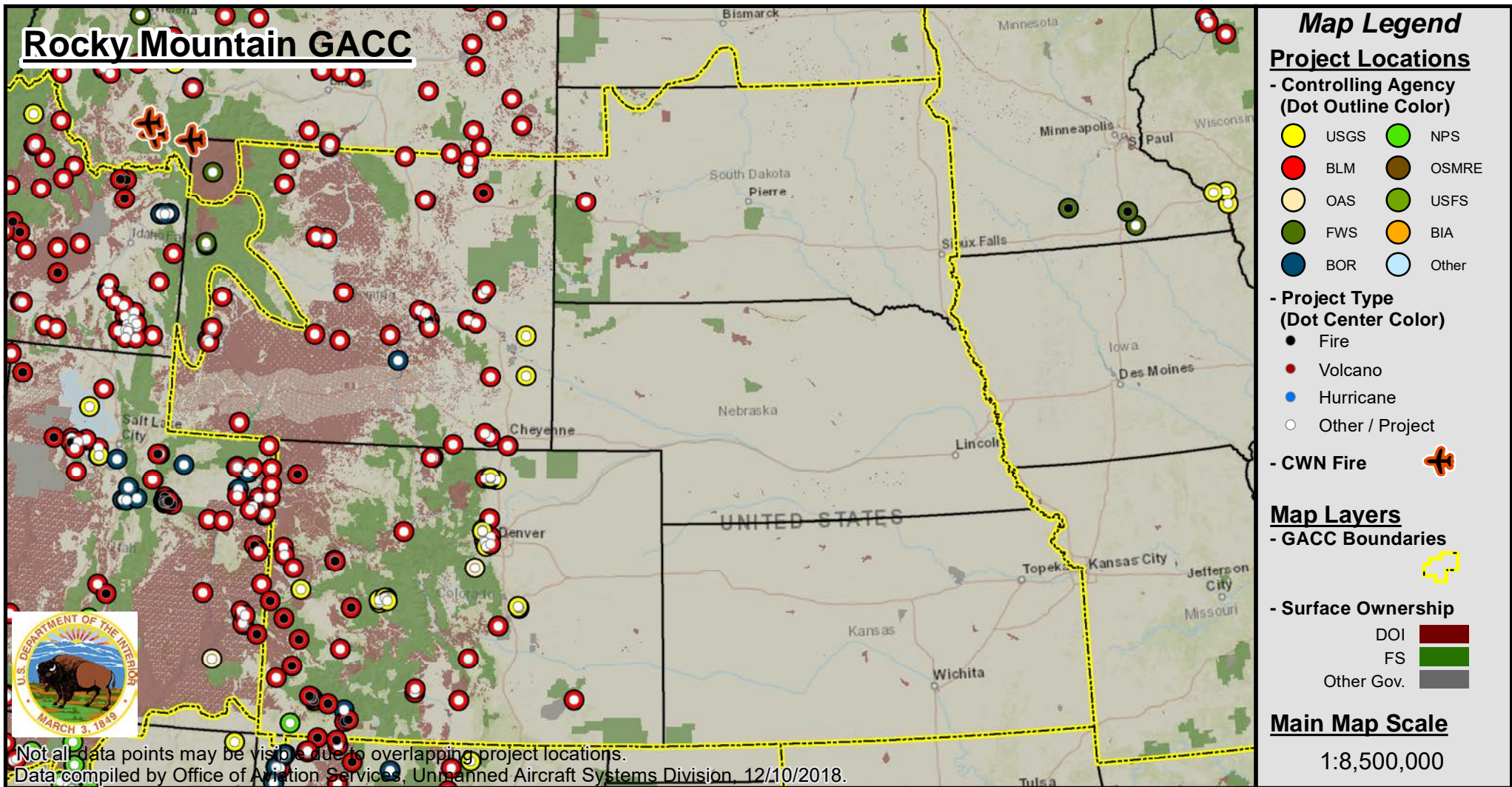


Not all data points may be visible due to overlapping project locations.  
 Data compiled by Office of Aviation Services, Unmanned Aircraft Systems Division, 12/10/2018.

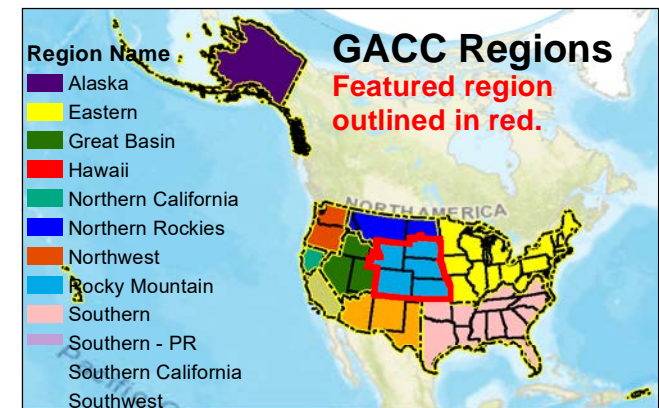
GACC	FY 2018 DOI UAS Flights by Bureau and GACC														FY18							
	BIA	BLM	USBR	USFWS	NPS	OAS	OSMRE	USFS	USGS	Other	#	%	#	%								
Alaska	0	408	0	205	118	0	0	0	143	114	988	0%	41%	0%	21%	12%	0%	0%	0%	15%	12%	10%
Eastern	0	5	0	86	40	19	106	0	239	0	495	0%	1%	0%	17%	8%	4%	21%	0%	48%	0%	5%
Great Basin	16	982	370	196	19	61	17	111	6	0	1,772	1%	55%	21%	11%	1%	3%	1%	6%	0%	0%	17%
Hawaii	0	41	0	48	0	318	0	1,067	72%	0	1,474	0%	3%	0%	3%	0%	22%	0%	72%	0%	0%	14%
Northern California	0	2	0	0	0	0	0	42	96%	0	44	0%	5%	0%	0%	0%	0%	0%	96%	0%	0%	0%
Northern Rockies	8	440	16	11	0	1	1	156	24%	8	641	1%	69%	3%	2%	0%	0%	0%	24%	1%	6%	6%
Northwest	10	828	41	83	8	242	0	149	10%	119	1,480	1%	56%	3%	6%	1%	16%	0%	10%	8%	14%	14%
Rocky Mountains	0	648	112	17	24	39	0	351	30%	0	1,191	0%	54%	9%	1%	2%	3%	0%	30%	0%	0%	12%
Southern	13	55	53	302	36	30	13	48	5%	334	884	2%	6%	6%	34%	4%	3%	2%	5%	5%	0%	9%
Southern - PR	0	0	0	0	11	0	0	47	81%	0	58	0%	0%	0%	0%	19%	0%	0%	81%	0%	0%	1%
Southern California	0	6	27	0	20	5	0	261	82%	0	319	0%	2%	9%	0%	6%	2%	0%	82%	0%	0%	3%
Southwest	13	480	162	11	170	7	0	115	12%	0	970	1%	50%	17%	1%	18%	1%	0%	12%	0%	0%	9%
Other - OUS	0	0	0	26	0	0	0	0	0%	0	26	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%



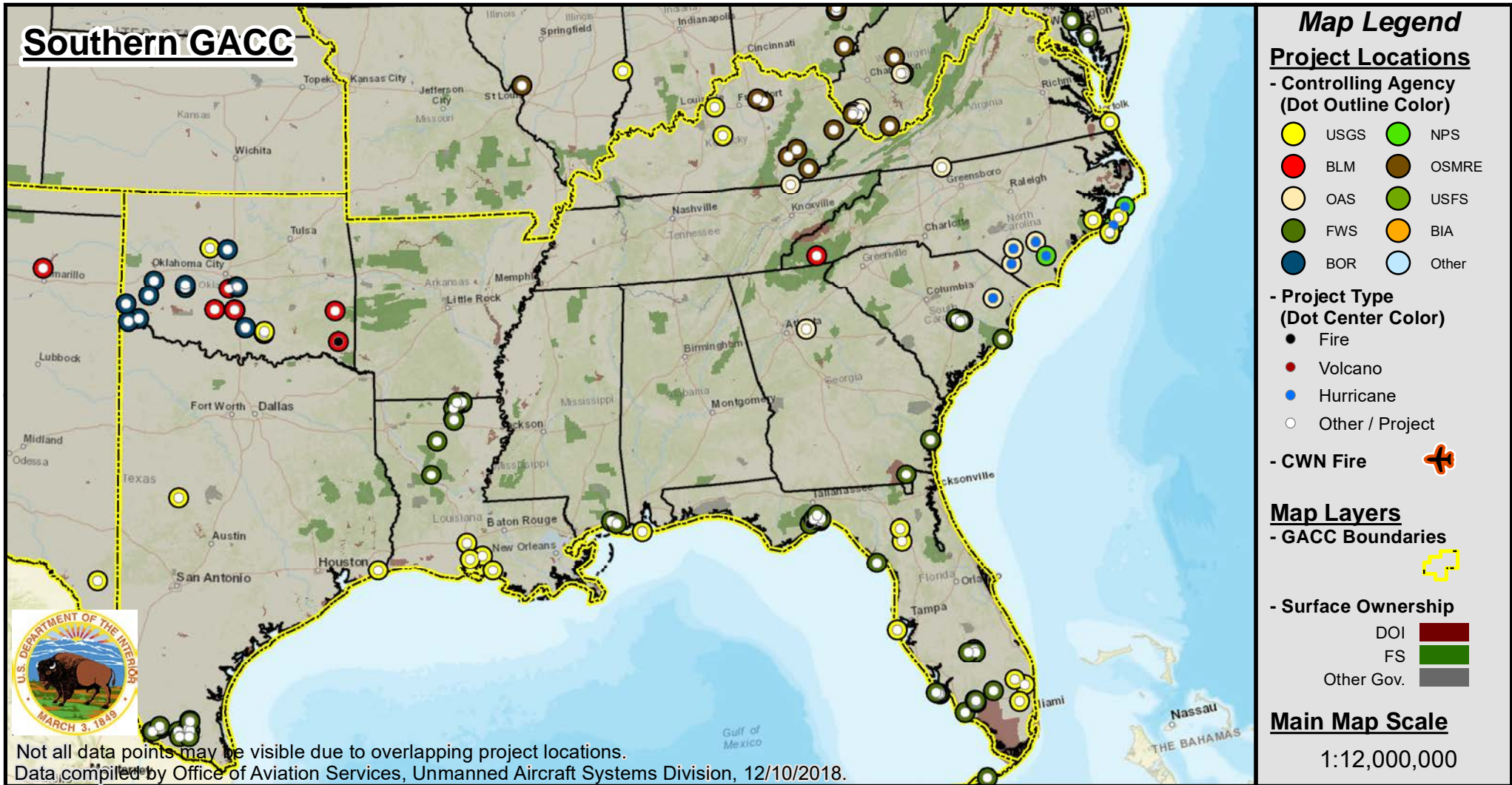
# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).



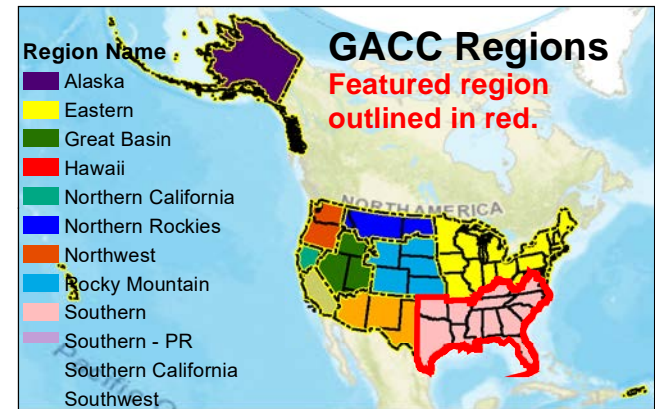
GACC	FY 2018 DOI UAS Flights by Bureau and GACC												FY18	
	BIA	BLM	USBR	USFWS	NPS	OAS	OSMRE	USFS	USGS	Other	GACC Total	#	%	
Alaska	0 0%	408 41%	0 0%	205 21%	118 12%	0 0%	0 0%	0 0%	143 15%	114 12%	988	10%		
Eastern	0 0%	5 1%	0 0%	86 17%	40 8%	19 4%	106 21%	0 0%	239 48%	0 0%	495	5%		
Great Basin	16 1%	982 55%	370 21%	196 11%	19 1%	61 3%	0 0%	17 1%	111 6%	0 0%	1,772	17%		
Hawaii	0 0%	41 3%	0 0%	48 3%	0 0%	318 22%	0 0%	0 0%	1,067 72%	0 0%	1,474	14%		
Northern California	0 0%	2 5%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	42 96%	0 0%	44	0%		
Northern Rockies	8 1%	440 69%	16 3%	11 2%	0 0%	1 0%	0 0%	1 0%	156 24%	8 1%	641	6%		
Northwest	10 1%	828 56%	41 3%	83 6%	8 1%	242 16%	0 0%	0 0%	149 10%	119 8%	1,480	14%		
Rocky Mountains	0 0%	648 54%	112 9%	17 1%	24 2%	39 3%	0 0%	0 0%	351 30%	0 0%	1,191	12%		
Southern	13 2%	55 6%	53 6%	302 34%	36 4%	30 3%	13 2%	48 5%	334 38%	0 0%	884	9%		
Southern - PR	0 0%	0 0%	0 0%	0 0%	11 19%	0 0%	0 0%	0 0%	47 81%	0 0%	58	1%		
Southern California	0 0%	6 2%	27 9%	0 0%	20 6%	5 2%	0 0%	0 0%	261 82%	0 0%	319	3%		
Southwest	13 1%	480 50%	162 17%	11 1%	170 18%	7 1%	0 0%	12 1%	115 12%	0 0%	970	9%		
Other - OUS	0 0%	0 0%	0 0%	26 100%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	26	0%		



# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

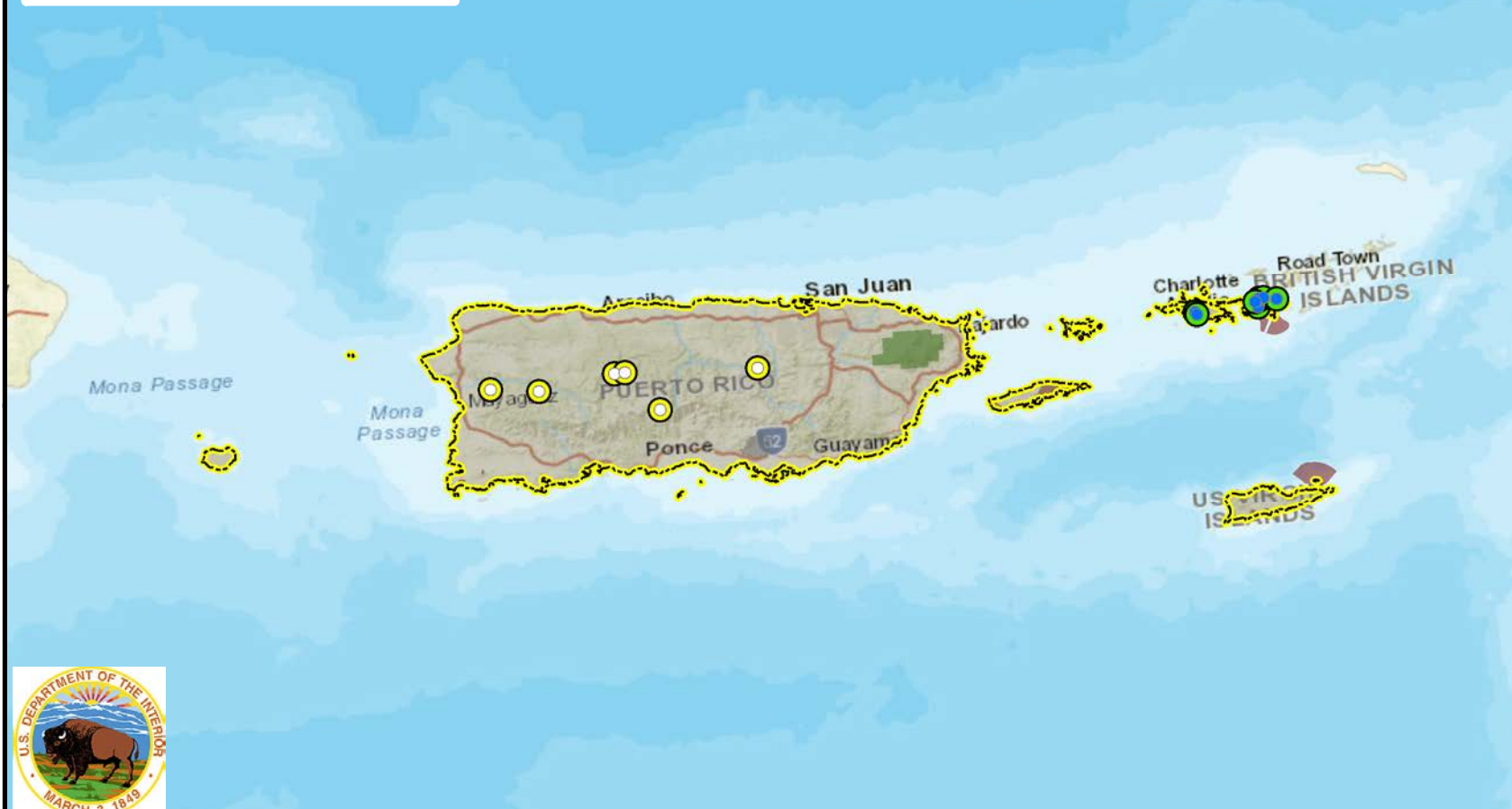


GACC	FY 2018 DOI UAS Flights by Bureau and GACC												FY18	
	BIA	BLM	USBR	USFWS	NPS	OAS	OSMRE	USFS	USGS	Other	GACC Total	#	%	
Alaska	0 0%	408 41%	0 0%	205 21%	118 12%	0 0%	0 0%	0 0%	143 15%	114 12%	988 10%	988	10%	
Eastern	0 0%	5 1%	0 0%	86 17%	40 8%	19 4%	106 21%	0 0%	239 48%	0 0%	495 5%	495	5%	
Great Basin	16 1%	982 55%	370 21%	196 11%	19 1%	61 3%	0 0%	17 1%	111 6%	0 0%	1,772 17%	1,772	17%	
Hawaii	0 0%	41 3%	0 0%	48 3%	0 0%	318 22%	0 0%	0 0%	1,067 72%	0 0%	1,474 14%	1,474	14%	
Northern California	0 0%	2 5%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	42 96%	0 0%	44 0%	44	0%	
Northern Rockies	8 1%	440 69%	16 3%	11 2%	0 0%	1 0%	0 0%	1 0%	156 24%	8 1%	641 6%	641	6%	
Northwest	10 1%	828 56%	41 3%	83 6%	8 1%	242 16%	0 0%	0 0%	149 10%	119 8%	1,480 14%	1,480	14%	
Rocky Mountains	0 0%	648 54%	112 9%	17 1%	24 2%	39 3%	0 0%	0 0%	351 30%	0 0%	1,191 12%	1,191	12%	
Southern	13 2%	55 6%	53 6%	302 34%	36 4%	30 3%	13 2%	48 5%	334 38%	0 0%	884 9%	884	9%	
Southern - PR	0 0%	0 0%	0 0%	0 0%	11 19%	0 0%	0 0%	0 0%	47 81%	0 0%	58 1%	58	1%	
Southern California	0 0%	6 2%	27 9%	0 0%	20 6%	5 2%	0 0%	0 0%	261 82%	0 0%	319 3%	319	3%	
Southwest	13 1%	480 50%	162 17%	11 1%	170 18%	7 1%	0 0%	12 1%	115 12%	0 0%	970 9%	970	9%	
Other - OUS	0 0%	0 0%	0 0%	26 100%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	26 0%	26	0%	



# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

## Southern - PR GACC



Not all data points may be visible due to overlapping project locations.  
Data compiled by Office of Aviation Services, Unmanned Aircraft Systems Division, 12/10/2018.

### Map Legend

#### Project Locations

- Controlling Agency (Dot Outline Color)

- USGS
- BLM
- OAS
- FWS
- BOR
- NPS
- OSMRE
- USFS
- BIA
- Other

- Project Type (Dot Center Color)

- Fire
- Volcano
- Hurricane
- Other / Project

- CWN Fire

#### Map Layers

- GACC Boundaries

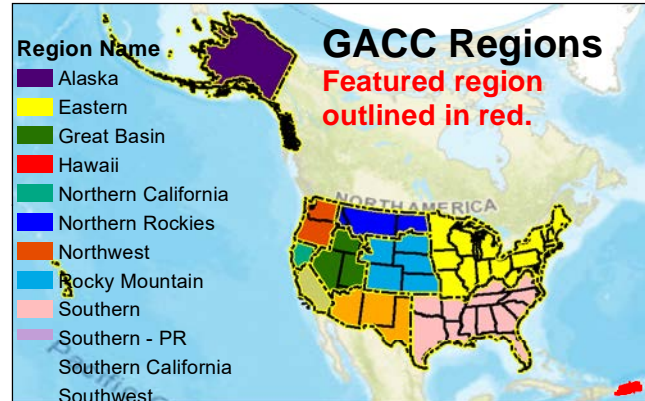
- Surface Ownership

- DOI
- FS
- Other Gov.

#### Main Map Scale

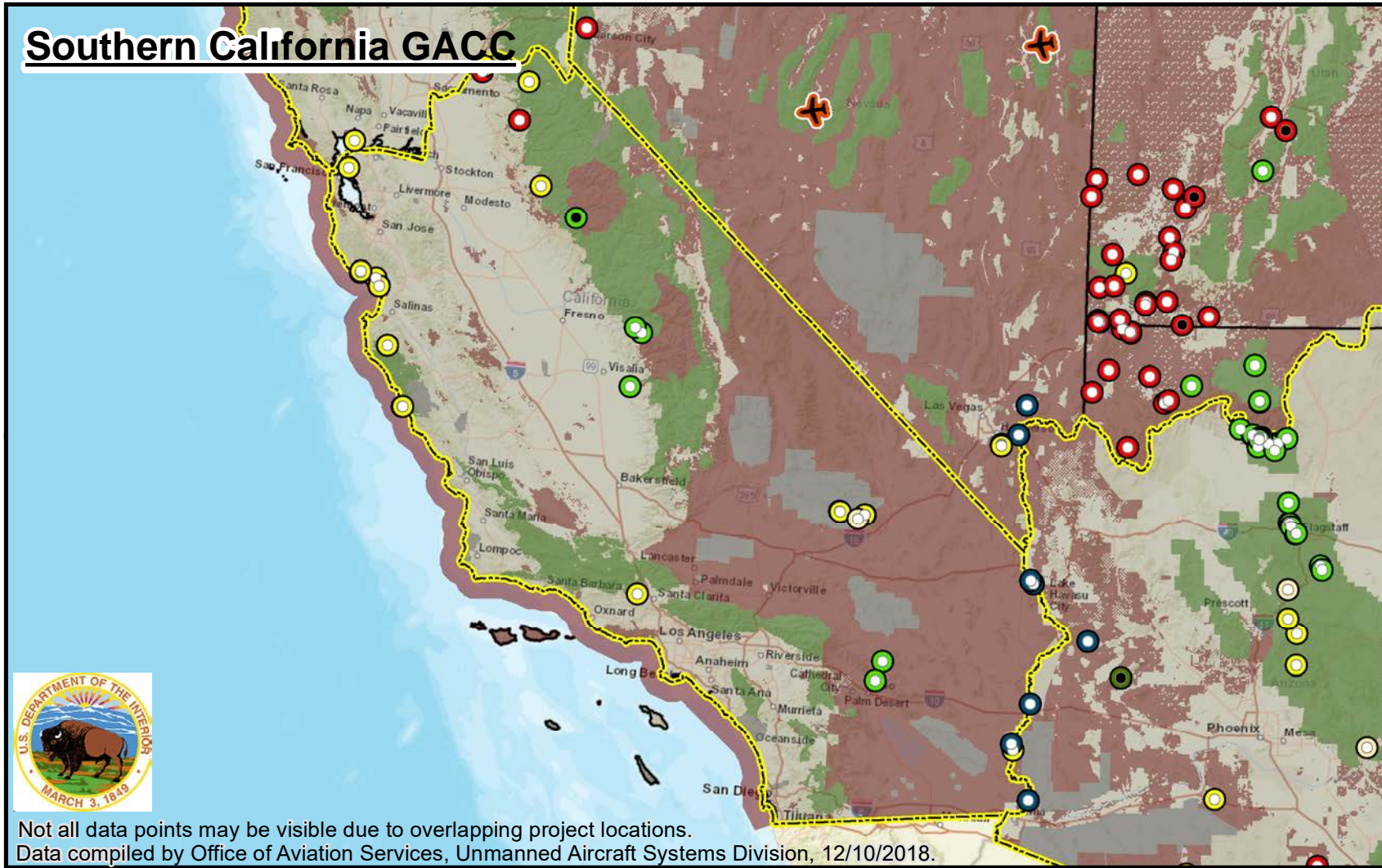
1:2,250,000

GACC	FY 2018 DOI UAS Flights by Bureau and GACC														FY18																		
	BIA	BLM	USBR	USFWS	NPS	OAS	OSMRE	USFS	USGS	Other	#	%	#	%																			
Alaska	0	408	0	205	118	0	0	143	114	988	10%	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	143	15%	114	12%	988	10%		
Eastern	0	5	0	86	40	19	106	239	0	495	5%	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	982	370	196	19	61	17	111	0	1,772	17%	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%
Hawaii	0	41	0	48	0	318	0	1,067	0	1,474	14%	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Northern California	0	2	0	0	0	0	0	42	0	44	0%	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	44	0%
Northern Rockies	8	440	16	11	0	1	1	156	8	641	6%	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%
Northwest	10	828	41	83	8	242	0	149	119	1,480	14%	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%
Rocky Mountains	0	648	112	17	24	39	0	351	0	1,191	12%	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%
Southern	13	55	53	302	36	30	48	334	0	884	9%	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%
Southern - PR	0	0	0	0	11	0	0	47	0	58	1%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%
Southern California	0	6	27	0	20	5	0	261	0	319	3%	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%
Southwest	13	480	162	11	170	7	12	115	0	970	9%	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%
Other - OUS	0	0	0	26	0	0	0	0	0	26	0%	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%		



# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).

## Southern California GACC



### Map Legend

#### Project Locations

- Controlling Agency (Dot Outline Color)

- USGS (Yellow)
- NPS (Light Green)
- BLM (Red)
- OSMRE (Brown)
- OAS (White)
- USFS (Dark Green)
- FWS (Dark Green)
- BIA (Orange)
- BOR (Blue)
- Other (White)

- Project Type (Dot Center Color)

- Fire (Black)
- Volcano (Red)
- Hurricane (Blue)
- Other / Project (White)

- CWN Fire (Orange cross symbol)

#### Map Layers

- GACC Boundaries (Yellow dashed line)

- Surface Ownership

- DOI (Dark Red)
- FS (Green)
- Other Gov. (Grey)

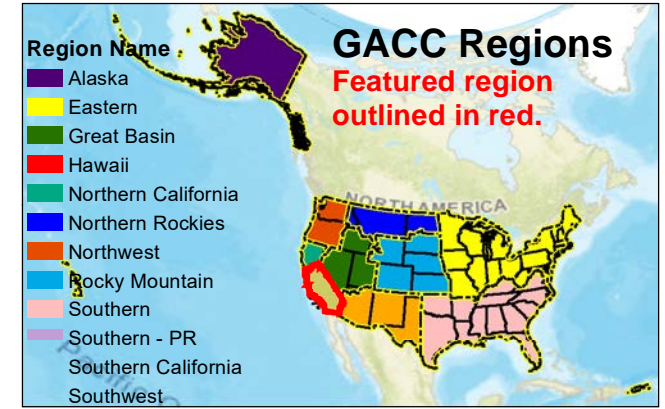
#### Main Map Scale

1:6,000,000

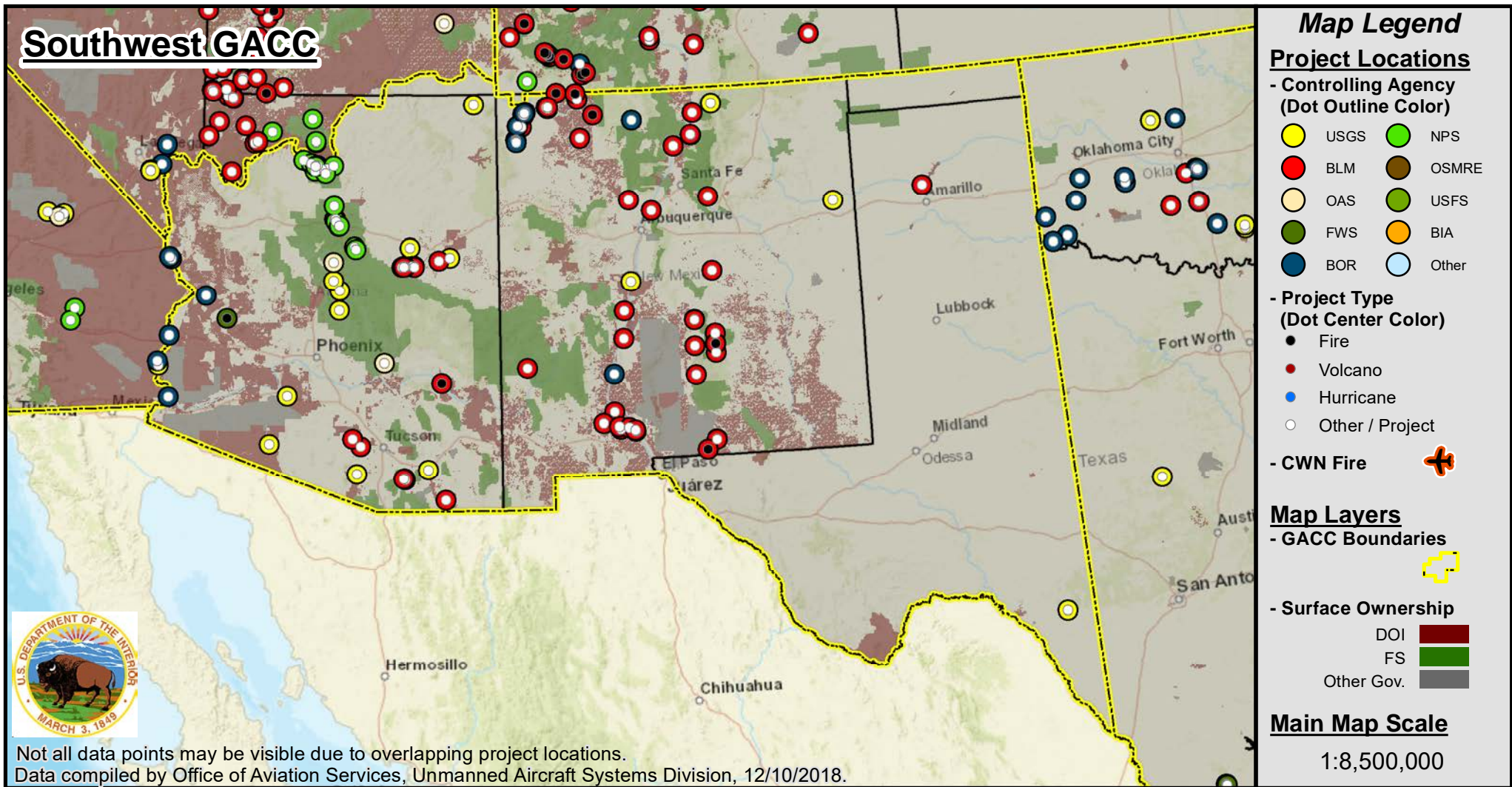


Not all data points may be visible due to overlapping project locations.  
Data compiled by Office of Aviation Services, Unmanned Aircraft Systems Division, 12/10/2018.

GACC	FY 2018 DOI UAS Flights by Bureau and GACC														FY18							
	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other		GACC Total (FY18)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	0	0%	143	15%	114	12%	988	10%
Eastern	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%
Northern California	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	44	0%
Northern Rockies	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%
Northwest	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%
Rocky Mountains	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%
Southern	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%
Southern - PR	0	0%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%
Southern California	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%
Southwest	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%
Other - OUS	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%



# U.S. Department of the Interior Unmanned Aerial Systems FY18 Project Locations by Agency, Project Type, and Interagency Geographic Area Coordination Center (GACC).



GACC	FY 2018 DOI UAS Flights by Bureau and GACC														FY18									
	BIA		BLM		USBR		USFWS		NPS		OAS		OSMRE		USFS		USGS		Other		GACC Total (FY18)			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%				
Alaska	0	0%	408	41%	0	0%	205	21%	118	12%	0	0%	0	0%	0	0%	143	15%	114	12%	988	10%		
Eastern	0	0%	5	1%	0	0%	86	17%	40	8%	19	4%	106	21%	0	0%	0	0%	239	48%	0	0%	495	5%
Great Basin	16	1%	982	55%	370	21%	196	11%	19	1%	61	3%	0	0%	17	1%	111	6%	0	0%	1,772	17%		
Hawaii	0	0%	41	3%	0	0%	48	3%	0	0%	318	22%	0	0%	0	0%	1,067	72%	0	0%	1,474	14%		
Northern California	0	0%	2	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	42	96%	0	0%	44	0%		
Northern Rockies	8	1%	440	69%	16	3%	11	2%	0	0%	1	0%	0	0%	1	0%	156	24%	8	1%	641	6%		
Northwest	10	1%	828	56%	41	3%	83	6%	8	1%	242	16%	0	0%	0	0%	149	10%	119	8%	1,480	14%		
Rocky Mountains	0	0%	648	54%	112	9%	17	1%	24	2%	39	3%	0	0%	0	0%	351	30%	0	0%	1,191	12%		
Southern	13	2%	55	6%	53	6%	302	34%	36	4%	30	3%	13	2%	48	5%	334	38%	0	0%	884	9%		
Southern - PR	0	0%	0	0%	0	0%	0	0%	11	19%	0	0%	0	0%	0	0%	47	81%	0	0%	58	1%		
Southern California	0	0%	6	2%	27	9%	0	0%	20	6%	5	2%	0	0%	0	0%	261	82%	0	0%	319	3%		
Southwest	13	1%	480	50%	162	17%	11	1%	170	18%	7	1%	0	0%	12	1%	115	12%	0	0%	970	9%		
Other - OUS	0	0%	0	0%	0	0%	26	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	26	0%		

