iGIS REPORT (GIP)

27/DEC/2021

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ABSTRACT

Established in in 2018 in Daegu, Korea, iGIS are a specialized information-based drone platform-specialized company, providing customized solutions[1].

According to iGIS request for advisory, the GIS solution 'IGIS' has been developed to replace the ArkGIS of Esri[2] from the US, optimized to the Korean environment by supporting Korean language and having the geographic information of the whole country. Specialized in forest management, 'IGIS-Forest'[3], is another GIS solution developed by iGIS.

The iGIS drone solution 'Dfos'[4] was developed to counter GoDji of DJI[5] in China. It provides a set of advanced features aiming at offering competitive alternatives to their Chinese counterpart.

[1] iGIS Vision (2021). "A spatial information-based drone platform-specialized company. Retrieved on 27 December 2021, from: https://igis.co.kr/en/vision.php

[2] Esri Arkgis: https://tinyurl.com/esri-arkgis

[3] iGIS Forest: https://igis.co.kr/en/solution.php?idx=9

[4] iGIS DFOS: https://igis.co.kr/en/solution.php?idx=5

[5] Dji Surveillance: https://tinyurl.com/go-dji

The company is planning to acquire deeper understanding of the GIS scenario in the United States and obtain insight of legislations and certifications required to operate in the country.

This research study investigates current state of GIS-related infrastructure and the use of Drones to perform GIS tasks. This document was built based on market-oriented articles, academic journals, and scholarly published studies.

Finds provide insights on federal, state, and local legislations, the meaning of certification and permits in the GIS segment, providing an assessment of GIS adoption and capabilities across the country.

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DOCUMENT VERSION CONTROL

DOCUMENT OWNERSHIP	ORGANIZATION
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ACTIVITY	DATE	RESPONSIBLE	Version
Document Creation	21/DEC/2021	Paulo H. Leocadio	0.1
Version Frozen	04/JAN/2022	Paulo H. Leocadio	1.0
Proof Reading	05/JAN/2022	Paulo H. Leocadio	1.1
Certification Additional Information	05/JAN/2022	Paulo H. Leocadio	1.2

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INTRODUCTION

The objective of this research is to respond three (3) questions iGIS has provided aiming at better understanding the GIS environment in the US, as well as rules and regulations related to drone operations and respective impact on potential presence and offerings in the country:

Q. How is the network environment? (Overall and forest areas).

Q. Certification requirements related to network, telecommunication, and software.

Q. Rules and regulations on drone operation and drone photography

This study proposes answers to those questions and builds upon US market concepts of certification, in comparison to permits, how certification is used in the GIS market, the differences between business certifications and professional certifications.

While the federal government builds up increments to drone operations legislations, local and state legislatures also play important role in specifics conditions. This document provides an overview and references.

Finally, this paper introduces GIS as a client to existing Internet and private infrastructure.

ABOUT ZINNIA

Zinnia Technology and Applied Sciences is the research and technology advisory branch of Zinnia Holdings LLC[6]. The umbrella enterprise dedicated to sciences, new technologies, and solutions to solve world problems.

The company started as a funding instrument for pre-cash technology start-ups and rapidly grew to building a portfolio of Series A companies with precise and well define social contributions.

Under federal and international investment agencies (e.g., USTDA - United States Trade and Development Agency, the World Bank, IABD - Inter-American Development Bank), we design Big Data, Data Sciences, AI, and Cloud-based solutions for federal and local governments around the world (ex. Istanbul, Ho Cho Minh City, Philippines).

Our core engineering team is based in Berlin, Germany, assembled from a group of world class engineers and architects coming from the Philipps-Universität Marburg Computer Sciences Grad School.

[6] Zinnia Holdings home page: http://www.zinnia.holdings/

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GIS INFRASTRUCTURE

"Today, Geographic Information Systems (GIS) and spatial analysis are being used by everyone whether we realize or not." (Steenson, 2019). With location-based search facility in Google, or smartphones apps to get from A to B. Parcel delivery and booked transportation vehicle. All these cases (and many more) use spatial information to obtain the best and most precise results and the most up to date information.

Estimates propose that hundreds of thousands of organizations in every segment or industry are using GIS to integrate interactive maps, perform different types of analysis, share information, and solve complex problems. This is changing the way the world works (Steenson, 2019). There is GIS-specific physical and logical infrastructure (for example, when a government agency needs real time geolocation information due to a repeating natural phenomena), so that related private business work in partnership with the authorities to deploy needed infrastructure.

With broadband cable, fiber optics cable, different Wi-Fi and cellular bands, radio, satellite, and other networks, GIS applications are clients to the existing open or paid access network (presented in most cases as Internet access), providing comprehensive coverage throughout the country. With efforts by Amazon and Google for example, soon there will be even more alternatives for remote or difficult access locations to be constantly on-line. The Geographic Information System market is predicted to reach US$9billion by 2024 (Bhutano & Wadhwani, 2017).

It is very important to highlight that successful past and present do not guarantee a similar future. External driving forces, including the very basic progress in information technology, have had a relevant impact on the continued improvement of different GIS fronts. Computer science perspective has been to the forefront of GIS development in the last ten (10) years (including, but not limited to, progress in multimedia technology, virtual reality technology, computer-generated graphics, and imagery as well as different new offerings in hardware (e.g., large-capacity optical disks), has directed GIS development to virtualized distributed environments and has popularized GIS for more general use (Richardson, 2018).

Contrarily, the internal driving forces of GIS are not sufficient to secure its continued relevance to the discipline of geography (Lu et al. 2013). Nowadays, there are two possible paths for GIS development: either to develop GIS together with new information technologies and intentionally integrate GIS into mainstream information

technology, or to continue exploration supported by geographic theories, while building momentum for development (and related technologies based on specific geographic aspects). (Guonian Lü, 2018)

A recent study by the National Geospatial Advisory Committee (NGAC) (Alexander, et al., 2018) warns that the aging United States' infrastructure is creating safety hazards, impacting life quality, increasing vulnerability to natural disasters, and hindering economic growth. Infrastructure renewal is a national vital priority for the United States, and it demands cooperative and coordinated action by the government and different segments of the private sector.

NGAC (Alexander, et al., 2018) highlights the pivotal role those geospatial technologies play in supporting infrastructure planning and development. It also provides guidelines on how to maximize returns on infrastructure investment.

As the United States exercises the reprioritization for the rebuilding of its infrastructure, the governments and companies involved will need precise and reliable spatial data of all types to ensure that sparse dollars are directed to the most efficient and effective ways possible. The knowledge about specific locations of the impacted infrastructure, how variant prices relate to one another, and where the critical dependencies exist are required first steps for making optimal financial decisions (Richardson, 2018).

Geographic Assessment

Current methods of assessing routes taken during active transport rely on subjective recall of trip length and barriers encountered enroute or the utilization of objective measures (a Geographic Information Systems or GIS) that may not represent actual travel patterns. This study examined the utility of Global Positioning Systems (GPS) to measure actual routes taken compared with GIS-estimated travel distance and barriers encountered.

Methods

Comparisons between GPS and GIS routes were performed for 59 of 75 children who wore a GPS during the journey to school on a single occasion. Home and school addresses were reported by parents and geocoded in GIS. Children were provided with a GPS and were instructed to travel their normal route to and from school. Data were collected between March and November 2005 and exported to the GIS to determine travel distance, number of busy streets crossed, and the ratio of busy streets to the total streets traveled on. Data analysis was performed in August 2006.

Results

No differences were observed between GPS-measured journeys to and from school on any of the examined variables. No differences were observed between GIS and GPS measures of travel distance ($p>0.05$). GIS-estimated travel routes crossed a significantly ($p<0.05$) higher number of busy streets (GIS: 1.68±0.12 vs GPS: 1.19±0.11) and traveled on a higher ratio of busy streets to total streets traveled on (GIS: 0.46±0.03 vs GPS: 0.35±0.04) ($p<0.05$) compared with GPS-measured actual travel routes.

Interpretation

Geographic Information Systems provides estimates of travel distance like GPS-measured actual travel distances. Travel routes estimated by GIS are not representative of actual routes measured by GPS, which indicates that GIS may not provide an accurate estimate of barriers encountered. The continued use of GPS in active transport research in encouraged. (Duncan & W. Kerry Mummery, 2007)

Big Data: Challenging GIS Infrastructure

With the rise of Cloud technologies and Big Data years ago, the concern was raised was around the challenge of how the world would be able to match with exponentially growing streams of data (Steenson, 2019). GIS has been facing this perceived challenge before: satellite imagery, orthophotography, largescale mapping and LIDAR point clouds, all create gigabytes of data. Now, combining GIS with geospatial cloud platforms together with the improvements in computing power, businesses can analyze massive warehouses of information. The result of this analysis often surfaces new data patterns and stimulate innovative ways to expand success through the understanding of location intelligence.

The Continuously Evolving GIS

By having in depth analytic power and wide reach, the geospatial cloud can attract the interest of many around the world with a project like the Esri Living Atlas (Poindexter, 2018).

According to (Steenson, 2019): “Applications also can be developed that engage people around the world in mission-driven campaigns and social enterprise. Volunteers can work together to track worrisome trends and businesses can use location-based data and predictive apps to understand what consumers will want and need several

years from now." The geospatial cloud introduces a new scale of spatial intelligence and businesses and organizations of every size and purpose are using it to break new ground and digitally transform their enterprises.

At the current level of development, the role of GIS is not limited to the collection, storage, and transmission of information. Modern GISs are becoming a tool for modeling natural, economic, social processes and situations, tracking their relationships, interactions, predicting development in space and time, obtaining new qualitative and quantitative information, and, most importantly - a means of providing (support) decision-making of a managerial nature and presenting conclusions (Andrew, 2020) (Li, Li, Nguyen, & Siebeneck, 2020).

GIS makes it possible to build thematic maps based on the created spatial databases that reflect the current state, study the dynamics of changes in space and time, stimulate the development of the situation, obtain complex estimates, construct various graphs, tables, and diagrams. The use of GIS makes it possible to reliably calculate the damage, because geographically attached information of various thematic layers is the basis for the calculation (Vovk, 2011).

Diagnosis

Summing up, it is necessary to say that with the development of information systems, GIS technology began to develop, due to which a person's convenient applications appeared to help people search for information and comfortable navigation (Karpik, 2012). GIS technologies allow efficient work with dynamic data on spatially distributed objects, complementing them with the ability to visualize, the ability to build models and solve problems of spatial-temporal analysis. As any IP that has the means of collecting and processing data, GIS makes it possible to accumulate and explore such information, quickly find, and process the necessary geographic data and visualize them in a user-friendly form. The use of GIS technology greatly increases the efficiency and quality of work with spatially distributed data comparing to traditional "paper" cartographic methods (Varfolomeev & Savelyev, 2011).

From the regulatory point of view, it is necessary to notice that the state is as interested as possible in the development of geographic information systems as strategy of the state (as an illustration it was determined and confirmed in 2015, by Russian Prime Minister Dmitry Medvedev an action plan for 2015-2030 to implement "The State Policy Fundamentals in Using of the Results of Space Activities in the Interests of Modernizing the Economy of the Russian Federation and Development of Its Regions for the Period till 2030. ")

Throughout time, there are shifts in the formation of a national spatial data infrastructure, which is a geographically distributed structure for collecting, processing, storing, and providing customers with spatial data from various

departments, starting from the federal and regional levels and ending with the district and municipal levels. The use of GIS makes it possible to provide absolutely all services with an information base on an essentially new level and, on this basis, implement the solution of technical, technological, economic and several other tasks (Serbulov, 2017) (Yakubaylik, 2011).

GIS technologies perfectly solve the needs of many market sectors. They have often been used for a long time, but initially in data collection systems on the state of network objects, where they studied not only the networks themselves, but their interaction with the environment (Andrew, 2020).

Reports, studies, and articles generally describe existing infrastructure supporting GIS around the country being robust and widespread to prevent mostly any barrier to applications and different uses, as mentioned before in this study, similar sources provide an alternative perspective when infrastructure and GIS are mentioned together. According to Esri (Esri, 2021) and Poindexter (Poindexter, 2018), there are three (3) ways s GIS can strengthen the United States' infrastructure by approaching infrastructure challenges with GIS: governments can rebuild with priority to maximize investments; governments can rethink current infrastructure to meet socioeconomic needs, and governments can change lifestyles and reimagine ideas around an internet of things-driven, future-ready community.

The United States Department of Transportation (DOT) (Nelson, Nicholas, & Lewis, 2017) released its first geospatial information systems (GIS) Strategic Plan and GIS Implementation Plan. The purpose of DOT's first GIS Strategic Plan is to examine the current use of Geographic Information Systems (GIS) at DOT and set goals to optimize GIS' potential. This Strategic Plan is accompanied by an Implementation Plan which provides timelines, tasks, and a workforce assessment. GIS allows a user to display, analyze, and manipulate data with a spatial component. Geospatial data analysis can be used as a decision support tool, to pinpoint "hot spots" and perform root cause analysis, to allocate staff and resources, and for many other projects which support DOT's mission.

United States Department of Transportation Data and Infrastructure

DOT has an extensive catalogue of geospatial data which is used by all levels of government, industry, and the public. Data includes:

• The National Transportation Atlas Database (NTAD), distributed by OST-R. It contains GIS data layers for transportation facilities, transportation networks, and associated infrastructure. Some of the data is collected by

OST-R (passenger connectivity, border crossings, and freight intermodal facilities) but the majority comes from other government agencies.

• Safety-critical infrastructure data at all U.S. airports, including runways, navaids, and obstructions, produced, and disseminated by FAA.

• All IFR Enroute aeronautical chart data in the national airspace system, produced and disseminated by FAA. All IFR and Visual charts are available as a geospatial pdf or Geo-TIFF. The public instrument flight procedures are in the process of being released in these formats as well.

• FAA office locations and service areas, unstaffed infrastructure locations, Center and Approach Control airspace boundaries, and locations of certificate holders authorized to conduct operations under Title 14 of the Code of Federal Regulations (CFR), produced by FAA.

• Highway and freight data, collected by FHWA and used in the HPMS and ARNOLD web mapping applications. HPMS also includes bridge inventory data, tunnel inventory data, ferry route data, and urban adjusted boundaries. • Truck company locations and truck accidents, collected by FMCSA

• Vehicular crash and fatal crash locations, collected by NHTSA

• Density and waybill data, Amtrak stations, freight and passenger rail lines, freight stations, grade crossings, and mileposts, collected by FRA and used in their FRAGIS web mapping application

• Gas transmission and hazardous liquid pipeline locations, pipeline-related facilities, accidents, derailments, and oil spill response resources, collected by PHMSA and used in the NPMS web mapping applications

Because no centralized architecture exists, the modes are finding their own solutions to storing and processing geospatial data. Most modes are using physical servers, and some modes are also using virtual machines (cloud-based servers). If physical servers are being used or if the virtual machines are not set up for scalability, performance degradation or interruption can occur when there are spikes in traffic or with large processing operations.

Likewise, because no DOT-wide standards exist for GIS web applications, there is no unified look and feel to DOT's applications. The modes have used ESRI and/or OpenGIS to build their web mapping applications. The ability to build new applications (either web or mobile) or update existing ones depends upon the mode's individual

budget. Many DOT mapping applications are using outdated software or dated interfaces (Nelson, Nicholas, & Lewis, 2017).

United States Department of Transportation Currently Identified Short Term Opportunities

(Nelson, Nicholas, & Lewis, 2017)

Cloud Environment

The cloud is a network of servers at a remote location which can host data and applications or process data. The benefit to a cloud environment subscription is that the server space used can be scaled up or down as needed. When the Takata airbag recall took place in 2015, NHTSA's website traffic increased exponentially as car owners looked up their VINs to see if their cars were affected by the recall. NHTSA used a cloud environment to handle the increased traffic with no interruption in website service. A substantial cost savings was realized; the cloud space which cost DOT less than $3,000 per month would have cost $3,000,000 had traditional physical servers been procured.

Two major cloud providers dominate the market: Amazon's AWS and Microsoft's Azure. DOT has an ELA with Microsoft and recently obtained an enterprise subscription for Azure. The term of the subscription is one year but it is likely to be renewed along with the ELA for other Microsoft products. The global DOT Azure account is managed by OCIO: the modes receive their own accounts upon request. The Azure cloud has been vetted as a secure environment for hosting DOT's sensitive datasets. A detailed governance policy and details on the service catalogue have not been finalized or communicated to the modes but are expected to be available in FY17. The Common Operating Environment policy from the CIO's council is currently being followed for decisions about cloud usage. The Associate CIO explained that this has been due to overwhelming interest by the modes, who wanted to begin using the cloud immediately and the decision by the CIO's office to accommodate that need.

Cloud environments are becoming increasingly popular for DOT's geospatial operations and applications. The cloud can be used for geospatial data storage, processing, backup, and hosting as well as for geospatial applications. This year, OST-R moved NTAD to the Azure cloud and uses the cloud to host applications, a map gallery, processing, and its production and development environments. NHTSA is considering moving its ArcGIS Server

instance to the cloud and will put REST (Representational State Transfer) services in the cloud via BTS' platform by the end of FY16. FHWA is moving its GIS applications to the cloud over the next year.

ArcGIS Online

ArcGIS Online (AGOL) is an online, collaborative web GIS that allows the user to use, create, and share maps, scenes, apps, layers, analytics, and data. A user has access to ready-to-use maps, apps, and ESRI's secure cloud, where he or she can add items and publish web layers. Currently, OST-R is sharing data on AGOL, PHMSA is setting up an AGOL environment to assist regional offices in making and sharing basic maps, and FAA uses AGOL for certain geocoding operations. FHWA is using AGOL to map access roads into federal lands and traffic counts.

AGOL is part of DOT's ELA, but most activities expend credits, which are allocated to DOT in a single account. Interviewees said that they have been reluctant to use AGOL extensively because there is no clear guidance as to how many credits each mode is allocated and how many credits specific activities on AGOL consume.

A detailed governance and usage policy for AGOL should be developed by the GIO, working with others in OCIO. It should include the total credits available to each mode and the number of credits common activities consume. The modes should be responsible for purchasing additional credits for their own accounts if they use more than their allocation.

Once these policies are in place, AGOL can benefit DOT in the following ways:

• AGOL is much easier to learn and use than ArcGIS desktop software. Novice GIS users can be empowered to create, modify, and collaborate on visually appealing maps that can help meet mission goals.

• The ability for multiple users to view, edit, and attach files such as videos, pictures, or PDFs to an online map is ideal for modes who have multiple offices across the country. Quickly constructing a map that can be shared and augmented with pictures and reports can assist modes in effectively responding to an accident.

• Although AGOL has the capability to process data and host applications, these activities are not recommended due to the high number of credits needed. Data can be processed with ArcGIS desktop software with no credits expended, and data or applications can be hosted on physical or virtual servers owned by DOT.

Map and Feature Services

Map services (sometimes referred to as Web Map Services or WMS) provide a user with a rendered map distributed online; feature services (sometimes referred to as Web Feature Services or WFS) provide the user with geospatial data streamed online. The main benefit is that both types of services show the user the most current data or maps. The services provide a dynamic view of the dataset and prevent the user from doing analysis on or drawing conclusions from outdated data.

Map and feature services are not widely used by DOT; however, OST-R distributes NTAD as a feature service. FHWA has expressed an interest in using map and feature services. NHTSA uses map and feature services internally only. FAA's External Data Access Initiative is not yet online but will provide map and feature services.

Centralized GIS Infrastructure

Because web mapping applications are developed and upgraded based on available funding at the modal level, the GIO and OCIO should evaluate options for developing a centralized architecture for DOT's geospatial data and applications. A centralized infrastructure would enable DOT to:

• Ensure that all web mapping applications are running versions of software that are currently supported and approved by DOT

• Upgrade all web mapping applications concurrently

• Provide the modes with equal access to hardware or cloud resources

• Maintain a true development environment, which is often not part of the modes' GIS architecture due to limited funds. This has resulted in web mapping applications going offline when a patch or policy has been incompatible with an ESRI software component.

• Patch all GIS-related servers at the same time Ideally, a centralized GIS infrastructure would be funded by OCIO, but cost-sharing among the modes can also be examined.

CERTIFICATION

About Certifications, Licenses, and Permits

As an introduction to the topic, it is important to define and differentiate the meaning of "certification" in the current United States GIS market. While different industries require a business and/or its products to obtain specific certification from an officially recognized entity – for instance, for medical devices, IEC 60601-1 (International Organization for Standardization, 2015) s an international standard for medical grade devices that specifically relates to patient safety, drone operation, a topic deeply intertwined with GIS applications, counties and municipalities require special permit (The City of Miami, 2021) to operate drones within its boundaries. Likewise, federal laws (Federal Aviation Administration, 2020) require drone pilot certification and license for commercial drone operations.

GIS Academic, Market and Professional Certification

Similarly, the GIS profession has also moved toward the development of professional certifications. Unlike the licensing programs in other fields such as medicine, law, and surveying, most GIS certification programs are on a voluntary basis. For example, land surveyors in the U.S. need to be licensed before they could legally practice the professional of land surveying, whereas GIS certification programs are not administered by government agencies, and GIS professionals are not required to obtain a certification before they practice the profession of GIS. The discussions on the development of GIS certification programs started in the early 1990s (Obermeyer, 1992) (J.Obermeyer, 1993). Many reasons have been listed to support the certification of GIS professionals. For example, GIS professional certification can help better define who is qualified to do a particular job and provides a baseline for comparison of one person's qualifications against another and to do such comparisons across international boundaries (Kemp, 2003). Other benefits of certification programs include raising the salary of GIS professionals and allowing those outsiders who are passionate about GIS to enter this industry (Kemp, 2003).

Several GIS-related certification programs have been developed in the U.S. to advance the development of this profession. For example, the GIS Professional (GISP) certification program was initiated in 2004 and is managed by a third-party organization—the GIS Certification Institute (GISCI). As of January 2019, this program has about 9155 members (including those whose certifications have expired) in the U.S. (GIS Certification Institute.). The

GISP certification program requires that applicants meet the portfolio requirements (educational achievement, professional experience, and contributions to the profession) and pass the exam before they can be certified. The GISP certification program has a point system and corresponding minimum requirements for each of the above-mentioned components in the portfolio review. Moreover, all certified GISPs need to sign a code of ethics, which is extremely important in the development of GIS as a profession (Huxhold & Craig, 2003). Specifically, the code of ethics includes a series of obligations to society, employers/funders, colleagues/the profession, and individuals in society [16]. Note that many GIS degree programs focus on theories and techniques in GIS and usually only cover some aspects of ethics (e.g., research ethics, objectivity in presenting results), and professional certification programs can, and often do, build upon these through the inclusion of other dimensions of ethics related to the professional work setting. In addition to the GISP certification program, The American Society for Photogrammetry and Remote Sensing (ASPRS) also has its own GIS-related certification program—the Certified Mapping Scientist GIS/LIT (Mathews & Wikle, 2017). As of April 2020, this program has 288 members (including inactive members) (ASPRS (American Society for Photogrammetry and Remote Sensing).)]. This certification program is relatively small when compared with the GISP Certification program. In addition to these two certification programs in the U.S., there are also other GIS certification programs outside the U.S. such as the Geomatics Specialist, GIS/LIS certification offered by the Canadian Institute of Geomatics (CIG) in Canada and the Geographic Information Systems Professional-Asia Pacific (GISP-AP) sponsored by the Surveying and Spatial Sciences Institute (SSSI) in Australia and New Zealand (Wikle, 2015). Relevant research reveals that most GIS certification programs still primarily dominate in individual countries, and the internationalization of GIS certification is still in its infancy [20]. Although most of the certified GISPs are still in the U.S., this program has started to be recognized internationally and been used as a good example in discussions about the development of new GIS certification programs outside the U.S. (Mulaku, 2013). A previous study found that 51% of the respondents agree or strongly agree that the GISP certification program is well-known in companies/agencies/organizations that hire GIS employees, while 21% of the respondents disagree with this argument (Mathews & Wikle, 2017). Although the GISP certification program is voluntary, it still has the potential to become as popular as the globally recognized Project Management Professional (PMP) certification program if it has a broader recognition in industry and government hiring practices. The success of a certification program could depend on many different factors such as advertisement/promotion, the management of the examination, and good collaboration with academia. As a top certification program in project management, the PMP program has a well-managed examination and relevant collaboration with academia (Poston & Richardson, 2012). GIS certification programs could borrow some best

practices from other successful certification programs (e.g., the PMP program) to further improve the quality and value of their programs and increase their popularity among GIS practitioners and employers.

GIS certification programs have played an important role in the development of this profession. However, very few studies have examined this topic. An early study by Wikle examined the characteristics of the above-mentioned four GIS certification programs based on the 2014 registry data downloaded from their websites (Wikle, 2015). Specifically, Wikle found that 45% of the GISP certification holders work in government agencies, 42% of them work in industry/consulting, and 5% of them in are employed in higher education (Wikle, 2015). Additionally, Mathews and Wikle (Mathews & Wikle, 2017) did a survey on the GISPs' characteristics including age, education, major, job title, employer, and income. Their study was based on the data collected from 1731 GISPs. They found that most respondents (93%) hold positions in the U.S., and the states with many GISPs include California, Colorado, Florida, North Carolina, Texas, and the Washington DC area (Mathews & Wikle, 2017). Additionally, their job title analysis shows that most of the survey participants identified themselves as GIS analysts (29%), followed by GIS coordinators/managers (26%), GIS administrators (11%), GIS specialists (10%), and consultants (6%) (Mathews & Wikle, 2017). In this article, we aim to analyze all the GISPs' characteristics based on the GISP registry data and other spatial data. We choose to study the GISP certification program because it accounts for over 95% of the certified GIS professionals in the U.S. (Wikle, 2015). Compared with previous studies, the novelty of this study is two-fold. First, we analyze the individual-level characteristics (e.g., gender, job title, and employer) of all certified GISPs in the U.S. and map them out at the state level. Second, we employ spatial analysis to examine the spatial distribution patterns of the certified GISPs at the state level and identify the hotspots and cold spots in the U.S. This is a descriptive and exploratory study, and the findings could result in new research topics in this area.

REGULATIONS FOR GIS DRONE OPERATIONS

Agency responsible for regulating drones in the USA:

Federal Aviation Administration

FAA Drone Website: https://www.faa.gov/uas/

UAS Laws – General rules for flying drones in USA

The USA agency responsible for drone safety, FAA, has provided several internet-accessible details on flying for fun or for work. The highlights are enumerated below. For more details go to the link above.

Are drones allowed in the USA?

Drones are allowed in the United States for recreational and commercial use, subject to FAA and local regulations. Read on for details on the Federal drone laws in the USA.

Notes for recreational drone pilots flying for fun in the USA

The United States Congress enacted the law H. R. 302 that describes how, when, and where you can fly drones for recreational purposes. You are considered a recreational user if you fly your drone for fun. It is important to know when and where you can fly and how to register your drone (Drone Laws For A Safer Airspace, 2021).

U.S. DRONE LAWS

The University of Texas System published its own research about drone laws in the United States (University of Texas System, 2019), providing a comprehensive overview with details from each legislature and direct references to each publication and motivation. This appendix one presents a full copy of that research as it is the single most complete source for references and for understanding current policies and regulations in the country. As a complement, the original text is augmented with further county or state level discussion on relevant topics where their respective legislature intention to build upon or be more restrictive than federal laws.

OVERVIEW OF DRON RULES AND REGULATIONS IN USA BY STATE

Before exploring the specific topics, states have legislated, it is important to consider the issue of preemption. If a state or local law directly conflicts with federal laws or regulations, the state or local law is likely to be invalidated. Because the FAA is the designated authority to regulate U.S. airspace, any state or local law that conflicts with FAA regulations or attempts to regulate in an area that is within the purview of the FAA may be preempted.

Examples of laws for which consultation with the FAA is recommended:

- "Operational UAS restrictions on flight altitude, flight paths; operational bans; any regulation of the navigable airspace. For example – a city ordinance banning anyone from operating UAS with State UAS Legislative Action in the city limits, within the airspace of the city, or within certain distances of landmarks."
- "Mandating equipment or training for UAS related to aviation safety such as geo-fencing would likely be preempted. Courts have found that state regulation pertaining to mandatory training and equipment requirements related to aviation safety is not consistent with the federal regulatory framework."

Examples of laws within state and local government police power:

- "Laws traditionally related to state and local police power – including land use, zoning, privacy, trespass, and law enforcement operations – generally are not subject to federal regulation."
- Requirement for police to obtain a warrant prior to using a UAS for surveillance. •
- Specifying that UAS may not be used for voyeurism.

- Prohibitions on using UAS for hunting or fishing, or to interfere with or harass someone who is hunting or fishing.
- Prohibitions on attaching firearms or similar weapons to UAS.

Privacy

One of the most significant areas of UAS legislation across the country has been related to privacy implications. The mission of the FAA is "to provide the safest, most efficient aerospace system in the world." This mission does not include regulating privacy-related issues. As a result, many states have considered and passed legislation dealing with privacy and drones.

Privacy law concerning drones generally fall into two categories:

1. Laws that require law enforcement to obtain a warrant prior to using a drone to perform a search of or surveillance on a suspect, and
2. Laws that prohibit private citizens (non-governmental actors) from using drones to do various activities that would invade someone else's privacy.

These laws vary considerably by state with regard to exactly what types of activities are prohibited, including: flying over private property (trespassing), filming over private property, photographing in a place where a person has a reasonable expectation of privacy, height restrictions for flying over private property, consent restrictions, restrictions on publishing images taken without consent, and other rules that specifically make it an offense to use a drone for harassment or voyeurism.

Since 2013, 24 states (Alaska, Arkansas, California, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Mississippi, Montana, Nevada, North Carolina, North Dakota, Oregon, Pennsylvania, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin) have passed legislation that falls within the broad category of privacy. This includes legislation related to warrant requirements for UAS use by law enforcement agencies and protection from privacy violations committed by non-government operators, including peeping toms.

Warrant Requirements

One of the first UAS uses that captured the attention of legislatures was the use of UAS by law enforcement agencies for surveillance. 18 states—Alaska, Florida, Idaho, Illinois, Indiana, Iowa, Maine, Montana, Nevada, North Carolina, North Dakota, Oregon, Tennessee, Texas, Utah, Vermont, Virginia, and Wisconsin— have passed

legislation requiring law enforcement agencies to obtain a search warrant to use UAS for surveillance or to conduct a search.

As is the case generally with search warrants, certain exceptions to the warrant requirement are included in the legislation, such as when exigent circumstances justify a search without a warrant.

Protection from Non-Government Operators

In addition to concerns regarding Fourth Amendment violations by law enforcement agencies, states have also addressed the potential for privacy violations committed by non-government operators.

At least 15 states—Arkansas, California, Florida, Idaho, Indiana, Kansas, Mississippi, Nevada, North Carolina, Oregon, Tennessee, Texas, Utah, Virginia, and Wisconsin—have passed legislation providing privacy protections from other citizens that are specific to drones. Some states have indicated they believe current privacy laws that do not specifically address the use of UAS but, rather, provide general privacy protections, can provide the same protections regarding UAS use.

Security Concerns

While there are obvious commercial applications for UAS in the monitoring and maintenance of critical infrastructure, there are also concerns about the dangers that could come with the unrestricted use of drones near these facilities. These problems revolve primarily around issues of security.

UAS can pose a potential danger to critical infrastructure and, therefore, public safety. The FAA has reported a substantial rise in the number of pilots reporting drone sightings near other aircrafts and airports. Correctional facilities across the United States are battling the problem of drones being used to deliver contraband. Security experts have warned that drones could be used by terrorists to surveil or assist in attacking critical infrastructure and critical facilities.

Prisons

States also have expressed concern about UAS operation near and over prisons. Currently, 14 states (Arizona, California, Iowa, Louisiana, Nevada, New Jersey, North Carolina, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Wisconsin) prohibit drones from operating near or over prisons.

States have taken various approaches in legislation, with some addressing where a drone can be operated and others specifically addressing the crime of introducing contraband into a correctional facility using a drone.

Critical Infrastructure

Legislation also has been enacted to protect critical infrastructure from rogue drone operators. The classification of critical infrastructure varies by state, but generally includes facilities such as petroleum refineries, chemical manufacturing facilities, pipelines, wastewater treatment facilities, power generating stations, electric utilities, chemical or rubber manufacturing facilities, and other similar facilities.

Ten (10) states specifically restrict drone access near critical facilities and infrastructures. These states include Arkansas, Arizona, Delaware, Florida, Louisiana, Nevada, Oklahoma, Oregon, Tennessee, and Texas.

Stadiums

FAA regulations prohibit drones flying within three miles of stadiums one hour before and one hour after the schedules time of any of the following events:

- Major League Baseball
- National Football League
- NCAA Division One Football
- NASCAR Sprint Cup, Indy Car, and Champ Series races

Two states - Delaware and Texas - have their own state laws prohibiting drones near stadiums or events. Delaware prohibits drones over any sporting event, concert, automobile race, festival, or other event at which more than 1500 people are in attendance. Texas specifically prohibits drones flying over “sports venues” with seating capacity of at least 30,000.

Airports

Under the Special Rule for model aircraft, the FAA requires hobby drone operators to notify the airport operator and air traffic control tower if they will be flying within 5 miles of an airport. The FAA also prohibits model aircraft from ever flying near other aircraft or near emergency response efforts.

Nevada legislation specifies that “A person may operate an unmanned aerial vehicle within 5 miles of an airport only if the person obtains the consent of the airport authority or the operator of the airport, or if the person has otherwise obtained a waiver, exemption or other authorization for such operation…” Anyone who violates this requirement is guilty of a misdemeanor.

Committees, Studies and Task Forces (per State)

Several states have convened committees, task forces, advisory boards or requested studies on the use and implications of unmanned aircraft systems. 19 states - Alaska, Colorado, Connecticut, Georgia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maryland, Michigan, Nevada, New Mexico, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Wisconsin - have assembled committees, task forces, advisory boards or requested studies.

DISCLAIMER: This is for informational purposes only. The information does not constitute legal advice. You should seek out an attorney licensed in your state if you need legal assistance.

Alabama

No state drone laws

Alaska

Definitions:

Alaska statute defines an "**unmanned aircraft system**" as "an unmanned aircraft operated without direct human intervention from inside the aircraft."

Article 13. LAW ENFORCEMENT USE OF UNMANNED AIRCRAFT SYSTEMS

HB 255

Three areas within the statute that contain laws related to unmanned aircraft systems:

(1) use by law enforcement officials

(2) retention of images captured by small, unmanned aircraft systems

(3) development of training in operation

Currently no statutes or bills for private or hobby use of drones

SCR 4

Continues the Task Force on UAS and specifies additional membership and duties of the task force.

Arizona

Definitions:

Arizona's law uses the terms **model aircraft, civil unmanned aircraft**, and **public unmanned aircraft** to describe drones as used for different purposes.

Model aircraft: an unmanned aircraft that is "capable of sustained flight in the atmosphere; flown within visual line of sight of the person operating the aircraft; and flown for hobby or recreational purposes." (**Hobby**)

Civil unmanned aircraft: "an unmanned aircraft or unmanned aircraft system that is operated by a person for any purpose other than strictly for hobby or recreational purposes, including commercial purposes, or in the furtherance of or incidental to any business or media service or agency." (**Commercial**)

Public unmanned aircraft: an unmanned aircraft "operated by a public agency for a government-related purpose." (**Government/Law Enforcement**)

Unmanned aircraft: "an aircraft, including an aircraft commonly known as a drone, that is operated without the possibility of direct human intervention from within or on the aircraft."

"**Critical facility**" means any of the following:

1. A petroleum or alumina refinery.
2. A petroleum, chemical or rubber production, transportation, storage, or processing facility.
3. A chemical manufacturing facility.
4. A water or wastewater treatment facility and water development, distribution, or conveyance system, including a dam.
5. An electric generation facility, as defined in section 42-14156, and any associated substation or switchyard.
6. An electrical transmission or distribution substation.
7. An electrical transmission line of at least sixty-nine thousand volts.
8. An electronic communication station or tower.
9. An energy control center.
10. A distribution operating center.
11. A facility that transfers or distributes natural gas, including a compressor station, regulator station, city gate station or pressure limiting station, or a liquefied natural gas facility or supplier tap facility.
12. Any railroad infrastructure or facility.
13. A federal, state, county, or municipal court.
14. A public safety or emergency operation facility.

15. A federal, state, county or municipal jail or prison or other facility in which persons are incarcerated.
16. A federal or state military installation or facility.
17. A hospital that receives air ambulance services.

13-3729. - Unlawful operation of model or unmanned aircraft; state preemption; classification; definitions

The operation of a model aircraft or civil unmanned aircraft is a class 1 misdemeanor if it is:

1. prohibited by federal law or regulation, including FAA regulations
2. Interferes with the operation of law enforcement, firefighters, or emergency services.

Class 1 misdemeanor is the most serious misdemeanor offense and is punishable by up to 6 months in jail, 3 years of probation and a $2,500 fine plus surcharges.

The operation or use of an unmanned aircraft to photograph or linger over or near a critical facility in the furtherance of a crime is a class 6 felony, except that a second or subsequent violation is a class 5 felony.

Class 6 felonies are punishable up to 2 years in prison.

28-8242. - Powers and duties

28-8280. - Careless or reckless aircraft operation; violation; classification; definitions

A person who operates an aircraft (model aircraft and civil unmanned aircraft) in the air, on the ground or on the water in a careless or reckless manner that endangers the life or property of another is guilty of a class 1 misdemeanor.

In determining whether the operation was careless or reckless, the court shall consider the standards for safe operation of aircraft prescribed by federal statutes or regulations governing aeronautics.

Arkansas

Definitions:

Arkansas defines "**drones**" as "**unmanned aircraft syste**ms." Arkansas' definition of an "**unmanned aircraft system**" is very broad, covering any "unmanned, powered aircraft that:

1. Does not carry a human operator.
2. Can be autonomous or remotely piloted or operated; and

3. Can be expendable or recoverable."

"**Unmanned aircraft system**" does **not** include:

1. A satellite orbiting the earth.
2. "Unmanned aircraft systems" that are being used by the federal government, the state after consultation with the governor, or because of a state or federal contract to inspect critical infrastructure
3. An unmanned aircraft used by a law enforcement agency, emergency medical service agency, hazardous materials response team, disaster management agency, or other emergency management agency for the purpose of incident command, area reconnaissance, personnel and equipment deployment monitoring, training, or a related purpose.
4. An unmanned aircraft system used under a certificate of authorization issued by the Federal Aviation Administration; or
5. An unmanned aircraft used by a law enforcement agency, emergency medical service agency, hazardous materials response team, disaster management agency, or other emergency management agency for the purpose of incident command, area reconnaissance, personnel and equipment deployment monitoring, training, or a related purpose.

"**Critical infrastructure**" means:

(A) An electrical power generation or delivery system.
(B) A petroleum refinery.
(C) A chemical or rubber manufacturing facility; or
(D) A petroleum or chemical storage facility.
(E) A railroad operating facility
(F) A communication tower or facility.

§ 5-60-103. - Unlawful use of unmanned aircraft system

A person commits the offense of unlawful use of an unmanned aircraft system if he or she knowingly uses an unmanned aircraft system to conduct surveillance of, gather evidence or collect information about, or photographically or electronically record critical infrastructure without the prior written consent of the owner of the critical infrastructure.

Unlawful use of an unmanned aircraft system is a class B misdemeanor. Second or subsequent offenses are a Class A misdemeanor.

§ 5-16-102. - Voyeurism

§ 5-16-101. - Crime of video voyeurism

Using a drone to spy or video someone without their consent is a punishable crime.

California

Definitions:

California law defines drone as an "unmanned aircraft" functioning without the possibility of direct human involvement. The term also includes the "communication links" and controller which help the pilot navigate the 'aircraft'.

California Civil Code 1708.8

California's first "drone law" was not specifically aimed at drones, but rather amended the invasion of privacy statute to penalize drone operators who violate the privacy of others as described by the statute.

California Civil Code 43.101

These laws limited the civil liability of first responders who damage a drone while working.

It also creates a misdemeanor offense for people who fly drones in a way that interferes with the work of first responders and other emergency workers.

California Government Code 853

A local public entity or public employee of a local public entity shall not be liable for any damage to an unmanned aircraft or unmanned aircraft system, if the damage was caused while the local public entity or public employee of a local public entity was providing, and the unmanned aircraft or unmanned aircraft system was interfering with, the operation, support, or enabling of any of the following emergency services:

1. Emergency medical services or ambulance transport services, including, but not limited to, air ambulance services.
2. Firefighting or firefighting-related services, including, but not limited to, air services related to firefighting or firefighting-related services.
3. Search and rescue services, including, but not limited to, air search and rescue services.

California Penal Code 402.- CRIMES AGAINST THE PUBLIC HEALTH AND SAFETY

(a)

(1) Every person who goes to the scene of an emergency, or stops at the scene of an emergency, for the purpose of viewing the scene or the activities of police officers, firefighters, emergency medical, or other emergency

personnel, or military personnel coping with the emergency in the course of their duties during the time it is necessary for emergency vehicles or those personnel to be at the scene of the emergency or to be moving to or from the scene of the emergency for the purpose of protecting lives or property, unless it is part of the duties of that person's employment to view that scene or those activities, and thereby impedes police officers, firefighters, emergency medical, or other emergency personnel or military personnel, in the performance of their duties in coping with the emergency, is guilty of a misdemeanor.

(2) For purposes of this subdivision, a person shall include a person, regardless of his or her location, **who operates or uses an unmanned aerial vehicle, remote piloted aircraft, or drone** that is at the scene of an emergency.

(b) Every person who knowingly resists or interferes with the lawful efforts of a lifeguard in the discharge or attempted discharge of an official duty in an emergency, when the person knows or reasonably should know that the lifeguard is engaged in the performance of his or her official duty, is guilty of a misdemeanor.

(c) For the purposes of this section, an emergency includes a condition or situation involving injury to persons, damage to property, or peril to the safety of persons or property, which results from a fire, an explosion, an airplane crash, flooding, windstorm damage, a railroad accident, a traffic accident, a power plant accident, a toxic chemical, or biological spill, or any other natural or human-caused event.

Senate Bill No. 1355. Unmanned aircraft systems: correctional facilities.

Senate Bill 1355 makes it illegal to operate an unmanned aircraft system (UAS) on or over state prisons, jails, and juvenile facilities.

This bill makes a person who knowingly and intentionally operates an unmanned aircraft system (UAS) on or above the grounds of a state prison, a jail, or a juvenile hall, camp, or ranch guilty of an infraction punishable by a fine of $500. These provisions are inapplicable to a person employed by the prison, jail, or county department that operates the juvenile hall, camp, or ranch acting within the scope of that employment, or a person who receives prior permission from the Department of Corrections and Rehabilitation, the county sheriff, or department that operates the juvenile hall, camp, or ranch.

An act to add Section 4577 to the Penal Code, relating to unmanned aircraft systems.

SECTION 1.

Section 4577 is added to the Penal Code, to read:

4577.

a. Except as provided in subdivisions (b), (c), and (d), a person who knowingly and intentionally operates an unmanned aircraft system on or above the grounds of a state prison, a jail, or a juvenile hall, camp, or ranch is guilty of an infraction, punishable by a fine of five hundred dollars ($500).

b. This section does not apply to a person employed by the prison who operates the unmanned aircraft system within the scope of his or her employment, or a person who receives prior permission from the Department of Corrections and Rehabilitation to operate the unmanned aircraft system over the prison.
c. This section does not apply to a person employed by the jail who operates the unmanned aircraft system within the scope of his or her employment, or a person who receives prior permission from the county sheriff to operate the unmanned aircraft system over the jail.
d. This section does not apply to a person employed by the county department that operates the juvenile hall, camp, or ranch who operates the unmanned aircraft system within the scope of his or her employment, or a person who receives prior permission from the county department that operates the juvenile hall, camp, or ranch to operate the
e. unmanned aircraft system over the juvenile hall, camp, or ranch.
f. For purposes of this section, the following definitions apply:
    i. "Unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.
    ii. "Unmanned aircraft system" means an unmanned aircraft and associated elements, including, but not limited to, communication links and the components that control the unmanned aircraft that are required for the pilot in command to operate safely and efficiently in the national airspace system.

SECTION 2.

No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because the only costs that may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

SR 21 - Relative to the Know Before You Fly educational campaign.

Colorado

HB 1070 - Study Drone Use by Public Safety Agencies

Requires the center of excellence within the department of public safety to perform a study. The study must identify ways to integrate UAS within local and state government functions relating to firefighting, search and rescue, accident reconstruction, crime scene documentation, emergency management, and emergencies involving significant property loss, injury, or death. The study must also consider privacy concerns, costs, and timeliness of deployment for each of these uses. The legislation also creates a pilot program, requiring the deployment of at least one team of

UAS operators to a region of the state that has been designated as a fire hazard where they will be trained on the use of UAS for the above specifies functions.

406-0 #004 – AIDS IN TAKING WILDLIFE

It shall be unlawful to use a drone to look for, scout, or detect wildlife as an aid in the hunting or taking of wildlife.

For the purposes of this regulation, drone shall be defined as including, without limitation, any contrivance invented, used, or designed for navigation of, or flight in the air that is unmanned or guided remotely. A drone may also be referred to as "Unmanned Aerial Vehicle" (UAV) or "Unmanned Aerial Vehicle System" (UAVS).

Connecticut

Definitions:

"**Commercial unmanned aircraft**" means an aircraft operated remotely by a pilot in command holding a valid remote pilot certificate with a small, unmanned aircraft systems rating issued by the Federal Aviation Administration.

Public Act 17-52 - AN ACT CONCERNING MUNICIPALITIES AND UNMANNED AIRCRAFT

This statue limits municipalities in enacting regulations regarding commercial unmanned aircraft. No municipality shall enact or enforce an ordinance or resolution that regulates the ownership, possession, purchase, sale, use, transportation, or operation of any commercial unmanned aircraft, except as otherwise authorized by state and federal law, and to the extent they do not conflict with policies and procedures adopted by the Connecticut Airport Authority. The statute makes an exception for municipalities that are also water companies.

Delaware

Definitions:

"**Unmanned aircraft system**" means a powered, aerial vehicle that:

1. Does not carry a human operator.
2. Uses aerodynamic forces to provide vehicle lift.
3. Can fly autonomously or be piloted remotely; and
4. Can be expendable or recoverable.

"**Critical infrastructure**" means petroleum refineries, petroleum storage facilities, chemical storage facilities, chemical manufacturing facilities, fuel storage facilities, electric substations, power plants, electric generation

facilities, military facilities, commercial port and harbor facilities, rail yard facilities, drinking water treatment or storage facilities, correctional facilities, government buildings, and public safety buildings or facilities.

"**First responder**" means federal, state, and local law-enforcement officers, fire, and emergency medical services personnel, hazardous materials response team members, 9-1-1 dispatchers, or any individual who is responsible for the protection and preservation of life and is directed to respond to an incident that could result in death or serious injury.

§ 1334 - Unlawful use of an unmanned aircraft system; unclassified misdemeanor; class B misdemeanor; class A misdemeanor

Prohibited acts. — Except as provided in this section, no person shall knowingly operate, direct, or program an unmanned aircraft system to fly:

1. Over any sporting event, concert, automobile race, festival, or other event at which more than 1500 people are in attendance; or
2. Over any critical infrastructure; or
3. Over any incident where first responders are actively engaged in response or air, water, vehicular, ground, or specialized transport.

Exemptions. — The prohibitions set forth in subsection (b) of this section shall not apply to:

1. An unmanned aircraft system used for law-enforcement purposes; or
2. An unmanned aircraft system flying over property where written permission has been granted by the property owner or occupier; or
3. An unmanned aircraft system operated by an institution of higher education for educational purposes in compliance with Federal Aviation Administration regulations; or
4. An unmanned aircraft system that is being used for a commercial or other purpose if the operator is authorized by the Federal Aviation Administration.

Penalties. — Unlawful use of an unmanned aircraft system is an unclassified misdemeanor for a first offense and a class B misdemeanor for a second or subsequent offense, except that in any case where physical injury to a person or damage to property occurs because of a violation of this section unlawful use of an unmanned aircraft system is a class A misdemeanor.

9202 - Regulations Governing Natural Areas and Nature Preserves

No person shall voluntarily bring, land, or cause to descend or alight on or upon any lands or waters administered by the Division any aircraft, flying machine, balloon, parachute, drones, or other apparatus for aviation except with the prior consent of the Director. "Voluntarily" shall mean for purposes of this paragraph anything other than a forced or emergency landing.

Florida

Definitions (UAV Coach, 2021):

Florida Statutes, defines a drone as a "powered, aerial vehicle that:

1. Does not carry a human operator.
2. Uses aerodynamic forces to provide vehicle lift.
3. Can fly autonomously or be piloted remotely.
4. Can be expendable or recoverable; and
5. Can carry a lethal or nonlethal payload."

"**Unmanned aircraft system**" means a drone and its associated elements, including communication links and the components used to control the drone which are required for the pilot in command to operate the drone safely and efficiently.

"**Critical infrastructure facility**" means any of the following, if completely enclosed by a fence or other physical barrier that is obviously designed to exclude intruders, or if clearly marked with a sign or signs which indicate that entry is forbidden, and which are posted on the property in a manner reasonably likely to come to the attention of intruders:

1. An electrical power generation or transmission facility, substation, switching station, or electrical control center.
2. A chemical or rubber manufacturing or storage facility.
3. A mining facility.
4. A natural gas or compressed gas compressor station, storage facility, or natural gas or compressed gas pipeline.
5. A liquid natural gas or propane gas terminal or storage facility with a capacity of 4,000 gallons or more.
6. Any portion of an aboveground oil or gas pipeline.
7. A wireless communications facility, including the tower, antenna, support structures, and all associated ground- based equipment.

330.41 - Unmanned Aircraft Systems Act

PROTECTION OF CRITICAL INFRASTRUCTURE FACILITIES. —

(a) A person may not knowingly or willfully:

    1. Operate a drone over a critical infrastructure facility.
    2. Allow a drone to contact a critical infrastructure facility, including any person or object on the premises of or within the facility; or

3. Allow a drone to come within a distance of a critical infrastructure facility that is close enough to interfere with the operations of or cause a disturbance to the facility.

934.50 - Freedom from Unwarranted Surveillance Act

PROHIBITED USE OF DRONES. —

1. A law enforcement agency may not use a drone to gather evidence or other information.
2. A person, a state agency, or a political subdivision as defined in s. 11.45 may not use a drone equipped with an imaging device to record an image of privately owned real property or of the owner, tenant, occupant, invitee, or licensee of such property with the intent to conduct surveillance on the individual or property captured in the image in violation of such person's reasonable expectation of privacy without his or her written consent. For purposes of this section, a person is presumed to have a reasonable expectation of privacy on his or her privately owned real property if he or she is not observable by persons located at ground level in a place where they have a legal right to

(b) be, regardless of whether he or she is observable from the air with the use of a drone.

EXCEPTIONS. —This section does not prohibit the use of a drone:

1. To counter a high risk of a terrorist attack by a specific individual or organization if the United States Secretary of Homeland Security determines that credible intelligence indicates that there is such a risk.
2. If the law enforcement agency first obtains a search warrant signed by a judge authorizing the use of a drone.
3. If the law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action is needed to prevent imminent danger to life or serious damage to property, to forestall the imminent escape of a suspect or the destruction of evidence, or to achieve purposes including, but not limited to, facilitating the search for a missing person.
4. By a person or an entity engaged in a business or profession licensed by the state, or by an agent, employee, or contractor thereof, if the drone is used only to perform reasonable tasks within the scope of practice or activities permitted under such person's or entity's license. However, this exception does not apply to a profession in which the licensee's authorized scope of practice includes obtaining information about the identity, habits, conduct, movements, whereabouts, affiliations, associations, transactions, reputation, or character of any society, person, or group of persons
5. By an employee or a contractor of a property appraiser who uses a drone solely for the purpose of assessing property for ad valorem taxation.
6. To capture images by or for an electric, water, or natural gas utility:
7. For aerial mapping, if the person or entity using a drone for this purpose is operating in compliance with Federal Aviation Administration regulations.
8. To deliver cargo, if the person or entity using a drone for this purpose is operating in compliance with Federal Aviation Administration regulations.
9. To capture images necessary for the safe operation or navigation of a drone that is being used for a purpose allowed under federal or Florida law.
10. By a communications service provider or a contractor for a communications service provider for routing, siting, installation, maintenance, or inspection of facilities used to provide communications services.

Georgia

Definitions:

'Unmanned aircraft system' means a powered, aerial vehicle that:

1. Does not carry a human operator and is operated without the possibility of direct human intervention from within or on the aircraft
2. Uses aerodynamic forces to provide vehicle lift.
3. Can fly autonomously or be piloted remotely.
4. Can be expendable or recoverable.
5. Such term shall not include a satellite.

No state drone laws. However, a resolution has been passed by house and senate to amend Chapter 6-1 to include 6-1-4 including unmanned aircraft systems.

HB 481 Aviation; unmanned aircraft systems

On November 2nd, 2016, the Governor of Georgia issued an executive order "That a Commission on Unmanned Aircraft Technology appointed by the Governor is hereby created to make state-level recommendations to the Governor consistent with current FAA regulations as well as the State's business and public safety interests."

The Governor appointed the following people to serve as members of the Commission of Unmanned Aircraft Technology:

- David Vigilante, Legal Senior Vice President, CNN
- Christopher Davidson, State Archivist/Assistant Vice Chancellor, Georgia Archives, Board of Regents of the University System of Georgia
- Jacob Hinton, Partner, Flyover Services LLC
- Lewis Massey, Partner, Massey, Watson & Hembree LLC
- Michael Wall, VP of Government and Regulatory Affairs, Comcast (Georgia)

Hawaii

No state drone laws. However, a statue did establish an unmanned aerial systems test site advisory board.

§201-72.6 - Hawaii unmanned aerial systems test site advisory board; established

This statue established a Hawaii unmanned aerial systems test site advisory board, as a subcommittee of the Hawaii aerospace advisory committee, to oversee the planning and operation of the Hawaii unmanned aerial systems test site.

Idaho

Definitions:

"**Unmanned aircraft system**" (UAS) means an unmanned aircraft vehicle, drone, remotely piloted vehicle, remotely piloted aircraft, or remotely operated aircraft that is a powered aerial vehicle that does not carry a human operator, can fly autonomously or remotely and can be expendable or recoverable.

"**Unmanned aircraft system**" does not include:

1. Model flying airplanes or rockets including, but not necessarily limited to, those that are radio controlled or otherwise remotely controlled and that are used purely for sport or recreational purposes; and
2. An unmanned aircraft system used in mapping or resource management.

21-213. - RESTRICTIONS ON USE OF UNMANNED AIRCRAFT SYSTEMS — DEFINITION — VIOLATION — CAUSE OF ACTION AND DAMAGES

The statute prohibits surveillance of the gathering of evidence or information about, and photographic or electronic recording of "specifically targeted" persons or private property without a warrant. An exception is made for emergency response for safety, search and rescue, and controlled substance investigations.

Any person who is the subject of prohibited conduct under subsection (2) of this section shall:

1. Have a civil cause of action against the person, entity, or state agency for such prohibited conduct; and
2. Be entitled to recover from any such person, entity, or state agency damages in the amount of the greater of one thousand dollars ($1,000) or actual and general damages, plus reasonable attorney's fees and other litigation costs reasonably incurred.

36-1101 - TAKING OF WILDLIFE UNLAWFUL EXCEPT BY STATUTE OR COMMISSION RULE OR PROCLAMATION — METHODS PROHIBITED — EXCEPTIONS

Idaho law prohibits the use of any unmanned aircraft system to aid in hunting activities unless the hunter has a physical disability and obtains a permit for such use

Illinois

Definitions:

"**Drone**" means any aerial vehicle that does not carry a human operator.

"**Authority**" means the Illinois Criminal Justice Information Authority.

"**Information**" means any evidence, images, sounds, data, or other information gathered by a drone.

"**Law enforcement agency**" means any agency of this State or a political subdivision of this State which is vested by law with the duty to maintain public order and to enforce criminal laws.

Statutes/Bills:

725 ILCS 167/ - Freedom from Drone Surveillance Act

Sec. 10. **Prohibited use of drones**. Except as provided in Section 15, a law enforcement agency may not use a drone to gather information.

Sec. 15. **Exceptions**. This Act does not prohibit the use of a drone by a law enforcement agency:

1. To counter a high risk of a terrorist attack by a specific individual or organization if the United States Secretary of Homeland Security determines that credible intelligence indicates that there is that risk.
2. If a law enforcement agency first obtains a search warrant based on probable cause issued under Section 108-3 of the Code of Criminal Procedure of 1963. The warrant must be limited to a period of 45 days, renewable by the judge upon a showing of good cause for subsequent periods of 45 days.
3. If a law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action is needed to prevent imminent harm to life, or to forestall the imminent escape of a suspect or the destruction of evidence. The use of a drone under this paragraph (3) is limited to a period of 48 hours. Within 24 hours of the initiation of the use of a drone under this paragraph (3), the chief executive officer of the law enforcement agency must report in writing the use of a drone to the local State's Attorney.
4. If a law enforcement agency is attempting to locate a missing person and is not also undertaking a criminal investigation.
5. If a law enforcement agency is using a drone solely for crime scene and traffic crash scene photography. Crime scene and traffic crash photography must be conducted in a geographically confined and time-limited manner to document specific occurrences. The use of a drone under this paragraph (5) on private property requires either a search warrant based on probable cause under Section 108-3 of the Code of Criminal Procedure of 1963 or lawful consent to search. The use of a drone under this paragraph (5) on lands, highways, roadways, or areas belonging to this State or political subdivisions of this State does not require a search warrant or consent to search. Any

1. law enforcement agency operating a drone under this paragraph (5) shall make every reasonable attempt to only photograph the crime scene or traffic crash scene and avoid other areas.

6. If a law enforcement agency is using a drone during a disaster or public health emergency, as defined by Section 4 of the Illinois Emergency Management Agency Act. The use of a drone under this paragraph (6) does not require an official declaration of a disaster or public health emergency prior to use. A law enforcement agency may use a drone under this paragraph (6) to obtain information necessary for the determination of whether a disaster or public health emergency should be declared, to monitor weather or

emergency conditions, to survey damage, or to otherwise coordinate response and recovery efforts. The use of a drone under this paragraph (6) is permissible during the disaster or public health emergency and during subsequent response and recovery efforts.

Sec. 20. **Information retention**. If a law enforcement agency uses a drone under Section 15 of this Act, the agency within 30 days shall destroy all information gathered by the drone, except that a supervisor at that agency may retain information if:

1. there is reasonable suspicion that the information contains evidence of criminal activity, or
2. the information is relevant to an ongoing investigation or pending criminal trial.

Sec. 25. **Information disclosure**. If a law enforcement agency uses a drone under Section 15 of this Act, the agency shall not disclose any information gathered by the drone, except that a supervisor of that agency may disclose information to another government agency, if:

1. there is reasonable suspicion that the information contains evidence of criminal activity, or
2. the information is relevant to an ongoing investigation or pending criminal trial.

Sec. 30. **Admissibility**. If the court finds by a preponderance of the evidence that a law enforcement agency used a drone to gather information in violation of the information gathering limits in Sections 10 and 15 of this Act, then the information shall be presumed to be inadmissible in any judicial or administrative proceeding.

Sec. 35. **Reporting**.

(a) If a law enforcement agency owns one or more drones, then subsequent to the effective date of this Act, it shall report in writing annually by April 1 to the Authority the number of drones that it owns.
(b) On July 1 of each year, the Authority shall publish on its publicly available website a concise report that lists every law enforcement agency that owns a drone, and for each of those agencies, the number of drones that it owns.

Sec. 40. **Law enforcement use of private drones**.

(a) Except as provided in Section 15, a law enforcement agency may not acquire information from or direct the acquisition of information through the use of a drone owned by a private third party. In the event that law enforcement acquires information from or directs the acquisition of information through the use of a privately owned drone under Section 15 of this Act, any information so acquired is subject to Sections 20 and 25 of this Act.
(b) Nothing in this Act prohibits private third parties from voluntarily submitting information acquired by a privately owned drone to law enforcement. In the event that law enforcement acquires information from the voluntary submission of that information, whether under a request 21 or on a private drone owner's initiative, the information is subject to Sections 20 and 25 of this Act.

720 ILCS 5/48-3 Criminal Code of 2012. - Hunter or fisherman interference

A person commits the crime of "hunter or fisherman interference" when they use a drone to interfere with someone's lawful hunting or fishing or animals. The statute does not apply to law enforcement personnel, officers of the U.S. Fish and Wildlife Service, and employees of the Department of Natural Resources, as long as their actions are authorized by law and necessary for the performance of their duties.

Indiana

Definitions:

"**Unmanned aerial vehicle**" means an aircraft that:

1. does not carry a human operator; and
2. is capable of flight under remote control or autonomous programming.

"**Use of an unmanned aerial vehicle**" means the use of an unmanned aerial vehicle by a law enforcement officer to obtain evidence relevant to the enforcement of statutes, rules, or regulations. The term includes:

1. the interception of wire, electronic, or oral communications; and
2. the capture, collection, monitoring, or viewing of images.

Indiana Code 14-22-6-16 - Use of unmanned aerial vehicles to aid hunting

Prohibits use of drones to aid in hunting activity.

Indiana Code 35-31.5-2-342.3

Indiana Code 35-33-5-9 - Unmanned aerial vehicles; search warrant; exceptions

Places limits on law enforcement use of drones; creates an exception that law enforcement may use drones to obtain aerial photographs or recordings of motor vehicle accidents on public streets or highways.

Iowa

808.15 - Unmanned aerial vehicle — information — admissibility

Information obtained as a result of the use of an unmanned aerial vehicle is not admissible as evidence in a criminal or civil proceeding, unless the information is obtained pursuant to the authority of a search warrant, or unless the information is otherwise obtained in a manner that is consistent with state and federal law.

321.492B - Use of unmanned aerial vehicle for traffic law enforcement prohibited

The state or a political subdivision of the state shall not use an unmanned aerial vehicle for traffic law enforcement.

HF 2492 (p.20)

Sec. 20. NEW SECTION 719.9 USE OF UNMANNED AERIAL VEHICLE ——

PROHIBITIONS.

1. As used in this section:
    a. "Facility" means a county jail, municipal holding facility, secure facility for the detention or custody of juveniles, community-based correctional facility, or institution under the management of the department of corrections.
    b. "Unmanned aerial vehicle" means a vehicle or device that uses aerodynamic forces to achieve flight and is piloted remotely.
2. A person shall not operate an unmanned aerial vehicle knowing that the unmanned aerial vehicle is operating in, on, or above a facility and any contiguous real property comprising the surrounding grounds of the facility, unless the unmanned aerial vehicle is operated by a law enforcement agency or the person has permission from the authority in charge of the facility to operate an unmanned aerial vehicle in, on, or above such facility.
3. This section does not apply to an unmanned aerial vehicle while operating for commercial use in compliance with federal aviation administration regulations, authorizations, or exemptions.
4. A person who violates this section commits a class "D" felony.

Kansas

Definitions:

"**Unmanned aerial system"** means a powered, aerial vehicle that:

1. Does not carry a human operator.
2. uses aerodynamic forces to provide vehicle lift.
3. may fly autonomously or be piloted remotely.
4. may be expendable or recoverable; and
5. may carry a lethal or nonlethal payload.

Bill 319 - amended the Protection from Stalking Act to address drones

‘‘Harassment’’ shall include any course of conduct carried out through the use of an unmanned aerial system over or near any dwelling, occupied vehicle or other place where one may reasonably expect to be safe from uninvited intrusion or surveillance.

Kentucky

Definitions:

"**Unmanned aircraft**" means an aircraft operated without the possibility of direct human intervention from within or on the aircraft.

"**Operator**" means a person operating or flying an unmanned aircraft

HB 540 - An ACT relating to aviation safety

HB 540 allows commercial airports to prepare unmanned aircraft facility maps. The bill specifies that UAS operators cannot operate, take off or land in areas designated by an airport’s map. It also prohibits operation of UAS in a reckless manner that creates a serious risk of physical injury or damage to property. Anyone who violates these provisions is guilty of a class A misdemeanor, or a class D felony if the violation causes a significant change of course or a serious disruption to the safe travel of an aircraft. The law specifies that these provisions do not apply to commercial operators in compliance with FAA regulations.

Louisiana

Definitions:

“**Unmanned aerial system**” means an unmanned aircraft and all associated support equipment, control station, data links, telemetry, communications, and navigation equipment necessary to operate the unmanned aircraft. The system may include drones, remote-controlled aircraft, unmanned aircraft, or any other such aircraft that is controlled autonomously by computer or remote control from the ground.

“**Unmanned aircraft system**” means an unmanned, powered aircraft that does not carry a human operator, may be autonomous or remotely piloted or operated, and may be expendable or recoverable.

The definition of unmanned aircraft system does not include use of a satellite orbiting the earth, an unmanned aircraft system used by the federal or state government or agent for the government to conduct surveillance of specific persons, use by local law enforcement agencies or fire departments, etc.

"**Targeted facility**" means the following systems:

1. Petroleum and alumina refineries.
2. Chemical and rubber manufacturing facilities.
3. Nuclear power electric generation facilities.
4. School and school premises as defined by R.S. 14:40.6

LA Revised Statutes §2.- Regulation of unmanned aerial systems and unmanned aircraft systems; preemption

The state shall have exclusive jurisdiction to regulate all unmanned aircraft systems and all unmanned aerial systems. This means that all state law will preempt and supersede any rule, regulation, code, or ordinance of any political subdivision or other local government. If federal law or regulation preempts any of the provisions of the Louisiana regulation, the federal regulation should be deemed to be the controlling law.

LA Revised Statutes 3:41-48 apply to the use of drones by the Department of Agriculture and Forestry (the "department") in the course of agricultural operations.

LA Revised Statutes 3:41 **Definitions**

LA Revised Statutes 3:42. **Powers of the commissioner**

LA Revised Statutes 3:43. **Licenses and registration**

LA Revised Statutes 3:44. **Unmanned aerial systems; operation**

LA Revised Statutes 3:45. **Violations**

LA Revised Statutes 3:46. **Stop orders**

LA Revised Statutes 3:47. **Penalties**

LA Revised Statutes 3:48. **Fees**

LA Revised Statutes 14:63. **Criminal trespass**

LA Revised Statutes 14:108. **Resisting an officer**

LA Revised Statutes 14:283. **Video voyeurism; penalties**

LA Revised Statutes 14:283.1. **Voyeurism; penalties**

LA Revised Statutes 14:284. **Peeping Tom; penalties**

LA Revised Statutes 14:337. **Unlawful use of an unmanned aircraft system**

Unlawful use of an unmanned aircraft system is either of the following:

1. The intentional use of an unmanned aircraft system to conduct surveillance of, gather evidence or collect information about, or photographically or electronically record a targeted facility without the prior written consent of the owner of the targeted facility.

2. The intentional use of an unmanned aircraft system over the grounds of a state or local jail, prison, or other correctional facility that incarcerates or detains juveniles or adults accused of, convicted of, sentenced for, or adjudicated delinquent for violations of criminal law without the express written consent of the person in charge of that state or local jail, prison, or other correctional facility.

Maine

Definitions:

"**Unmanned aerial vehicle**" means an aircraft operated without a physical human presence within or on the aircraft that, in the manner in which the aircraft is used or the manner in which it is equipped, is capable of performing audio or visual surveillance.

Statutes/Bills:

§4501. - Regulation of unmanned aerial vehicles

Places limits on law enforcement use of drones.

Maryland

Definitions:

"**Unmanned aircraft**" means the flying portion of an unmanned aircraft system, flown by a pilot via a ground control system, or autonomously through use of an onboard computer, a communication link, and any additional equipment that is necessary for the unmanned aircraft to operate safely.

"**Unmanned aircraft system**" means an unmanned aircraft and all the associated support equipment, control stations, data links, telemetry, communications and navigation equipment, and other equipment necessary to operate the unmanned aircraft.

SB 0370 - Unmanned Aircraft Systems Research, Development, Regulation, and Privacy Act of 2015

Maryland's statewide drone statute establishes that only the state may enact a law or take any other action to prohibit, restrict, or regulate the testing or operation of unmanned aircraft systems in the State. These state laws will preempt any laws created by counties or municipalities on the same subject and trumps any law currently in existence. State law will supersede any ordinances that local governments may enact or have previously enacted.

Massachusetts

No state drone laws

Michigan

Definitions:

"**Unmanned aircraft system**" means an unmanned aircraft and all of the associated support equipment, control station, data links, telemetry, communications, navigation equipment, and other equipment necessary to operate the unmanned aircraft.

"**Unmanned aircraft**" means an aircraft flown by a remote pilot via a ground control system, or autonomously through use of an on-board computer, communication links, and any additional equipment that is necessary for the unmanned aircraft to operate safely.

Act 436 - Unmanned Aircraft Systems Act

Enacts a range of drone-related laws for the state of Michigan:

- State preemption, banning cities and municipalities from enacting their own drone regulations or ordinances.
- Confirms that drone operation in the state is legal as long as the operator is complying with FAA regulations.
- An individual shall not knowingly and intentionally operate an unmanned aircraft system in a manner that interferes with the official duties of any of the following: police officer, firefighter, paramedic, search, and rescue personnel.
- Expands harassment, restraining order, and invasion of privacy laws to include activity conducted via a drone.
- Places restrictions on drone usage by registered sex offenders.
- Created an Unmanned Aircraft Systems Task Force to develop statewide policy recommendations on the operation, use, and regulation of unmanned aircraft systems in this state.

Section 259.301	Short title.
Section 259.303	Definitions.
Section 259.305	Political subdivision; limitations; powers; federal preemption; conflict with other sections of law.

Section 259.307	Prohibited use of an unmanned aircraft system; exceptions; permit, license, order, or other decree; notice of state-owned or operated; consent; information exempt from freedom of information act; applicability.
Section 259.311	Operation of unmanned aircraft system; person authorized by Federal Aviation Administration.
Section 259.313	Operation of unmanned aircraft system; manner.
Section 259.320	Criminal liability: offense committed with aid of an unmanned aircraft system; exception
Section 259.321	Operation of unmanned aircraft system; interference with official duties prohibited.
Section 259.322	Operation of unmanned aircraft system; harassment, violation of order, or invasion of privacy prohibited; definition; individual registered as sex offender.
Section 259.323	Violation as misdemeanor; penalty; other violation of law.
Section 259.330	Michigan aeronautics commission; duties; departmental support.
Section 259.331	Unmanned aircraft systems task force.

Act 451 - Hunting & Fishing Restrictions

Illegal to use drones to aid in hunting or fishing activity.

Act 451 - Hunting & Fishing Interference

Illegal to use drones to interfere with or disrupt lawful hunting or fishing activity.

Minnesota

SF 550 - Moose Calf Surveys and Monitoring

Appropriates $348,000 to assess the use of UAS in natural resource monitoring of moose populations and changes in ecosystems.

Mississippi

SB 2022 - An ACT to amend Section 97-29-61, Mississippi Code of 1972

Mississippi addresses drones in its "voyeurism" statute. It is considered a felony offense to use a drone or other instrumentality to spy on another person.

Penalties range from up to five years for a person who was over the age of twenty-one at the time of the offense, to up to ten years when a person who was over the age of twenty-one at the time of the offense spied upon a child under the age of sixteen.

Missouri

Missouri Revised Statutes Section 44.023.1 - Disaster volunteer program established, agency's duties–expenses–immunity from liability, exception

The Missouri state emergency management agency shall establish and administer an emergency volunteer program to be activated in the event of a disaster. This program is to allow volunteers, to offer the use of their services and equipment - either manned or unmanned – as needed to assist the state emergency management agency.

Montana

Definitions:

"**Unmanned aerial vehicle**" means an aircraft that is:

- capable of sustaining flight; and
- operated with no possible direct human intervention from on or within the aircraft.

"**Unmanned aerial vehicle system**" means the entire system used to operate an unmanned aerial vehicle, including:

1. the unmanned aerial vehicle.
2. communications equipment.
3. navigation equipment.
4. controllers.
5. support equipment; and
6. autopilot functionality.

46-5-109. - Limitations on unmanned aerial vehicles.

In any prosecution or proceeding within the state of Montana, information from an unmanned aerial vehicle is not admissible as evidence unless the information was obtained:

1. pursuant to the authority of a search warrant; or
2. in accordance with judicially recognized exceptions to the warrant requirement.

7-32-401. - Limitations on excess property provided to local law enforcement — definitions.

Law enforcement may not acquire armored or weaponized drones from military surplus.

76-13-214. - Obstruction of aerial wildfire suppression effort — penalty — exceptions.

Establishes legal penalties for drone flights that interfere with wildfire response efforts.

Nebraska

No state drone laws

Nevada

Definitions:

"**Unmanned aerial vehicle**" means a powered aircraft of any size without a human operator aboard the vehicle and that is operated remotely or autonomously.

Nevada also includes the term "unmanned aerial vehicle" in its general definition of aircraft. "**Aircraft**" includes a balloon, airplane, hydroplane, **unmanned aerial vehicle** and any other vehicle used for navigation through the air.

"**Critical facility**" means a petroleum refinery, a petroleum or chemical production, transportation, storage or processing facility, a chemical manufacturing facility, a pipeline and any appurtenance thereto, a wastewater treatment facility, a water treatment facility, a mine as that term is defined in NRS 512.006, a power generating station, plant or substation and any appurtenances thereto, any transmission line that is owned in whole or in part by an electric utility as that term is defined in subsection 5 of NRS 704.187, a county, city or town jail or detention facility and any prison, facility or institution under the control of the Department of Corrections. The term does not include any facility or infrastructure of a utility that is located underground.

Statutes/Bills:

NRS 360.753 Partial abatement of certain taxes imposed on aircraft, components of aircraft and other personal property used for certain purposes related to aircraft: Powers and duties of Office of Economic Development, Nevada Tax Commission, applicant for abatement, business approved for abatement and county treasurer. [Effective through June 30, 2035.]

Title 44 Aeronautics, Chapter 493 - GENERAL PROVISIONS

UNIFORM LAW

NRS 493.010 Short title.

NRS 493.010 to 493.120, inclusive, may be cited as the Uniform State Law for Aeronautics.

[12:66:1923; NCL § 286] — (NRS A 2015, 1777)

NRS 493.020 Definitions.

NRS 493.030 Sovereignty in space.

NRS 493.040 Ownership of space.

NRS 493.050 Lawfulness of flight and landing; liability for forced landing.

1. Flight of an aircraft over the lands and waters of this state is lawful:
   (a) Unless at such a low altitude as to interfere with the then existing use to which the land or water, or the space over the land or water, is put by the owner.
   (b) Unless so conducted as to be imminently dangerous to persons or property lawfully on the land or water beneath.
   (c) Unless specifically prohibited by the provisions of NRS 493.010 to 493.120, inclusive, or any regulations adopted pursuant thereto.
2. The landing of an aircraft on the lands or waters of another, without his or her consent, is unlawful, except in the case of a forced landing. For damages caused by a forced landing, the owner, lessee or operator of the aircraft is liable as provided in NRS 493.060.

[4:66:1923; NCL § 278] — (NRS A 1991, 253; 2015, 1777)

NRS 493.060 Liability for damages on land or water; lien for damages.

1. The owner of every aircraft which is operated over the lands or waters of this state is presumed liable for injuries to persons or property on the land or water beneath, caused by the:
   (a) Ascent, descent, or flight of the aircraft; or
   (b) Dropping or falling of any object therefrom, unless the injury is caused in whole or in part by the negligence of the person injured, or of the owner or bailee of the property injured.

NRS 493.070 Liability for collision of aircraft.

The liability of the owner of one aircraft to the owner of another aircraft, or to operators or passengers in either aircraft, for damage caused by a collision on land or in the air, must be determined by the rules of law applicable to torts on land.

[6:66:1923; NCL § 280] — (NRS A 1991, 253)

NRS 493.080 Jurisdiction over crimes and torts.

All crimes, torts and other wrongs committed by or against an operator or passenger while in flight over this state are governed by the laws of this state.

NRS 493.090 Jurisdiction over contracts.

NRS 493.100 Dangerous flying: Penalty.

1. Any operator or passenger, while an aircraft is in flight over a heavily populated area or over a public gathering within this state, who:
    (a) Except as otherwise provided in subsection 2, engages in trick or acrobatic flying, or in any acrobatic feat.
    (b) Except while in landing or taking off, flies at such a low level as to endanger the persons on the surface beneath; or
    (c) Drops any object with reckless disregard for the safety of other persons and willful indifference to injuries that could reasonably result from dropping the object, is guilty of a misdemeanor.
2. The provisions of paragraph (a) of subsection 1 do not apply to the operator of an unmanned aerial vehicle in a park unless the operator is operating the unmanned aerial vehicle with reckless disregard for the safety of other persons and with willful indifference to injuries that could reasonably result from such operation.

[9:66:1923; NCL § 283] — (NRS A 1967, 596; 1991, 254; 2015, 1778)

NRS 493.103 Unmanned aerial vehicles: Action for trespass against owner or operator; exceptions; award of treble damages for injury to person or property; award of attorney's fees and costs and injunctive relief.

1. Except as otherwise provided in subsection 2, a person who owns or lawfully occupies real property in this State may bring an action for trespass against the owner or operator of an unmanned aerial vehicle that is flown at a height of less than 250 feet over the property if:
    (a) The owner or operator of the unmanned aerial vehicle has flown the unmanned aerial vehicle over the property at a height of less than 250 feet on at least one previous occasion; and
    (b) The person who owns or occupies the real property notified the owner or operator of the unmanned aerial vehicle that the person did not authorize the flight of the unmanned aerial vehicle over the property at a height of less than 250 feet. For the purposes of this paragraph, a person may place the owner or operator of an unmanned aerial vehicle on notice in the manner prescribed in subsection 2 of NRS 207.200.
2. A person may not bring an action pursuant to subsection 1 if:
    (a) The unmanned aerial vehicle is lawfully in the flight path for landing at an airport, airfield, or runway.
    (b) The unmanned aerial vehicle is in the process of taking off or landing.
    (c) The unmanned aerial vehicle was under the lawful operation of:
        (1) A law enforcement agency in accordance with NRS 493.112.
        (2) A public agency in accordance with NRS 493.115.
    (d) The unmanned aerial vehicle was under the lawful operation of a business registered in this State or a land surveyor if:

(1) The operator is licensed or otherwise approved to operate the unmanned aerial vehicle by the Federal Aviation Administration.
(2) The unmanned aerial vehicle is being operated within the scope of the lawful activities of the business or surveyor; and
(3) The operation of the unmanned aerial vehicle does not unreasonably interfere with the existing use of the real property.

3. A plaintiff who prevails in an action for trespass brought pursuant to subsection 1 is entitled to recover treble damages for any injury to the person or the real property as the result of the trespass. In addition to the recovery of damages pursuant to this subsection, a plaintiff may be awarded reasonable attorney's fees and costs and injunctive relief.

(Added to NRS by 2015, 1774)

NRS 493.106 Unmanned aerial vehicles: Weaponization prohibited; penalties.

1. A person shall not weaponize an unmanned aerial vehicle or operate a weaponized unmanned aerial vehicle. A person who violates this section is guilty of a category D felony and shall be punished as provided in NRS 193.130.
2. A person who weaponizes an unmanned aerial vehicle in violation of subsection 1 and who discharges the weapon is guilty of a category C felony and shall be punished as provided in NRS 193.130.

(Added to NRS by 2015, 1773)

NRS 493.109 Unmanned aerial vehicles: Operation near critical facility or within 5 miles of airport prohibited; exceptions; penalty.

a. A person shall not operate an unmanned aerial vehicle within:
   (a) A horizontal distance of 500 feet or a vertical distance of 250 feet from a critical facility without the written consent of the owner of the critical facility.
   (b) Except as otherwise provided in subsection 2, 5 miles of an airport.
2. A person may operate an unmanned aerial vehicle within 5 miles of an airport only if the person obtains the consent of the airport authority or the operator of the airport, or if the person has otherwise obtained a waiver, exemption, or other authorization for such operation pursuant to any rule or regulation of the Federal Aviation Administration. A person who is authorized to operate an unmanned aerial vehicle within 5 miles of an airport pursuant to this subsection shall, at all times during such operation, maintain on his or her person documentation of any waiver, exemption, authorization, or consent permitting such operation.
3. A person who violates this section is guilty of a misdemeanor.
4. As used in this section, "airport" means any area of land or water owned, operated, or maintained by or on behalf of a city, county, town, municipal corporation, or airport authority that is designed and set aside for the landing and taking off of aircraft and that is utilized in the interest of the public for such purposes.

(Added to NRS by 2015, 1773)

NRS 493.112 Unmanned aerial vehicles: Operation by law enforcement agency; warrant required under certain circumstances; information acquired in violation of section inadmissible and may not be used to establish reasonable suspicion or probable cause.

1. Except as otherwise provided in this section, nothing in this section shall be deemed to otherwise prohibit the operation of an unmanned aerial vehicle by a law enforcement agency for any lawful purpose in this State.
2. Except as otherwise provided in subsection 3, a law enforcement agency shall not operate an unmanned aerial vehicle for the purpose of gathering evidence or other information within the curtilage of a residence or at any other location or upon any property in this State at which a person has a reasonable expectation of privacy, unless the law enforcement agency first obtains a warrant from a court of competent jurisdiction authorizing the use of the unmanned aerial vehicle for that purpose. A warrant authorizing the use of an unmanned aerial vehicle must specify the period for which operation of the unmanned aerial vehicle is authorized. A warrant must not authorize the use of an unmanned aerial vehicle for a period of more than 10 days. Upon motion and a showing of probable cause, a court may renew a warrant after the expiration of the period for which the warrant was initially issued.
3. A law enforcement agency may operate an unmanned aerial vehicle without obtaining a warrant issued pursuant to subsection 2:
    (a) If the law enforcement agency has probable cause to believe that a person has committed a crime, is committing a crime or is about to commit a crime, and exigent circumstances exist that make it unreasonable for the law enforcement agency to obtain a warrant authorizing the use of the unmanned aerial vehicle.
    (b) If a person provides written consent to the law enforcement agency authorizing the law enforcement agency to acquire information about the person or the real or personal property of the person. The written consent must specify the information to be gathered and the time, place, and manner in which the information is to be gathered by the law enforcement agency.
    (c) For the purpose of conducting search and rescue operations for persons and property in distress.
    (d) Under circumstances in which the law enforcement agency believes that an imminent threat exists to the life and safety of an individual person or to the public at large, including, without limitation, the threat of an act of terrorism. A law enforcement agency that operates an unmanned aerial vehicle pursuant to this paragraph shall document the factual basis for its belief that such an imminent threat exists and shall, not later than 2 business days after initiating operation, file a sworn statement with a court of competent jurisdiction describing the nature of the imminent threat and the need for the operation of the unmanned aerial vehicle.
    (e) Upon the declaration of a state of emergency or disaster by the Governor. A law enforcement agency that operates an unmanned aerial vehicle pursuant to this paragraph shall not use the unmanned aerial vehicle outside of the geographic area specified in the declaration or for any purpose other than the preservation of public safety, the protection of property, or the assessment and evaluation of environmental or weather-related damage, erosion, or contamination.
4. Any photograph, image, recording or other information that is acquired by a law enforcement agency through the operation of an unmanned aerial vehicle in violation of this section, or that is acquired from any other person or governmental entity, including, without limitation, a public agency and any department or agency of the Federal Government, that obtained the photograph, image, recording or other information in a manner inconsistent with the requirements of this section, and any evidence that is derived therefrom:
    (a) Is not admissible in and must not be disclosed in a judicial, administrative, or other adjudicatory proceeding; and
    (b) May not be used to establish reasonable suspicion or probable cause as the basis for investigating or prosecuting a crime or offense.

(Added to NRS by 2015, 1775)

NRS 493.115 Unmanned aerial vehicles: Operation by public agency; requirements; prohibited uses; information acquired in violation of section inadmissible and may not be used to establish reasonable suspicion or probable cause.

1. A public agency:
   (a) May operate an unmanned aerial vehicle only if:
      (1) Before the operation of the unmanned aerial vehicle, the public agency registers the unmanned aerial vehicle with the Department pursuant to subsection 2 of NRS 493.118.
      (2) The public agency operates the unmanned aerial vehicle in accordance with the regulations adopted by the Department pursuant to subsection 4 of NRS 493.118.
   (b) Must not operate an unmanned aerial vehicle for the purposes of assisting a law enforcement agency with law enforcement or conducting a criminal prosecution.
2. Any photograph, image, recording or other information that is acquired by a public agency through the operation of an unmanned aerial vehicle in violation of this section, and any evidence that is derived therefrom:
   (a) Is not admissible in, and must not be disclosed in, a judicial, administrative, or other adjudicatory proceeding; and
   (b) May not be used to establish reasonable suspicion or probable cause as the basis for investigating or prosecuting a crime or offense.

(Added to NRS by 2015, 1776)

NRS 493.118 Unmanned aerial vehicles: Department of Public Safety required to establish and maintain registry of such vehicles operated by public agencies; public agencies required to submit certain information for inclusion in registry; annual reports to Legislature; regulations.

1. The Department shall, to the extent that money is available for this purpose, establish and maintain a registry of unmanned aerial vehicles that are operated by public agencies in this State. The Department shall include on its Internet website the information that is maintained in the registry.
2. A public agency shall, for each unmanned aerial vehicle the public agency intends to operate, submit to the Department, on a form provided by the Department, for inclusion in the registry:
   (a) The name of the public agency.
   (b) The name and contact information of each operator of the unmanned aerial vehicle.
   (c) Sufficient information to identify the unmanned aerial vehicle; and
   (d) A statement describing the use of the unmanned aerial vehicle by the public agency.

NRS 493.120 Uniformity of interpretation.

NRS 493.010 to 493.120, inclusive, shall be so interpreted and construed as to effectuate their general purpose to make uniform the law of those states which enact them, and to harmonize, as far as possible, with federal laws and regulations on the subject of aeronautics. They shall not be interpreted or construed to apply in any manner to

aircraft owned and operated by the Federal Government.

[11:66:1923; NCL § 285] — (NRS A 2015, 1778)

REGULATION

NRS 493.130 Operation of aircraft while under influence of intoxicating liquor or controlled substance or in reckless manner: Penalty; exception.

1. Any person operating an aircraft in the air, or on the ground or water:
   (a) While under the influence of intoxicating liquor or a controlled substance, unless in accordance with a lawfully issued prescription; or
   (b) In a careless or reckless manner so as to endanger the life or property of another, is guilty of a gross misdemeanor.
2. As used in this section:
   (a) "Aircraft" includes an unmanned aerial vehicle as that term is defined in subsection 8 of NRS 493.020.

[1:114:1947; 1943 NCL § 288.1] — (NRS A 1967, 597; 1971, 2031; 1973, 8; 1987, 1554; 1993, 2237; 1995, 1723; 2015, 1778)

NRS 493.140 Standards for determining whether operation is careless or reckless.

In any proceeding charging careless or reckless operation of aircraft in violation of NRS 493.130 to 493.200, inclusive, the court in determining whether the operation was careless or reckless shall consider the standards for safe operation of aircraft prescribed by federal statutes or regulations governing aeronautics.

NRS 493.150 United States certificate, permit or license required for operation of civil aircraft within State.

It shall be unlawful for any person to operate or cause or authorize to be operated any civil aircraft within this State unless such aircraft has an appropriate effective certificate, permit or license issued by the United States, if such certificate, permit, or license is required by the United States.

NRS 493.160 Licensing of airmen and operators.

It shall be unlawful for any person to engage in aeronautics as an airman or operator in this state unless the person has an appropriate effective airman certificate, permit, rating, or license issued by the United States authorizing him or her to engage in the particular class of aeronautics in which he or she is engaged, if such certificate, permit, rating or license is required by the United States.

[4:114:1947; 1943 NCL § 288.4] — (NRS A 1991, 254)

NRS 493.170 Licensing of aeronautics instructors.

It shall be unlawful for any aeronautics instructor to give instruction in flying unless such instructor has an appropriate effective instructor's rating, certificate, permit or license as a flight instructor issued by the United States.

[5:114:1947; 1943 NCL § 288.5]

NRS 493.180 Posting and inspection of license of airman and aircraft.

1. Where a certificate, permit, rating, or license is required for an airman by the United States, it shall:
   (a) Be kept in the airman's personal possession when he or she is operating within the State.
   (b) Be presented for inspection upon the demand of any peace officer, or any other officer of this state or of a municipality, or any official, manager or person in charge of any airport upon which the airman shall land, or upon the reasonable request of any other person.
2. Where a certificate, permit or license is required by the United States for an aircraft, it shall:
   (a) Be carried in the aircraft at all times while the aircraft is operating in the State.
   (b) Be conspicuously posted in the aircraft where it may be readily seen by passengers or inspectors.
   (c) Be presented for inspection upon the demand of any peace officer, or any other officer of the State or of a municipality, or any official, manager or person in charge of any airport upon which the aircraft shall land, or upon the reasonable request of any person.

[6:114:1947; 1943 NCL § 288.6] — (NRS A 1959, 64)

NRS 493.190 Powers and duties of state and municipal officers.

Every state and municipal officer charged with the enforcement of state and municipal laws, shall enforce, and assist in the enforcement of NRS 493.130 to 493.200, inclusive, and of all rules, regulations and orders issued pursuant thereto, and of all other laws of this state relating to aeronautics. In that connection, each of the aforesaid persons is authorized to inspect and examine at reasonable hours any premises, and the buildings and other structures thereon, where airports, air navigation facilities, air schools, or other aeronautical activities are operated or conducted.

NRS 493.200 Penalty.

Unless a specific penalty is otherwise provided, any person violating any of the provisions of NRS 493.130 to 493.200, inclusive, is guilty of a misdemeanor.

MISCELLANEOUS PROVISIONS

NRS 493.210 Aerial navigational chart: Contents; fee; use of receipts.

1. The Commission on Tourism shall prepare and publish an aerial navigational chart of the State for the use of pilots of private aircraft. The chart must contain such navigational and other information as the

Commission determines to be desirable. The Commission shall charge a fee for each chart which is sufficient to pay for the cost of printing the chart.

2. The Aerial Navigational Chart Account is hereby created in the State General Fund. All money received by the Commission pursuant to subsection 1 must be deposited in the Account. Money in the Account may only be used by the Commission for printing aerial navigational charts of the State for the use of pilots of private aircraft. (Added to NRS by 1979, 1091; A 1983, 1171)

New Hampshire

Definitions (New Hampshire Department of Transportation, 2021):

"**Unmanned aerial vehicle**" or "**UAV**" means any device capable of flying in the air, which is remotely, automatically, or otherwise piloted without an occupant, including but not limited to, drones.

SB 222 - Hunting & Fishing Interference

This bill extends the prohibition on harassment of persons hunting, fishing, or trapping and adds the use of unmanned aerial vehicles to the activities prohibited.

New Jersey

Definitions:

"**Operate**" means to fly, control, direct, or program the flight of an unmanned aircraft system.

"**Unmanned aircraft**" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

"**Unmanned aircraft system**" means an unmanned aircraft and associated elements, including communication links and the components that control the unmanned aircraft, that are required for the pilot in command to operate safely and efficiently.

"**Correctional facility**" means a jail, prison, lockup, penitentiary, reformatory, training school, or other similar facility within the State of New Jersey

Statutes/Bills:

SB 3370 - AN ACT concerning the operation of unmanned aircraft systems and amending and supplementing various parts of the statutory law.

This act allows UAS operation that is consistent with federal law. The law specifies that owners or operators of critical infrastructure may apply to the FAA to prohibit or restrict operation of UAS near the critical infrastructure. Operating a UAS in a manner that endangers the life or property of another is a disorderly person's offense.

It is a fourth-degree crime if a person "knowingly or intentionally creates or maintains a condition which endangers the safety or security of a correctional facility by operating an unmanned aircraft system on the premises of or in close proximity to that facility."

Using a UAS to conduct surveillance of a correctional facility is a third-degree crime. It also makes it a criminal offense to operate a UAS in a way that interferes with a first responder actively engaged in response and to use a UAS to take wildlife.

Operating a UAS under the influence of drugs or with a BAC of .08 percent is a disorderly person's offense.

The law also applies the operation of UAS to limitations within restraining orders and specifies that convictions under the law are separate from other convictions such as harassment, stalking, and invasion of privacy.

The bill preempts localities from regulating UAS in any way that is inconsistent with this legislation.

New Mexico

Definitions:

"**Drone**" is defined as any device used or designed for navigation or flight in the air that is unmanned and guided remotely or by an onboard computer or onboard control system. Drones may also be referred to as "unmanned aerial vehicle (UAV)" or "unmanned aerial vehicle systems (UAVS)."

Title 19, Chapter 31, Part 10, 19.31.10.13 - USE OF VEHICLES AND ROADS IN HUNTING:

It shall be unlawful, at any time, to pursue, harass, harry, drive, or rally any protected species by use of a drone. It is also unlawful to use a drone to assist in the locating or taking of any protected species.

Exceptions: Aircraft, drone, and vehicle exemptions to this rule: The Director may exempt a person from the prohibition of utilizing an aircraft, drone, or vehicle for management purposes.

New York

N.Y. Tax Law Article 28, Part 3, § 1115.

New York's current statutory law only addresses drones in the context of its tax code. The statutes provide for drones in its list of sales tax and compensating use tax exemptions.

New York City Parks has a website listing where you can fly your model aircraft.

North Carolina

Definitions:

"**Unmanned aircraft**" – An aircraft, as defined in G.S. 63-1, that is operated without the possibility of human intervention from within or on the aircraft and that does not meet the definition of model aircraft.

"**Unmanned aircraft system**" – An unmanned aircraft and associated elements, including communication links and components that control the unmanned aircraft that are required for the pilot in command to operate safely and efficiently in the national airspace system.

"**Model aircraft**" – An aircraft, as defined in G.S. 63-1, that is mechanically driven or launched into flight and that meets all of the following requirements:

1. Is flown solely for hobby or recreational purposes.
2. Is not used for payment, consideration, gratuity, or benefit, directly or indirectly charged, demanded, received, or collected, by any person for the use of the aircraft or any photographic or video image produced by the aircraft.

Chapter 15A – Criminal Procedure

§15A-300.1 Restrictions on use of UAS

General Prohibitions. – No person, entity, or State agency shall use an unmanned aircraft system to do any of the following:

Conduct surveillance of:

1. A person or a dwelling occupied by a person and that dwelling's curtilage without the person's consent.
2. Private real property without the consent of the owner, easement holder, or lessee of the property.

Photograph an individual, without the individual's consent, for the purpose of publishing or otherwise publicly disseminating the photograph. This subdivision shall not apply to newsgathering, newsworthy events, or events or places to which the general public is invited.

Law Enforcement Exceptions. – The use of unmanned aircraft systems by law enforcement agencies of the State or a political subdivision of the State is not prohibited in the following instances:

1. To counter a high risk of a terrorist attack by a specific individual or organization if the United States Secretary of Homeland Security or the Secretary of the North Carolina Department of Public Safety determines that credible intelligence indicates that such a risk exists.
2. To conduct surveillance in an area that is within a law enforcement officer's plain view when the officer is in a location the officer has a legal right to be.
3. If the law enforcement agency first obtains a search warrant authorizing the use of an unmanned aircraft system.
4. If the law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action is needed to prevent imminent danger to life or serious damage to property, to forestall the imminent escape of a suspect or the destruction of evidence, to conduct pursuit of an escapee or suspect, or to facilitate the search for a missing person.
5. To photograph gatherings to which the general public is invited on public or private land.

§15A-300.2 Regulation of launch and recovery sites

a. No unmanned aircraft system may be launched or recovered from any State or private property without consent.
b. A unit of local government may adopt an ordinance to regulate the use of the local government's property for the launch or recovery of unmanned aircraft systems.
(2014-100, s. 34.30(a).)
(This includes state parks - North Carolina administrative code 13B.1204 prohibits drones from ascending or taking-off within or upon any state park area or state park water surface. UAS may be operated after obtaining a special activity permit from the park.)

§15A-300.3 Use of an unmanned aircraft system near a confinement or correctional facility prohibited

Prohibition. – No person, entity, or State agency shall use an unmanned aircraft system within either a horizontal distance of 500 feet, or a vertical distance of 250 feet from any local confinement facility, as defined in G.S. 153A-217, or State or federal correctional facility.

Penalty. – The following penalties apply for violations of this section:

1. A person who uses an unmanned aircraft system:
   (i) in violation of subsection (a) of this section or
   (ii) pursuant to an exception in subsection (b) of this section and who delivers, or attempts to deliver, a weapon to a local confinement facility or State or federal correctional facility is guilty of a Class H felony, which shall include a fine of one thousand five hundred dollars ($1,500). For purposes of this subdivision, the term "weapon" is as defined in G.S. 14-401.24(c).
2. A person who uses an unmanned aircraft system:
   (i) in violation of subsection (a) of this section or
   (ii) (ii) pursuant to an exception in subsection (b) of this section and who delivers, or attempts to deliver, contraband to a local confinement facility or State or federal correctional facility is guilty of a Class I felony, which shall include a fine of one thousand dollars ($1,000). For purposes of this

subdivision, the term "contraband" includes controlled substances, as defined in G.S. 90-87, cigarettes, alcohol, and communication devices, but does not include weapons.

3. A person who uses an unmanned aircraft system in violation of subsection (a) of this section for any other purpose is guilty of a Class 1 misdemeanor, which shall include a fine of five hundred dollars ($500.00).

Chapter 14 – Criminal Law

§14-7.45 Crimes committed by use of UAS

All crimes committed by use of an unmanned aircraft system, as defined in G.S.15A- 300.1, while in flight over this State shall be governed by the laws of this State, and the question of whether the conduct by an unmanned aircraft system while in flight over this State constitutes a crime by the owner of the unmanned aircraft system shall be determined by the laws of this State.

§14.280.3 Interference with manned aircraft by UAS

Class H felony to any person who willfully damages, disrupts the operation of, or otherwise interferes with a manned aircraft through use of an unmanned aircraft system, while the manned aircraft is taking off, landing, in flight, or otherwise in motion.

§14.401.24 Unlawful possession and use of UAS (Weapon attached)

It shall be a Class E felony for any person to possess or use an unmanned aircraft or unmanned aircraft system that has a weapon attached.

It is a Class 1 misdemeanor to fish or to hunt using an unmanned aircraft system.

It is a Class A1 misdemeanor to publish or disseminate images taken through the use of infrared or other thermal imaging technology attached to an unmanned aircraft system revealing individuals, materials, or activities inside of a structure without the consent of the property owner.

§14.401.25 Unlawful distribution of images

Chapter 113 – Conservation and Development

§113-295 Unlawful harassment of persons taking wildlife resources

Chapter 63 – Aeronautics

This chapter does not apply to "model aircrafts."

§63-95 Training required for operations of UAS

§63-96 License required for commercial operation of UAS

North Dakota

Definitions:

"**Unmanned aerial vehicle**" means any aerial vehicle that is operated without the possibility of direct human intervention within or on the aerial vehicle. The term does not include satellites.

"**Unmanned aerial vehicle system**" means an unmanned aerial vehicle and associated elements, including communication links and the components that control the unmanned aerial vehicle, which are required for the pilot in command to operate safely and efficiently in state airspace.

"**Flight data**" means imaging or other observation recording.

"**Flight information**" means flight duration, flight path, and mission objective.

Statutes/Bills:

29-29.4-02. Limitations on use of unmanned aerial vehicle system.

Information obtained from an unmanned aerial vehicle is not admissible in a prosecution or proceeding within the state unless the information was obtained:

1. Pursuant to the authority of a search warrant; or
2. In accordance with exceptions to the warrant requirement.

29-29.4-03. Warrant requirements.

A warrant for the use of an unmanned aerial vehicle must satisfy the requirements of the Constitution of North Dakota. In addition, the warrant must contain a data collection statement that includes:

1. The persons that will have the power to authorize the use of the unmanned aerial vehicle.
2. The locations in which the unmanned aerial vehicle system will operate.
3. The maximum period for which the unmanned aerial vehicle system will operate in each flight; and
4. Whether the unmanned aerial vehicle system will collect information or data about individuals or groups of individuals

29-29.4-04. Exceptions.

Does not prohibit any use of an unmanned aerial vehicle for surveillance during the course of:

1. Patrol of national borders.
2. Exigent circumstances. Exigent circumstances exist when a law enforcement agency possesses reasonable suspicion that absent swift preventative action, there is an imminent danger to life or bodily harm.
3. An environmental or weather-related catastrophe.
4. Research, education, training, testing, or development efforts undertaken by or in conjunction with a school or institution of higher education within the state and its political subdivisions, nor to public and private collaborators engaged in mutually supported efforts involving research, education, training, testing, or

development related to unmanned aerial vehicle systems or unmanned aerial vehicle system technologies and potential applications.

29-29.4-05. Prohibited use.

1. A law enforcement agency may not authorize the use of, including granting a permit to use, an unmanned aerial vehicle armed with any lethal weapons.
2. This chapter prohibits any use of an unmanned aerial vehicle for:
    a. Domestic use in private surveillance. A law enforcement agency may not authorize the use of, including granting a permit to use, an unmanned aerial vehicle to permit any private person to conduct surveillance on any other private person without the express, informed consent of that other person or the owner of any real property on which that other private person is present.
    a. Surveillance of the lawful exercise of constitutional rights unless the surveillance is otherwise allowed under this chapter.

29-29.4-06. Documentation of unmanned aerial vehicle use.

The person authorized to conduct the surveillance must document all use of an unmanned aerial vehicle for surveillance. The person shall document all surveillance flights as to duration, flight path, and mission objectives.

Ohio

HB 292 - Ohio aerospace and aviation technology committee.

Ohio created an aerospace and aviation technology committee. The legislation that established this committee is the only Ohio law that addresses the use of drones. The committee's duties include the promotion of research and development in the aviation, aerospace, and technology industry, "including research and development of unmanned aerial vehicles."

There is hereby created the Ohio aerospace and aviation technology committee, consisting of the following members:

1. Three members of the senate, appointed by the president of the senate, not more than two of whom may be members of the same political party.
2. Three members of the house of representatives, appointed by the speaker of the house of representatives, not more than two of whom may be members of the same political party.
3. Fifteen members representing the aviation, aerospace, or technology industry, the military, or academia. One such member shall be appointed by the governor, and fourteen such members shall be appointed by majority vote of the six members representing the senate and house of representatives.

The duties of the committee shall include, but are not limited to, all of the following:

1. Studying and developing comprehensive strategies to promote the aviation, aerospace, and technology industry throughout the state, including through the commercialization of aviation, aerospace, and technology products and ideas.

2. Encouraging communication and resource-sharing among individuals and organizations involved in the aviation, aerospace, and technology industry, including business, the military, and academia.
3. Promoting research and development in the aviation, aerospace, and technology industry, including research and development of unmanned aerial vehicles.
4. Aiding related to military base realignment and closure.

Oklahoma

Definitions:

"**Unmanned aircraft**" means an aircraft without occupants that is flown by a pilot via a ground control system or autonomously through use of an onboard computer and other additional equipment necessary to operate the aircraft and includes unmanned aircraft commonly called drones.

"**Critical infrastructure facility**" means:

a. one of the following, if completely enclosed by a fence or other physical barrier that is obviously designed to exclude intruders, or if clearly marked with a sign or signs that are posted on the property, are reasonably likely to come to the attention of intruders, and indicate that entry is forbidden or flight of unmanned aircraft without site authorization is forbidden:
    1. a petroleum or alumina refinery,
    2. an electrical power generating facility, substation, switching station or electrical control center,
    3. a chemical, polymer or rubber manufacturing facility,
    4. a water intake structure, water treatment facility, wastewater treatment plant or pump station,
    5. a natural gas compressor station,
    6. a liquid natural gas terminal or storage facility,
    7. a telecommunications central switching office,
    8. wireless telecommunications infrastructure, including cell towers,
    9. a port, railroad switching yard, trucking terminal or other freight transportation facility,
    10. a gas processing plant, including a plant used in the processing, treatment or fractionation of natural gas or natural gas liquids,
    11. a transmission facility used by a federally licensed radio or television station,
    12. a steelmaking facility that uses an electric arc furnace to make steel,
    13. a facility identified and regulated by the United States Department of Homeland Security Chemical Facility Anti-Terrorism Standards (CFATS) program,
    14. a dam that is regulated by the state or federal government, or
    15. a natural gas distribution utility facility, including, but not limited to, pipeline interconnections, a city gate or town border station, metering station, aboveground piping, a regulator station, and a natural gas storage facility, or
b. any aboveground portion of an oil, gas, hazardous liquid, or chemical pipeline that is enclosed by a fence or other physical barrier that is obviously designed to exclude intruders.

HB2599

3-322. Critical infrastructure facility – Unmanned aircraft prohibited.

A person shall not intentionally or knowingly:

1. Operate an unmanned aircraft over a critical infrastructure facility if the unmanned aircraft is less than four hundred (400) feet above ground level.
2. Allow an unmanned aircraft to contact a critical infrastructure facility, including any person or object on the premises of or within the facility; or
3. Allow an unmanned aircraft to come within a distance of a critical infrastructure facility that is close enough to interfere with the operations of or cause a disturbance to the facility.

This law does not apply to conduct committed by:

1. The federal government, the state, or a political subdivision of the state.
2. A person under contract with or otherwise acting under the direction or on behalf of the federal government, the state, or a political subdivision of the state.
3. A law enforcement agency.
4. A person under contract with or otherwise acting under the direction or on behalf of a law enforcement agency.
5. An owner or operator of the critical infrastructure facility.
6. A person under contract with or otherwise acting under the direction or on behalf of an owner or operator of the critical infrastructure facility.
7. A person who has the prior written consent of the owner or operator of the critical infrastructure facility.
8. The owner or occupant of the property on which the critical infrastructure facility is located or a person who has the prior written consent of the owner or occupant of that property; or
9. An operator of an unmanned aircraft that is being used for a commercial purpose, if the operator is authorized by the Federal Aviation Administration to conduct operations over that airspace.

Oregon

Definitions:

"**Unmanned aircraft system**" means an unmanned flying machine, commonly known as a drone, and its associated elements, including communication links and the components that control the machine.

837.310 Restrictions; exceptions.

Except as otherwise provided in ORS 837.310 to 837.345, a law enforcement agency may not operate an unmanned aircraft system, acquire information through the operation of an unmanned aircraft system or disclose information acquired through the operation of an unmanned aircraft system.

Oregon law enforcement may only use a drone under one or more of the following circumstances: they obtain a written warrant that specifies the period of use of the drone which cannot exceed 30 days, they reasonably believe that exigent circumstances exist in the commitment of a crime making it unreasonable to wait for a warrant, they

have written consent from the individual whose property is being searched, they are using the drone solely for training purposes, or if they intend to use the drone to conduct search and rescue operations during a time of emergency.

837.320 Authorized use upon issuance of warrant; exigent circumstances.

1. A law enforcement agency may operate an unmanned aircraft system, acquire information through the operation of an unmanned aircraft system, or disclose information acquired through the operation of an unmanned aircraft system, if:
    (a) A warrant is issued authorizing use of an unmanned aircraft system; or
    (b) The law enforcement agency has probable cause to believe that a person has committed a crime, is committing a crime or is about to commit a crime, and exigent circumstances exist that make it unreasonable for the law enforcement agency to obtain a warrant authorizing use of an unmanned aircraft system.
2. A warrant authorizing the use of an unmanned aircraft system must specify the period for which operation of the unmanned aircraft system is authorized. In no event may a warrant provide for the operation of an unmanned aircraft system for a period of more than 30 days. Upon motion and good cause shown, a court may renew a warrant after the expiration of the 30-day period. [2013 c.686 §3; 2015 c.315 §3]

837.330 Written consent.

A law enforcement agency may operate an unmanned aircraft system for the purpose of acquiring information about an individual, or about the individual's property, if the individual has given written consent to the use of an unmanned aircraft system for those purposes. [2013 c.686 §4; 2015 c.315 §4]

837.335 Search and rescue; use in emergencies.

A law enforcement agency may operate an unmanned aircraft system for the purpose of search and rescue activities, assisting an individual in an emergency, and during a state of emergency that is declared by the Governor.

837.340 Criminal investigations.

A law enforcement agency may operate an unmanned aircraft system, acquire information through the operation of an unmanned aircraft system, or disclose information acquired through the operation of an unmanned aircraft system, for the purpose of reconstruction of a specific crime scene or accident scene, or similar physical assessment, related to a specific criminal investigation.

837.345 Training.

A law enforcement agency may operate an unmanned aircraft system for training purposes.

837.360 Restrictions; civil penalties; registration; fees; rules.

1. A public body may not operate an unmanned aircraft system in the airspace over this state without registering the unmanned aircraft system with the Oregon Department of Aviation.

2. The Oregon Department of Aviation may impose a civil penalty of up to $10,000 against a public body that violates subsection (1) of this section.
3. Evidence obtained by a public body through the use of an unmanned aircraft system in violation of subsection (1) of this section is not admissible in any judicial or administrative proceeding and may not be used to establish reasonable suspicion or probable cause to believe that an offense has been committed.
4. The Oregon Department of Aviation shall establish a registry of unmanned aircraft systems operated by public bodies and may charge a fee sufficient to reimburse the department for the maintenance of the registry.
5. The Oregon Department of Aviation shall require the following information for registration of an unmanned aircraft system:
    (a) The name of the public body that owns or operates the unmanned aircraft system.
    (b) The name and contact information of the individuals who operate the unmanned aircraft system.
    (c) Identifying information for the unmanned aircraft system as required by the department by rule.
6. A public body that registers one or more unmanned aircraft systems under this section shall provide an annual report to the Oregon Department of Aviation that:
    (a) Summarizes the frequency of use of the unmanned aircraft systems by the public body during the preceding calendar year.
    (b) Summarizes the purposes for which the unmanned aircraft systems have been used by the public body during the preceding calendar year; and
    (c) Indicates how the public can access the policies and procedures established under section 7 of this 2016 Act.
7. The State Aviation Board may adopt all rules necessary for the registration of unmanned aircraft systems in Oregon that are consistent with federal laws and regulations.

Section 9 of HB4066 said:

1. Section 7 of this 2016 Act and the amendments to ORS 837.360 by section 8 of this 2016 Act become operative on January 1, 2017.
2. A public body may take any action before the operative date specified in subsection (1) of this section that is necessary to enable the public body to exercise, on and after the operative date specified in subsection (1) of this section, all the duties, functions and powers conferred on the public body by section 7 of this 2016 Act and the amendments to ORS 837.360 by section 8 of this 2016 Act.

837.365 Weaponized unmanned aircraft systems.

A person may not intentionally, knowingly, or recklessly operate or cause to be operated an unmanned aircraft system that is capable of firing a bullet or projectile or otherwise operate or cause to be operated an unmanned aircraft system in a manner that causes the system to function as a dangerous weapon as defined in ORS 161.015

Violations are either a class B or C felony depending on whether the action resulted in the drone causing physical injury to another person.

Rule does not apply if:

1. The person uses the unmanned aircraft system to release, discharge, propel or eject a nonlethal projectile for purposes other than to injure or kill persons or animals.
2. The person uses the unmanned aircraft system for nonrecreational purposes in compliance with specific authorization from the Federal Aviation Administration.
3. The person notifies the Oregon Department of Aviation, the Oregon State Police and any other agency that issues a permit or license for the activity requiring the use of the unmanned aircraft system of the time and location at which the person intends to use an unmanned aircraft system that is capable of releasing, discharging, propelling, or ejecting a projectile at least five days before the person uses the system.
4. If the person intends to use an unmanned aircraft system that is capable of releasing, discharging, propelling, or ejecting a projectile in an area open to the public, the person provides reasonable notice to the public of the time and location at which the person intends to use the unmanned aircraft system; and
5. The person maintains a liability insurance policy in an amount not less than $1 million that covers injury resulting from use of the unmanned aircraft system.

837.375 Interference with an unmanned aircraft system; unauthorized control.

In addition to any other remedies allowed by law, a person who intentionally interferes with, or gains unauthorized control over, an unmanned aircraft system licensed by the Federal Aviation Administration or operated by the Armed Forces of the United States as defined in ORS 352.313, an agency of the United States or a federal, state, or local law enforcement agency, is liable to the owner of the unmanned aircraft system in an amount of not less than $5,000. The court shall award reasonable attorney fees to a prevailing plaintiff in an action under this section.

837.380 Owners of real property; Attorney General.

Oregon statutes forbid any person from flying a drone over another's property multiple times, as long as the drone has been flown over the property at least once and the property owner notified the drone operator or owner that they did not want the drone flown over property. However, the property owner has no cause of action if the drone is taking off or landing or is lawfully in the flight path of an airport or runway. If the property owner brings a cause of action and prevails, they may recover treble damages and attorneys' fees.

837.385 Preemption of local laws regulating unmanned aircraft systems.

Except as expressly authorized by state statute, the authority to regulate the ownership or operation of unmanned aircraft systems is vested solely in the Legislative Assembly. Except as expressly authorized by state statute, a local

government, as defined ORS 174.116, may not enact an ordinance or resolution that regulates the ownership or operation of unmanned aircraft systems or otherwise engage in the regulation of the ownership or operation of unmanned aircraft systems.

837.995 Crimes involving unmanned aircraft systems; penalties.

1. A person commits a Class A felony if the person possesses or controls an unmanned aircraft system and intentionally causes, or attempts to cause, the unmanned aircraft system to:
    (a) Fire a bullet or other projectile at an aircraft while the aircraft is in the air.
    (b) Direct a laser at an aircraft while the aircraft is in the air; or
    (c) Crash into an aircraft while the aircraft is in the air.
2. A person who intentionally interferes with, or gains unauthorized control over, an unmanned aircraft system licensed by the Federal Aviation Administration or operated by the Armed Forces of the United States as defined in ORS 352.313, an agency of the United States or a federal, state, or local law enforcement agency, commits a Class C felony.

HB 4066 Critical Infrastructure Facility (Passed as law but waiting on location to where it is to be added between 837.300-390)

"**Critical infrastructure facility**" means any of the following facilities, if completely enclosed by a fence or other physical barrier that is obviously designed to exclude intruders, or if marked with a sign conspicuously posted on the property that indicates that entry is forbidden:

1. A petroleum or alumina refinery.
2. An electrical power generating facility, substation, switching station or electrical control center.
3. A chemical, polymer or rubber manufacturing facility.
4. A water intake structure, water treatment facility, wastewater treatment plant or pump
5. A natural gas compressor station.
6. A liquid natural gas terminal or storage facility.
7. A telecommunications central switching office.
8. A port, railroad switching yard, trucking terminal or other freight transportation facility.
9. A gas processing plant, including a plant used in the processing, treatment, or fractionation of natural gas.

10. A transmission facility used by a federally licensed radio or television station.
11. A steelmaking facility that uses an electric arc furnace to make steel.
12. A dam that is classified as a high hazard by the Water Resources Department.
13. Any portion of an aboveground oil, gas or chemical pipeline that is enclosed by a fence or other physical barrier that is obviously designed to exclude intruders; or
14. A correctional facility or law enforcement facility.

A person commits a Class A violation if the person intentionally or knowingly:

1. Operates an unmanned aircraft system over a critical infrastructure facility at an altitude not higher than 400 feet above ground level; or
2. Allows an unmanned aircraft system to contact a critical infrastructure facility, including any person or object on the premises of or within the facility.

Violations do not apply to:

1. The federal government.
2. A public body.
3. A law enforcement agency.
4. A person under contract with or otherwise acting under the direction or on behalf of the federal government, a public body, or a law enforcement agency.
5. An owner or operator of the critical infrastructure facility.
6. A person who has the prior written consent of the owner or operator of the critical infrastructure facility.
7. The owner or occupant of the property on which the critical infrastructure facility is located.
8. A person who has the prior written consent of the owner or occupant of the property on which the critical infrastructure facility is located.
9. A person operating an unmanned aircraft system for commercial purposes in compliance with authorization granted by the Federal Aviation Administration.

498.128 **Use of drones for pursuit of wildlife prohibited**

The State Fish and Wildlife Commission shall adopt rules prohibiting the use of drones for the following purposes related to the pursuit of wildlife:

1. Angling.

2. Hunting.

3. Trapping.

4. Aiding angling, hunting, or trapping through the use of drones to harass, track, locate or scout wildlife; and

5. Interfering in the acts of a person who is lawfully angling, hunting, or trapping.

Oregon Aviation Regulations Chapter 738

Purpose and Statutory Authority:

To regulate the registration of aircraft and UAS in Oregon

738-080-0015 Definitions

738-080-0020 Exemption from Aircraft and UAS Registration Fee

738-080-0030 Temporary Exemption from Registration of Manned Aircraft

738-080-0045 Public Agency Registration of Unmanned Aircraft System (UAS)

Pennsylvania

Act 78 of 2018 (HB 1346). UNLAWFUL USE OF UNMANNED AIRCRAFT AND PROHIBITING LOCAL REGULATION OF UNMANNED AIRCRAFT.

Amending Titles 18 (Crimes and Offenses) and 53 (Municipalities Generally) of the Pennsylvania Consolidated Statutes, in burglary and other criminal intrusion, defining the offense of unlawful use of unmanned aircraft; and, in preemptions, prohibiting local regulation of unmanned aircraft.

Section 1. Title 18 of the Pennsylvania Consolidated Statutes is amended by adding a section to read:

§ 3505. Unlawful use of unmanned aircraft.

a. Offense defined. --A person commits the offense of unlawful use of unmanned aircraft if the person uses an unmanned aircraft intentionally or knowingly to:
   i. Conduct surveillance of another person in a private place.
   ii. Operate in a manner which places another person in reasonable fear of bodily injury.
   iii. Deliver, provide, transmit or furnish contraband in violation of section 5123 (relating to contraband) or 61 Pa.C.S. § 5902 (relating to contraband prohibited).
b. Grading. --The offense of unlawful use of unmanned aircraft shall be graded as follows:
   i. An offense under subsection (a)(1) or (2) is a summary offense punishable by a fine of up to $300.
   ii. An offense under subsection (a)(3) is a felony of the second degree.
c. Exceptions for law enforcement officers. --Subsection (a) shall not apply if the conduct proscribed under subsection (a) is committed by any of the following:
   i. Law enforcement officers engaged in the performance of their official law enforcement duties.
   ii. Personnel of the Department of Corrections, local correctional facility, prison, or jail engaged in the performance of their official duties.
d. Other exceptions. --Subsection (a)(1) and (2) shall not apply if the conduct proscribed under subsection (a)(1) or (2) is committed by any of the following:
   i. Firefighters, as defined in section 2 of the act of December 16, 1998 (P.L.980, No.129), known as the Police Officer, Firefighter, Correction Employee and National Guard Member Child Beneficiary Education Act, or special fire police, as provided for in 35 Pa.C.S. Ch. 74 Subch. D (relating to special fire police), engaged in the performance of their official firefighting or fire police duties.

ii. Emergency medical responders, as defined in 35 Pa.C.S. § 8103 (relating to definitions), engaged in the performance of their official duties.
iii. An employee or agent of an electric, water, natural gas or other utility while engaged in the performance of the employee's or agent's official duties.
iv. An employee or agent of a government agency while engaged in the performance of the employee's or agent's official duties.

e. Aerial data collection. --Subsection (a)(1) shall not apply if the conduct proscribed is committed by a person engaged in aerial data collection if:
i. the person utilized the unmanned aircraft in a manner which complies with Federal Aviation Administration regulations, or the unmanned aircraft is authorized by an exemption that is issued by the Federal Aviation Administration; and
ii. the person did not knowingly or intentionally conduct surveillance of another person in a private place.

f. Definitions. --As used in this section, the following words and phrases shall have the meanings given to them in this subsection unless the context clearly indicates otherwise:
"Bodily injury." As defined in section 2301 (relating to definitions).
"Law enforcement officer." An officer of the United States, of another state or subdivision thereof, or of the Commonwealth or political subdivision thereof, who is empowered by law to conduct investigations of or to make arrests for offenses enumerated in this title or an equivalent crime in another jurisdiction and an attorney authorized by law to prosecute or participate in the prosecution of the offense.
"Private place." A place where a person has a reasonable expectation of privacy.
"Surveillance." Using or causing to be used an unmanned aircraft to observe, record or invade the privacy of another.
"Unmanned aircraft." An aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

Section 2. Title 53 is amended by adding a section to read:

§ 305. Local regulation of unmanned aircraft prohibited.

a. Preemption. --The provisions of 18 Pa.C.S. § 3505 (relating to unlawful use of unmanned aircraft) shall preempt and supersede any ordinance, resolution, rule, or other enactment of a municipality regulating the ownership or operation of unmanned aircraft. As of the effective date of this section, a municipality shall not regulate the ownership or operation of unmanned aircraft unless expressly authorized by statute.
b. Municipal use. --Nothing under 18 Pa.C.S. § 3505 shall prohibit a municipality from using unmanned aircraft within the boundaries of the municipality for municipal purposes and regulating that use.
c. Definition. --As used in this section, the term "municipality" shall include a county, city, borough, incorporated town or township or home rule, optional plan or optional charter municipality, any other general-purpose unit of government established by the General Assembly, a municipal authority and any entity formed pursuant to Ch. 23 Subch. A (relating to intergovernmental cooperation).

Pennsylvania Department of Conservation and Natural Resources created a management policy for drones in the state parks.

Pennsylvania's Department of Transportation created a UAS page.

Rhode Island

§ 1-8-1 Exclusive aerial regulations.

Subject to federal law, the state of Rhode Island and the Rhode Island airport corporation shall have exclusive legal authority to regulate any object capable of flying that is remotely controlled and flies autonomously through software-controlled flight plans embedded in the object's system by a global-position system, commonly known as unpiloted aerial vehicles, remotely piloted aircraft, drones, or unmanned aircraft systems.

South Carolina

No state drone laws

South Dakota

Definitions:

"**Drone**" means a powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, and can fly autonomously or be piloted remotely. The vehicle may be expendable or recoverable.

22-21-1. - Trespassing to eavesdrop–Installation or use of unauthorized eavesdropping device–Drones.

Any person who, except as authorized by law:

1. Trespasses on property with intent to subject anyone to eavesdropping or other surveillance in a private place.
2. Installs in any private place, without the consent of the person or persons entitled to privacy there, any device for observing, photographing, recording, amplifying, or broadcasting sounds or events in such place, or uses any such unauthorized installation.
3. Intentionally uses a drone to photograph, record, or otherwise observe another person in a private place where the person has a reasonable expectation of privacy; or
4. Lands a drone on the lands or waters of another resident provided the resident owns the land beneath the water body in its entirety without the owner's consent, except in the case of forced landing and the owner or lessee of the drone will be liable for any damage resulting from a forced landing; is guilty of a Class 1 misdemeanor. Subdivisions (2) and (3) do not apply to law enforcement officers, or to those acting under the direction of a law enforcement officer, while engaged in the performance of the officer's lawful duties. These restrictions do not apply to a drone operator operating a drone for commercial or agricultural purposes pursuant to or in compliance with federal aviation administration regulations, authorizations, and exemptions nor do they apply to an emergency management worker operating a drone within the scope of the worker's duties.

50-11-9.1. - Certain unmanned aircraft exempt from registration.

Exempts UAS that weigh less than 55 pounds from aircraft registration requirements.

50-15-1. - Drone defined.

50-15-2. Compliance with federal requirements–Exemption from chapter.

Any operation of a drone in the state shall comply with all applicable federal aviation administration requirements. Any drone operating under the authority of the Armed Forces of the United States, including the National Guard, is exempt from this chapter.

50-15-3. - Authorization required to operate drone over certain facilities–Violation as misdemeanor.

No person may operate a drone over the grounds of a prison, correctional facility, jail, juvenile detention facility, or any military facility unless expressly authorized by the administrator thereof.

A violation of this section is a Class 1 misdemeanor.

50-15-4. - Prohibited delivery of contraband or controlled substance–Felony.

Any person who uses a drone to deliver contraband or controlled substances to a state prison or other correctional facility is guilty of a Class 6 felony in addition to the penalty for the principal offense.

Tennessee

Definitions:

The Tennessee Freedom from Unwanted Surveillance Act defines a "drone" as "a powered, aerial vehicle" that:

1. does not carry a human operator and cannot be operated by a human from within or on the aircraft.
2. uses aerodynamic forces for lift.
3. can be piloted remotely or fly autonomously.
4. can be recoverable or expendable.

"**Law enforcement agency**" refers to an agency that is responsible for preventing and detecting crime, for enforcing local government code, and for enforcing "penal, traffic, regulatory, game, or controlled substance laws."

"**Critical infrastructure facility**" means:

1. An electrical power generation system; electrical transmission system, either as a whole system or any individual component of the transmission system; or electrical distribution substation.
2. A petroleum refinery.
3. A manufacturing facility that utilizes any hazardous substance, as defined in § 68-131-102, either in storage or in the process of manufacturing.
4. A chemical or rubber manufacturing facility.
5. A petroleum or chemical storage facility.
6. A water or wastewater treatment facility.
7. Any facility, equipment, or pipeline infrastructure utilized in the storage, transmission, or distribution of natural gas or propane; and

8. Railroad yards and facilities do not open to the general public.

The statute generally prohibits drone use by a law enforcement agency to gather evidence or other information. Following the general prohibition, the statute prescribes exceptions by which drone use is permissible.

The statute allows use of a drone in these circumstances:

1. to counter a high risk of a terrorist attack by a specific individual or organization if the United States secretary of homeland security determines that credible intelligence indicates that there is such a risk.
2. if the law enforcement agency first obtains a search warrant signed by a judge authorizing its use.
3. if the law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action is needed to prevent imminent danger to life.
4. to provide continuous aerial coverage when law enforcement is searching for a fugitive or escapee or is monitoring a hostage situation; or
5. to provide more expansive aerial coverage when deployed for the purpose of searching for a missing person.

In 2014, the Tennessee General Assembly enacted a chapter concerning "Surveillance by Unmanned Aircraft" as part of the Tennessee Code's Criminal Offenses Title. It first defines "images" broadly, including "any capturing of sound waves, thermal, infrared, ultraviolet, visible light, or other electromagnetic waves, odor, or other conditions existing on or about real property in this state or an individual located on that property." The definition of "unmanned aircraft" is broad, including any "airborne device that is operated without an individual in or on the device."

39-13-902. - Lawful capture of images – Use for lawful purposes.

it is legal to capture an image using a drone in any of the following circumstances:

1. for purposes of professional or scholarly research and development by a person acting on behalf of an institution of higher education.
2. in airspace designated as a test site or range authorized by the Federal Aviation Administration for the purpose of integrating unmanned aircraft systems into the national airspace.
3. as part of an operation, exercise, or mission of any branch of the United States military, as long as it complies with the United States Constitution.
4. if the image is captured by a satellite for the purposes of mapping.
5. if the image is captured by or for an electric or natural gas utility for one of several listed purposes.
6. with the consent of the individual who owns or lawfully occupies the real property captured in the image.
7. (7) "for law enforcement purposes," as defined by another statute, (see Tenn. Code 39-13-609).
8. (8) if the image is captured by state law enforcement authorities, or a person who is under contract with or otherwise acting under the direction or on behalf of state authorities to survey a catastrophe or determine whether a state of emergency should be declared, to preserve public safety or protect property or survey damage or contamination during a lawfully declared state of emergency, or to conduct routine air quality sampling and monitoring.
9. at the scene of a spill, or a suspected spill, of hazardous materials.

10. for the purpose of fire suppression.
11. for the purpose of rescuing a person whose life or well-being is in imminent danger.
12. if the image is captured by a Tennessee licensed real estate broker in connection with the marketing, sale, or financing of real property, provided no individual can be identified in the image.
13. if the image is of real property or a person on that property.
14. if the image is captured by the owner or operator of an oil, gas, water, or other pipeline for the purpose of inspecting, maintaining, or repairing pipelines or other related facilities, and is captured without the intent to conduct surveillance on an individual or real property located in Tennessee.
15. in connection with oil and gas pipeline and well safety and protection.
16. in connection with port authority surveillance and security.
17. as authorized or permitted by the Federal Aviation Administration for use in a motion picture, television, or similar production where the filming is authorized by the property owner and a state or local film permit agency, if necessary.
18. as a part of a commercial service that has received authorization from the federal aviation administration to use unmanned aircraft or an unmanned aircraft operating under regulations promulgated by the federal aviation administration for commercial use of unmanned aircraft; (19) when an image is "captured by a state or local government agency, or by a person who is under contract with or otherwise acting under the direction or on behalf of such agency, [it] shall be handled in accordance with § 39-13-609 and shall not be used for any purpose other than the lawful purpose for which the image was captured as permitted by this section." A recent amendment to the statute provides that it is legal to use drones to capture images in land surveying; by the department of transportation; or photogrammetric mapping.

39-13-903. Unlawful capture of image with intent to conduct surveillance a misdemeanor offense -Defense.

If drones are used to capture images in any of the following ways, actions result in a Class C misdemeanor:

1. uses an unmanned aircraft to capture an image of an individual or privately owned real property in Tennessee with the intent to conduct surveillance on the individual or property captured in the image.
2. knowingly uses an image captured for law enforcement purposes by a state or local law enforcement agency, or by a person who is under contract with or otherwise acting under the direction of or on behalf of such agency.
3. uses an unmanned aircraft to intentionally capture an image of an individual or event at an open-air event venue wherein more than one hundred individuals are gathered for a ticketed event, provided there is no consent from the venue owner or operator.
4. knowingly uses an unmanned aircraft within or over a designated fireworks discharge site, fireworks display site, or fireworks fallout area during an event, subject to provided definitions of "discharge site," "display site," and "fallout area"; or
5. knowingly uses an unmanned aircraft over the grounds of a correctional facility.
6. knowingly uses an unmanned aircraft within two hundred fifty feet of the perimeter of any critical infrastructure facility without the business operator's written consent for the purpose of conducting surveillance of, gathering evidence, or collecting information about, or photographically or electronically recording, critical infrastructure data.

39-13-904. - Possession or distribution and use of unlawfully captured images – Misdemeanor offenses – Separate images constitute separate offenses – Defenses.

The statutes create a Class C misdemeanor offense when a person possesses an image in violation of the law, and a Class B misdemeanor when one "discloses, displays, distributes, or otherwise uses that image." Each image creates a separate offense.

The section concludes by listing two separate defenses to these charges:

1. that one destroyed the image as soon as he or she had knowledge it was captured illegally, or
2. that one "stopped disclosing, displaying, distributing, or otherwise using the image" as soon as he or she had knowledge it was captured illegally.

39-13-905. Use of unlawfully captured images as evidence -Disclosure of images limited.

39-13-906. Applicability of part.

39-13-907. Construction of part.

The Tennessee Hunter Protection Act

70-4-301. Part definitions.

70-4-302. Violations -Penalty.

70-4-303. Injunctions – Damages – Construction.

The Tennessee Hunter Protection Act concerns the use of drones to interfere with a lawful exercise of taking wildlife. The statute creates a Class C misdemeanor for using a drone with the intent to conduct video surveillance of private citizens who are lawfully hunting or fishing without obtaining the written consent of the persons being surveilled prior to conducting the surveillance.

Texas

Definitions:

"**Image**" means: any capturing of sound waves, thermal, infrared, ultraviolet, visible light, or other electromagnetic waves, odor, or other conditions existing on or about real property in this state or an individual located on that property.

"**Critical infrastructure facility**" means:

(A) one of the following, if completely enclosed by a fence or other physical barrier that is obviously designed to exclude intruders, or if clearly marked with a sign or signs that are posted on the property, are reasonably likely to come to the attention of intruders, and indicate that entry is forbidden:
    1. a petroleum or alumina refinery.
    2. an electrical power generating facility, substation, switching station, or electrical control center.
    3. a chemical, polymer, or rubber manufacturing facility.
    4. a water intake structure, water treatment facility, wastewater treatment plant, or pump station.

5. a natural gas compressor station.
6. a liquid natural gas terminal or storage facility.
7. a telecommunications central switching office or any structure used as part of a system to provide wired or wireless telecommunications services.
8. a port, railroad switching yard, trucking terminal, or other freight transportation facility.
9. a gas processing plant, including a plant used in the processing, treatment, or fractionation of natural gas.
10. a transmission facility used by a federally licensed radio or television station.
11. a steelmaking facility that uses an electric arc furnace to make steel.
12. a dam that is classified as a high hazard by the Texas Commission on Environmental Quality; or
13. a concentrated animal feeding operation, as defined by Section 26.048, Water Code; or

(B) if enclosed by a fence or other physical barrier obviously designed to exclude intruders:

(A) any portion of an aboveground oil, gas, or chemical pipeline.
(B) an oil or gas drilling site.
(C) a group of tanks used to store crude oil, such as a tank battery.
(D) an oil, gas, or chemical production facility.
(E) an oil or gas wellhead; or
(F) any oil and gas facility that has an active flare.

"**Correctional facility**" means:

1. a confinement facility operated by or under contract with any division of the Texas Department of Criminal Justice.
2. a municipal or county jail.
3. a confinement facility operated by or under contract with the Federal Bureau of Prisons; or
4. a secure correctional facility or secure detention facility, as defined by Section 51.02, Family Code.

"**Detention facility**" means a facility operated by or under contract with United States Immigration and Customs Enforcement for the purpose of detaining aliens and placing them in removal proceedings.

Texas Government Code Chapter 423. - USE OF UNMANNED AIRCRAFT

The State of Texas's Government Code regarding use of unmanned aircrafts details what is permissible use (423.002) and what is considered an offense (423.003, 423.004, 423.045, 423.046).

The statute provides that it is legal to capture an image using a drone in any of the following circumstances:

1. “For the purpose of professional or scholarly research and development or for another academic purpose by a person acting on behalf of an institution of higher education”.
2. “In airspace designated as a test site or range authorized by the Federal Aviation Administration for the purpose of integrating unmanned aircraft systems into the national airspace”.
3. “As part of an operation, exercise or mission of any branch of the United States military”.
4. “If the image is captured by a satellite for the purposes of mapping”.

5. “If the image is captured by or for an electric or natural gas utility or a telecommunications provider” for express purposes.
6. “With the consent of the individual who owns or lawfully occupies the real property captured in the image”.
7. “Pursuant to a valid search or arrest warrant”.
8. “if the image is captured by a law enforcement authority or a person who is under contract with or otherwise acting under the direction or on behalf of a law enforcement authority” in “immediate pursuit” of a suspect upon probable cause, to document a crime scene, to investigate a scene of death or serious motor vehicle accident, to search for a missing person, to conduct a high-risk tactical operation; of private property that is generally open to the public where property owner provides consent to law enforcement public safety responsibilities; or of real property or a person on real property that is within 25 miles of the United States border for the sole purpose of ensuring border security;
9. for the same law enforcement authority designated above, except for the purposes of surveying a catastrophe, preserving public safety, and protecting property, surveying during a declared state of emergency, or conducting routine air quality monitoring.
10. “At the scene of a spill, or a suspected spill, of hazardous materials”.
11. “For the purpose of fire suppression”.
12. “For the purpose of rescuing a person whose life or well-being is in imminent danger”.
13. “If the image is captured by a Texas licensed real estate broker in connection with the marketing, sale, or financing of real property,” provided no individual can be identified in the image.
14. “From a height no more than eight feet above ground level in a public place, if the image was captured without using any electronic, mechanical, or other means to amplify the image beyond normal human perception”.
15. if the image is “of public real property or a person on that property”.
16. “If the image is captured by the owner or operator of an oil, gas, water, or other pipeline for the purpose of inspecting, maintaining, or repairing pipelines or other related facilities, and is captured without the intent to conduct surveillance on an individual or real property” located in Texas.
17. “In connection with oil pipeline safety and rig protection”.
18. “In connection with port authority surveillance and security”.
19. “If the image is captured by a registered professional land surveyor in connection with the practice of professional surveying,” and if no individual can be identified in the image.
20. “If the image is captured by a professional, licensed engineer,” provided the image is captured in connection with the practice of engineering and no individual can be identified in the image.
21. “The image is captured by an employee of an insurance company or of an affiliate of the company in connection with the underwriting of an insurance policy, or the rating or adjusting of an insurance claim, regarding real property or a structure on real property; and the operator of the unmanned aircraft is authorized by the Federal Aviation Administration to conduct operations within the airspace from which the image is captured.”

Sec. 423.003. OFFENSE: ILLEGAL USE OF UNMANNED AIRCRAFT TO CAPTURE IMAGE.

(a) A person commits an offense if the person uses an unmanned aircraft to capture an image of an individual or privately owned real property in this state with the intent to conduct surveillance on the individual or property captured in the image.

(b) An offense under this section is a Class C misdemeanor.

(c) It is a defense to prosecution under this section that the person destroyed the image:

(1) as soon as the person had knowledge that the image was captured in violation of this section; and

(2) without disclosing, displaying, or distributing the image to a third party.

(d) In this section, "intent" has the meaning assigned by Section 6.03, Penal Code.

The statutes prescribe a Class C misdemeanor when a "person uses an unmanned aircraft to capture an image of an individual or privately owned real property in this state with the intent to conduct surveillance on the individual or property captured in the image."

Sec. 423.004. OFFENSE: POSSESSION, DISCLOSURE, DISPLAY, DISTRIBUTION, OR USE OF IMAGE.

A person commits an offense if the person:

1. captures an image in violation of Section 423.003; and
2. possesses, discloses, displays, distributes, or otherwise uses that image.

An offense under this section for the possession of an image is a Class C misdemeanor. An offense under this section for the disclosure, display, distribution, or other use of an image is a Class B misdemeanor.

Each image a person possesses, discloses, displays, distributes, or otherwise uses in violation of this section is a separate offense.

Sec. 423.0045. OFFENSE: OPERATION OF UNMANNED AIRCRAFT OVER CORRECTIONAL FACILITY, DETENTION FACILITY, OR CRITICAL INFRASTRUCTURE FACILITY.

The statutes create a Class B misdemeanor, or a Class A misdemeanor in the case of a previous conviction, for "intentionally or knowingly" committing any of the following acts:

1. operates an unmanned aircraft over a correctional facility, detention facility, or critical infrastructure facility and the unmanned aircraft is not higher than 400 feet above ground level.
2. allows an unmanned aircraft to contact a correctional facility, detention facility, or critical infrastructure facility, including any person or object on the premises of or within the facility; or
3. allows an unmanned aircraft to come close to a correctional facility, detention facility, or critical infrastructure facility that is close enough to interfere with the operations of or cause a disturbance to the facility.

Sec. 423.0046. OFFENSE: OPERATION OF UNMANNED AIRCRAFT OVER SPORTS VENUE.

In this section, "sports venue" means an arena, automobile racetrack, coliseum, stadium, or other type of area or facility that:

1. has a seating capacity of 30,000 or more people; and

2. is primarily used for one or more professional or amateur sports or athletics events.

A person commits an offense if the person intentionally or knowingly operates an unmanned aircraft over a sports venue and the unmanned aircraft is not higher than 400 feet above ground level. An offense under this section is a Class B misdemeanor, except that the offense is a Class A misdemeanor if the actor has previously been convicted under this section or Section 423.0045.

Sec. 423.006. CIVIL ACTION.

An owner or tenant of privately owned real property located in this state may bring against a person who, in violation of Section 423.003, captured an image of the property or the owner or tenant while on the property an action to:

1. enjoin a violation or imminent violation of Section 423.003 or 423.004;
2. recover a civil penalty of:
   (A) $5,000 for all images captured in a single episode in violation of Section 423.003; or
   (B) $10,000 for disclosure, display, distribution, or other use of any images captured in a single episode in violation of Section 423.004; or
3. recover actual damages if the person who captured the image in violation of Section 423.003 discloses, displays, or distributes the image with malice.

An action brought under this section must be commenced within two years from the date the image was:

1. captured in violation of Section 423.003; or
2. initially disclosed, displayed, distributed, or otherwise used in violation of Section 423.004.

Sec. 423.005. ILLEGALLY OR INCIDENTALLY CAPTURED IMAGES NOT SUBJECT TO DISCLOSURE.

(a) Except as otherwise provided by Subsection (b), an image captured in violation of Section 423.003, or an image captured by an unmanned aircraft that was incidental to the lawful capturing of an image:
   1. may not be used as evidence in any criminal or juvenile proceeding, civil action, or administrative proceeding.
   2. is not subject to disclosure, inspection, or copying under Chapter 552; and
   3. is not subject to discovery, subpoena, or other means of legal compulsion for its release.

(b) An image described by Subsection (a) may be disclosed and used as evidence to prove a violation of this chapter and is subject to discovery, subpoena, or other means of legal compulsion for that purpose.

Sec. 423.007. RULES FOR USE BY LAW ENFORCEMENT.

The Department of Public Safety shall adopt rules and guidelines for use of an unmanned aircraft by a law enforcement authority in this state.

Sec. 423.008. REPORTING BY LAW ENFORCEMENT AGENCY.

(a) Not earlier than January 1 and not later than January 15 of each odd-numbered year, each state law enforcement agency and each county or municipal law enforcement agency located in a county or municipality, as applicable,

with a population greater than 150,000, that used or operated an unmanned aircraft during the preceding 24 months shall issue a written report to the governor, the lieutenant governor, and each member of the legislature and shall:

1. retain the report for public viewing; and
2. post the report on the law enforcement agency's publicly accessible website if one exists.

(b) The report must include:

1. the number of times an unmanned aircraft was used, organized by date, time, location, and the types of incidents and types of justification for the use.
2. the number of criminal investigations aided using an unmanned aircraft and a description of how the unmanned aircraft aided each investigation.
3. the number of times an unmanned aircraft was used for a law enforcement operation other than a criminal investigation, the dates and locations of those operations, and a description of how the unmanned aircraft aided each operation.
4. the type of information collected on an individual, residence, property, or area that was not the subject of a law enforcement operation and the frequency of the collection of this information; and
5. the total cost of acquiring, maintaining, repairing, and operating or otherwise using each unmanned aircraft for the preceding 24 months.

Sec. 423.009. REGULATION OF UNMANNED AIRCRAFT BY POLITICAL SUBDIVISION.

Prohibits localities from regulating UAS except during a special event and when the UAS is used by the locality.

"Political subdivision" includes a county, a joint board created under Section 22.074,

Transportation Code, and a municipality.

"**Special event**" means a festival, celebration, or other gathering that:

(A) involves:

1. the reservation and temporary use of all or a portion of a public park, road, or other property of a political subdivision; and

2. entertainment, the sale of merchandise, food, or beverages, or mass participation in a sports event; and

(B) requires a significant use or coordination of a political subdivision's services.

Utah

Definitions:

"**Unmanned aircraft**" means an aircraft that is:

1. capable of sustaining flight; and
2. operated with no possible direct human intervention from on or within the aircraft.

"**Unmanned aircraft system**" means the entire system used to operate an unmanned aircraft, including:

1. the unmanned aircraft, including payload.
2. communications equipment.
3. navigation equipment.
4. controllers.
5. support equipment; and
6. autopilot functionality.

Title 72 - Chapter 14 Part 1: General Provisions (72-14-1)

Section 101: Title

This chapter is known as "Unmanned Aircraft -- Drones."

Section 102: Definitions

Section 103: Preemption of local ordinance

Section 104: Applicability

This chapter does not apply to a person or business entity:

1. using an unmanned aircraft for legitimate educational or business purposes; and
2. operating the unmanned aircraft system in a manner consistent with applicable Federal Aviation Administration rules, exemptions, or other authorizations.

Title 72 - Chapter 14 Part 2: Law Enforcement Use of Unmanned Aircraft (72-14-2)

Section 201: Title

This part is known as "Law Enforcement Use of Unmanned Aircraft."

Section 202: Definitions

Section 203: Unmanned aircraft system use requirements -- Exceptions.

A law enforcement agency or officer may not obtain, receive, or use data acquired through an unmanned aircraft system unless the data is obtained:

1. pursuant to a search warrant.
2. in accordance with judicially recognized exceptions to warrant requirements.
3. from a nongovernment actor, subject to limitations listed below.
4. to locate a lost or missing person in an area in which a person has no reasonable expectation of privacy; or

5. for purposes unrelated to a criminal investigation.

A law enforcement officer or agency may only use for law enforcement purposes data obtained from a nongovernment actor if:

1. the data appears to pertain to the commission of a crime; or
2. the law enforcement agency or officer believes, in good faith, that:
    a. the data pertains to an imminent or ongoing emergency involving danger of death or serious bodily injury to an individual; and
    b. disclosing the data would assist in remedying the emergency.

A law enforcement agency that "obtains, receives, or uses" data acquired pursuant to the methods above must destroy the data as soon as reasonably possible.

Section 204: Data retention

Section 205: Reporting

Title 72 - Chapter 14 Part 3: Unlawful Use of Unmanned Aircraft.

Section 301: Title

This part is known as "Unlawful Use of Unmanned Aircraft."

Section 302: Reserved

Section 303: Weapon attached to unmanned aircraft -- Penalties.

A person is guilty of a Class B misdemeanor if they fly an unmanned aircraft that carries a weapon or to which a weapon is attached.

An exception is made when:

1. for someone who flies a drone that carries or has attached to it a weapon if that person has approval from the FAA and acts accordingly.
2. for someone who has a contract with the state or federal government, or
3. someone who operates such aircraft with the Department of Defense's permission in airspace controlled by the U.S. Department of defense.

Title 72 - Chapter 14 Part 4: Safe Use of Unmanned Aircraft

Section 401: Title

This part is known as "Safe Use of Unmanned Aircraft."

Section 402: Reserved

Section 403: Safe operation of unmanned aircraft.

The individual operating the drone, or an observer must:

1. maintain visual line of sight of the unmanned aircraft to:

a. know the location of the unmanned aircraft.
b. determine the attitude, altitude, and direction of flight.
c. observe the airspace for other air traffic or hazards; and
d. determine that the unmanned aircraft does not endanger the life or property of another person.

An individual may not operate an unmanned aircraft in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless the operator of the unmanned aircraft has prior authorization from air traffic control.

An individual may not operate an unmanned aircraft in a manner that interferes with operations and traffic patterns at any airport, heliport, or seaplane base.

Flying a drone at an altitude higher than 400 feet above ground is prohibited unless:

1. the drone is flown within a 400-foot radius of a structure; and
2. is not flown higher than 400 feet above the structure's highest point.

An individual who violates this section is liable for any damages that may result from the violation. A law enforcement officer shall issue a written warning for the first violation. If an individual violates the statute after receiving a written warning, he or she is guilty of an infraction. Every subsequent offense of the statute after an infraction was received is a class B misdemeanor.

65A-3-2.5 Wildland fire and unmanned aircraft.

A person may not operate an unmanned aircraft system in a manner that causes an unmanned aircraft to fly within an area that is under a temporary flight restriction that is issued by the Federal Aviation Administration as a result of the wildland fire, or an area designated as a wildland fire scene on a system managed by a federal, state, or local government entity that disseminates emergency information to the public, unless the person operates the unmanned aircraft system with the permission of, and in accordance with the restrictions established by, the incident commander.

A person, other than a government official or a government employee acting within the person's capacity as a government official or government employee, that recklessly operates an unmanned aircraft system in a manner that causes an unmanned aircraft to fly within an area described in Subsection (2) is guilty of:

a. except as provided in Subsection (3)(b), (c), or (d), a class B misdemeanor, punishable by imprisonment as provided in Section 76-3-204 and a fine not to exceed $2,500.
b. except as provided in Subsection (3)(c) or (d), a class A misdemeanor, punishable by imprisonment as provided in Section 76-3-204 and a fine not to exceed $5,000, if the operation of the unmanned aircraft system:

(i) causes an aircraft being used to contain or control a wildland fire to drop a payload of water or fire retardant in a location other than the location originally designated for the aircraft to drop the payload.
(ii) causes an aircraft being used to contain or control a wildland fire to land without dropping a payload of water or fire retardant in the location originally designated for the aircraft to drop the payload; or
(iii) prevents an aircraft, intended for use in containing or controlling a wildland fire, from taking flight.

c. except as provided in Subsection (3)(d), a third-degree felony, punishable by imprisonment as provided in Section 76-3-203 and a fine not to exceed $10,000, if the operation of the unmanned aircraft system causes the unmanned aircraft to come into direct physical contact with a manned aircraft; or
d. a second-degree felony, punishable by imprisonment as provided in Section 76-3-203 and a fine not to exceed $15,000, if the operation of the unmanned aircraft is the proximate cause of a manned aircraft colliding with the ground, a structure, or another manned aircraft.

72-10-109 Certificate of registration of aircraft required – Exceptions.

Unmanned aircraft as defined in Section 72-14-102 are exempt from the state registration requirement

76-6-206 Criminal trespass.

Criminal trespass laws in relation to drones. In the context of this section, "enter" means "intrusion of the entire (...) unmanned aircraft." "Remain unlawfully" is defined as staying on or over private property when the property or part of it is not open to the public, and the person flying the drone is not authorized to do so.

A person is guilty of criminal trespass as it relates to drones if he or she:

1. causes a drone to "enter and remain unlawfully over property" and either intends to annoy or injure a person, or damage property, including by painting graffiti; intends to commit any crime besides theft or a felony; or "is reckless as to whether the (...) unmanned aircraft's presence will cause fear for the safety of another,"
2. knowingly "causes an unmanned aircraft to enter or remain unlawfully over property to which notice against entering is given" through personal communication, a fence or other enclosure obviously meant to exclude, or posting signs in reasonably conspicuous place,

Violations of either of the above is a class B misdemeanor unless the violation is committed in a dwelling, in which event the violation is a class A misdemeanor.

76-9-402 Privacy violation.

The law specifies that a person is not guilty of what would otherwise be a privacy violation if the person is operating a UAS for legitimate commercial or education purposes consistent with FAA regulations.

76-9-702.7 Voyeurism offenses – Penalties.

It is a class A or class B misdemeanor to use any type of technology, including UAS, to secretly record video of a person in certain instances.

R651-602-8. Operation of Unmanned Aircraft (park system)

A person must obtain written permission from the park manager before operating an unmanned aircraft within the park system.

HB 217 Harassment of livestock. (76-9-308)

Prohibits a person from intentionally, knowingly, or recklessly chasing, actively disturbing, or harming livestock using UAS. Anyone who violates this law is guilty of a class B misdemeanor for the first offense and a class A misdemeanor for a subsequent offense or if livestock is seriously injured or killed or there is damage more than $1,000.

HB 59 UNMANNED AIRCRAFT REVISIONS

AMENDS: 72-14-102, as renumbered and amended by Laws of Utah 2017, Chapter 364

ENACTS: 72-14-304, Utah Code Annotated 1953

Section 1. Section 72-14-102 is amended to read:

72-14-102. Definitions.

As used in this chapter:

(1) "Airport" means the same as that term is defined in Section 72-10-102.
(2) "Airport operator" means the same as that term is defined in Section 72-10-102.
(3) "Correctional facility" means the same as that term is defined in Section 77-16b-102.
(4) "Unmanned aircraft" means an aircraft that is:
    a. capable of sustaining flight; and
    b. operated with no possible direct human intervention from on or within the aircraft
(5) "Unmanned aircraft system" means the entire system used to operate an unmanned aircraft, including:
    a. the unmanned aircraft, including payload.
    b. communications equipment.
    c. navigation equipment.
    d. Controllers.
    e. Support equipment; and
    f. Autopilot functionality

Section 2. Section 72-14-304 is enacted to read:

72-14-304. Unlawful operation of unmanned aircraft near prison facilities -- Penalties.

(1) An individual may not operate an unmanned aircraft system:
    (a) to carry or drop any item to or inside the property of a correctional facility; or
    (b) in a manner that interferes with the operations or security of a correctional facility.
(2)
    (a) A violation of Subsection (1)(a) is a third-degree felony.
    (b) A violation of Subsection (1)(b) is a class B misdemeanor.

(3) An operator of an unmanned aircraft system does not violate Subsection (1) if the operator is:
  (a) an employee or contractor working on behalf of a mosquito abatement district created pursuant to Title 17B, Limited Purpose Local Government Entities - Local Districts, or Title 17D, Limited Purpose Local Government Entities - Other Entities; and
  (b) acting in the course and scope of the operator's employment.

Vermont

Definitions:

"**Drone**" means a powered aerial vehicle that does not carry a human operator and is able to fly autonomously or to be piloted remotely.

Statutes/Bills:

§ 4622. Law enforcement use of drones

The statute generally prohibits any of these law enforcement agencies from using a drone "for the purpose of investigating, detecting, or prosecuting a crime" or to "gather or retain data on private citizens peacefully exercising their constitutional rights of free speech and assembly."

Law enforcement agencies may use drones in the following circumstances, which serve as exceptions to the general rule:

1. if the agency has obtained a warrant pursuant to Rule 41 of the Vermont Rules of Criminal Procedure or
2. for public safety reasons that do not include collecting and keeping data.

§ 4623. Use of drones; Federal Aviation Administration requirements

Any use of drones by any person, including a law enforcement agency, shall comply with all applicable Federal Aviation Administration requirements and guidelines.

§ 4624. Reports

On or before September 1 of each year, any law enforcement agency that has used a drone within the previous 12 months shall report the following information to the Department of Public Safety:

1. The number of times the agency used a drone within the previous 12 months. For each use of a drone, the agency shall report the type of incident involved, the nature of the information collected, and the rationale for deployment of the drone.
2. The number of criminal investigations aided, and arrests made through use of information gained by the use of drones within the previous 12 months, including a description of how the drone aided each investigation or arrest.
3. The number of times a drone collected data on any person, home, or area other than the target of the surveillance within the previous 12 months and the type of data collected in each instance.

4. The cost of the agency's drone program and the program's source of funding.

§ 4018. DRONES

No person shall equip a drone with a dangerous or deadly weapon or fire a projectile from a drone. A person who violates this section shall be imprisoned not more than one year or fined not more than $1,000.00, or both.

§ 20 Aerial Hunting

The purpose of this rule is to restrict the taking of wild animals by use of aircraft and drones.

Prohibitions:

1. It shall be unlawful for any person to take or attempt to take wild animals while a person is in an aircraft.
2. It shall be unlawful for any person to take or attempt to take wild animals by use of an UAV.
3. It shall be unlawful for any person within an aircraft, or with the use of a drone or UAV, to:
    a. attempt to locate, surveil, or aid or assist in attempting to locate or surveil any wild animal, for the purpose of taking or attempting to take the wild animal; or
    b. drive or harass any wild animal, or otherwise aid or assist in taking or attempting to take a wild animal.

Virginia

Definitions:

"**Unmanned aircraft**" means an aircraft that is operated without the possibility of human intervention from within or on the aircraft.

"**Unmanned aircraft system**" means an unmanned aircraft and associated elements, including communication links, sensing devices, and the components that control the unmanned aircraft.

§ 15.2-926.3. Local regulation of certain aircraft.

No locality may regulate the use of privately owned, unmanned aircraft system as defined in § 19.2-60.1 within its boundaries.

§ 19.2-60.1. Use of unmanned aircraft systems by public bodies; search warrant required.

The statute prohibits the use of unmanned aircraft systems by any state or local government department or by law enforcement, except during the execution of a search warrant. Any evidence obtained without the warrant is inadmissible in court.

An unmanned aircraft system may be deployed without a warrant:

1. when an Amber Alert is activated pursuant to § 52-34.3,
2. when a Senior Alert is activated pursuant to § 52-34.6,

3. when a Blue Alert is activated pursuant to § 52-34.9,
4. where use of an unmanned aircraft system is determined to be necessary to alleviate an immediate danger to any person,
5. for training exercises related to such uses, or
6. if a person with legal authority consents to the warrantless search.

The warrant requirements of this section shall not apply when such systems are utilized to support the Commonwealth for purposes other than law enforcement, including damage assessment, traffic assessment, flood stage assessment, and wildfire assessment. Nothing herein shall prohibit use of unmanned aircraft systems for private, commercial, or recreational use or solely for research and development purposes by institutions of higher education and other research organizations or institutions.

In no case may a weaponized unmanned aircraft system be deployed in the Commonwealth, or its use facilitated in the Commonwealth by a state or local government department, agency, or instrumentality or department of law enforcement in the Commonwealth except in operations at the Space Port and Naval/Aegis facilities at Wallops Island.

HB 2350 Peeping or spying into dwelling or occupied building by electronic device; penalty.

Makes it a Class 1 misdemeanor to use UAS to trespass upon the property of another for the purpose of secretly or furtively peeping, spying, or attempting to peep or spy into a dwelling or occupied building located on such property.

SB 873 Authority of a fire chief over unmanned aircraft at a fire, explosion, or other hazardous situation.

Specifies that the fire chief or other officer in charge of a fire department has authority to maintain order at an emergency incident including the immediate airspace. Individuals who don't obey the orders of the officer in charge are guilty of a class 4 misdemeanor.

1. HB 683 Trespass; use of an unmanned aircraft system, penalty

   That §15.2-926.3 of the Code of Virginia is amended and reenacted and that the Code of Virginia is amended by adding a section numbered 18.2-121.3 and by adding in Article 8 of Chapter 7 of Title 18.2 a section numbered 18.2-324.2 as follows:

§15.2-926.3. (Expires July 1, 2019) Local regulation of certain aircraft.

No locality political subdivision may regulate the use of a privately owned, unmanned aircraft system as defined in § 19.2-60.1 within its boundaries. Nothing in this section shall permit a person to go or enter upon land owned by a

political subdivision solely because he is in possession of an unmanned aircraft system if he would not otherwise be permitted entry upon such land.

§18.2-121.3. Trespass with an unmanned aircraft system; penalty.

A. Any person who knowingly and intentionally causes an unmanned aircraft system to enter the property of another and come within 50 feet of a dwelling house:
   (i) to coerce, intimidate, or harass another person or
   (ii) after having been given actual notice to desist, for any other reason, is guilty of a Class 1 misdemeanor.
B. This section shall not apply to any person who causes an unmanned aircraft system to enter the property as set forth in subsection A if:
   (i) consent is given to the entry by any person with legal authority to consent or by any person who is lawfully present on such property or
   (ii) such person is authorized by federal regulations to operate an unmanned aircraft system and is operating such system in an otherwise lawful manner and consistent with federal regulations.

§18.2-324.2. Use of unmanned aircraft system for certain purposes; penalty.

A. It is unlawful for any person who is required to register pursuant to §9.1-901 to use or operate an unmanned aircraft system to knowingly and intentionally:
   (i) follow or contact another person without permission of such person or
   (ii) capture the images of another person without permission of such person when such images render the person recognizable by his face, likeness, or other distinguishing characteristic.
B. It is unlawful for a respondent of a protective order issued pursuant to §16.1-279.1 or 19.2-152.10 to knowingly and intentionally use or operate an unmanned aircraft system to follow, contact, or capture images of the petitioner of the protective order or any other individual named in the protective order.
C. A violation of this section is a Class 1 misdemeanor.

2. That the second enactment of Chapter 451 of the Acts of Assembly of 2016 is repealed.
3. That the Secretary of Commerce and Trade, in consultation with the Virginia Economic Development Partnership, shall study the impact of this act on unmanned aircraft research, innovation, and economic development in Virginia and report to the Governor and General Assembly no later than November 1, 2019.

Washington

Definitions:

"**Drones**" should apply to unmanned aerial vehicles controlled by a remote operator.

Sample definition: "An unmanned aircraft that is operated without the possibility of direct human intervention from within or on the aircraft."

WAC 200-250-030 Drone use prohibited; State Capitol Campus

Launching, landing, or operating an unmanned aircraft from or on lands and waters within the boundaries of the state capitol campus is prohibited except for the exclusions listed under WAC 200-250-040.

The Chief Privacy Officer of the Washington Office of Privacy and Data Protection issued guidelines for unmanned aircraft systems for policy makers and stakeholders as they develop policy proposals.

West Virginia

§20-2-5. Unlawful methods of hunting and fishing and other unlawful acts.

Except as authorized by the director or by law, it is unlawful at any time for any person to:

1. Hunt, take, kill, wound, or shoot at wild animals or wild birds from an airplane or other airborne conveyance, a drone, or other unmanned aircraft, an automobile or other land conveyance, or from a motor-driven water conveyance.
2. Use a drone or other unmanned aircraft to hunt, take or kill a wild bird or wild animal, or to use a drone or other unmanned aircraft to drive or herd any wild bird or wild animal for the purposes of hunting, trapping, or killing.

ARTICLE 14. USE OF UNMANNED AIRCRAFT SYSTEMS.

§61-14-1. Definitions.

As used in this article:

1. "Aircraft" means any device now known or subsequently invented, used, or designed for flight in the air, including, but not limited to, unmanned aircraft vehicles or systems.
2. "Unmanned aircraft system" or "system" means an aircraft that is operated without direct human intervention from inside or on the aircraft and includes the crewmember, the associated support equipment, the control station, data links, telemetry, communications, and navigation equipment necessary to operate the unmanned aircraft, including, but not limited to, drones.
3. "Unmanned aircraft system operator" or "operator" means a person exercising control over an unmanned aircraft system during flight.

§61-14-2. Prohibited use of an unmanned aircraft system, criminal penalties.

(a) Except as authorized by the provisions of this article, a person may not operate an unmanned aircraft system:
1. To knowingly and intentionally capture or take photographs, images, video, or audio of another person or the private property of another, without the other person's permission, in a manner that would invade the individual's reasonable expectation of privacy, including, but not limited to, capturing, or recording through a window.
2. To knowingly and intentionally view, follow, or contact another person or the private property of another without the other person's permission in a manner that would invade the individual's reasonable expectation of privacy, including, but not limited to, viewing, following, or contacting through a window.
3. To harass another person knowingly and intentionally.

4. To violate a restraining order or similar judicial order.
5. To act with a willful wanton disregard for the safety of persons or property; or
6. To operate an unmanned aircraft system knowingly and intentionally in a manner that interferes with the official duties of law enforcement personnel or emergency medical personnel.

(b) Any person violating the provisions of subsection (a) of this section is guilty of a misdemeanor and, upon conviction thereof, shall be fined not less than $100 nor more than $1,000 or confined in jail for not more than one year, or both fined and confined.

(c) Any person who equips an unmanned aircraft system with any deadly weapon or operates any unmanned aircraft system equipped with any deadly weapon, other than for military in an official capacity, is guilty of a felony and, upon conviction thereof, shall be fined not less than $1,000 nor more than $5,000 or imprisoned in a state correctional facility for not less than one nor more than five years, or both fined and imprisoned.

(d) Any person who operates an unmanned aircraft system with the intent to cause damage to or disrupt in any way the flight of a manned aircraft is guilty of a felony and, upon conviction thereof, shall be fined not less than $1,000 nor more than $5,000 imprisoned for not less than one nor more than five years, or both fined and imprisoned.

(e) A person that is authorized by the Federal Aviation Administration to operate unmanned aircraft systems for commercial purposes may operate an unmanned aircraft system in this state for such purposes if the unmanned aircraft system is operated in a manner consistent with federal law.

Wisconsin

Definitions:

"**Drone**" means a powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, and can fly autonomously or be piloted remotely. A drone may be expendable or recoverable.

114.04 Flying and landing, limitations.

114.045 Limitation on the operation of drones. (Correctional institutions)

1. No person may operate a drone, as defined in s. 114.105 (1) (a), over a state correctional institution, as defined in s. 301.01 (4), including any grounds of the institution.
2. Any person who violates above rule may be required to forfeit not more than $5,000.

114.105 Local regulation.

175.55 Use of drones restricted.

1. No person may operate a drone, as defined in s. 114.105 (1) (a), over a state correctional institution, as defined in s. 301.01 (4), including any grounds of the institution.
2. Any person who violates sub. (1) may be required to forfeit not more than $5,000.
3. A law enforcement officer investigating an alleged violation of sub. (1) shall seize and transfer to the department of corrections any photograph, motion picture other visual representation, or data that represents a visual image that was created or recorded by a drone during an alleged violation of sub. (1).

941.292 Possession of a weaponized drone.

Whoever operates any weaponized drone is guilty of a Class H felony. This subsection does not apply to a member of the U.S. armed forces or national guard acting in his or her official capacity.

942.10 Use of a drone.

Use of a drone with the intention to photograph, record or otherwise observe an individual in a place where they have a reasonable expectation of privacy a Class A misdemeanor. The statute does not apply to the authorized use of a drone by law enforcement officers.

Wyoming

Definitions:

"**Operator**" means a person operating or flying an unmanned aircraft;

"**Unmanned aircraft**" means an aircraft operated without the possibility of direct human intervention from within or on the aircraft, but excludes small, unmanned aircraft, weighing under 55 pounds.

SF 170 AN ACT relating to aeronautics; authorizing the Wyoming aeronautics commission to promulgate rules related to unmanned aircraft.

The law requires the Wyoming Aeronautics Commission to develop rules regulating where unmanned aircraft can take off and land. The commission is also permitted to develop reasonable rules regulating the operation of unmanned aircraft through coordination with the unmanned aircraft industry and local governments. The law specifies that the commission does not have the power to regulate unmanned aircraft operation in navigable airspace. It also makes it unlawful to land an unmanned aircraft on the property of another person, but operators can pilot an unmanned aircraft over their own property.

Washington, D.C.

DC No Drone Zone

The National Capital Region is governed by a Special Flight Rules Area (SFRA) within a 30-mile radius of Ronald Reagan Washington National Airport, which restricts all flights in the greater DC area.

The SFRA is divided into a 15-mile radius inner ring and a 30-mile radius outer ring.

- Flying an unmanned aircraft within the 15-mile radius inner ring is prohibited without specific FAA authorization.
- Flying a UAS for recreational or non-recreational use between 15 and 30 miles from Washington, D.C. is allowed under these operating conditions:
    - Aircraft must weigh less than 55 lbs. (including any attachments such as a camera)
    - Aircraft must be registered and marked (if it is not operated exclusively under the Special Rule for Model Aircraft, pending NOTAM change)
    - Fly below 400 ft.

- Fly within visual line-of-sight
- Fly in clear weather conditions
- Never fly near other aircraft

"Everyone and their dog '*is*' creating maps online now."

Oliver O'Brien, Centre for Advanced Spatial Analysis at University College London.

February 22nd, 2011

The Adoption of GIS Applications for Regulatory Compliance

Many cities in the world especially in the United States and Canada are dealing with regulatory enforcement actions for sewer overflows, such as consent orders and consent decrees. These communities must comply with various mapping, monitoring, inspection, and rehabilitation requirements and develop and implement sewer overflow control plans. To comply with the regulatory requirements, the cities are collecting massive amounts of data on the inventory and condition of their sewer system infrastructure. A dilemma that all stakeholders are facing is how to cost effectively manage this data and monitor what has been accomplished versus what still needs to be done. Geographic Information System (GIS) is a cost-effective technology to manage and analyze these datasets. Above and beyond the conventional GIS mapping of inspection data, integration of field inspection data with a GIS allows development of a sewer rehabilitation decision support system that can be used to plan the rehabilitation work required to control the sewer overflows. With the help of case studies, this chapter describes a GIS-based sewer system inspection and rehabilitation approach.

Using GIS as a Tool for Compliance

Currently, related mostly to aging and poor maintenance, sewer systems of many older cities in developed countries are in critical stages of deterioration. The deteriorated sewer infrastructure is contributing to frequent sewer overflows and basement backups (Water Environment Federation, 1999). GIS-based mapping, monitoring, modeling, and inspection and maintenance systems provide a spatial infrastructure management approach that is very effective in prioritizing the infrastructure improvement and maintenance needs and in meeting the regulatory requirements (Shamsi U. M., GIS Applications in Inspection and Maintenance of Collection Systems., 2002) (Shamsi U. M., GIS Tools for Water, Wastewater, and Stormwater Systems, 2002) (Shamsi U. M., GIS Applications for Water, Wastewater, and Stormwater Systems. , 2005). The most popular applications of GIS for regulatory compliance are described below (Shamsi U. M., Navigating a Smart User Strategy., 2007).

Internet GIS

This application allows us to see a sewer system map of a city overlaid on a wide variety of base maps such as color aerial photographs, property parcels, topographic maps, or as-built drawings. Maintenance crews can access the latest sewer maps (even those updated few hours ago) from their wireless enabled laptops for efficient completion of

service requests and work orders. To safeguard the security of sensitive information (e.g., location of large sewers and manholes) in vulnerable areas, site access or access to sensitive data layers can be restricted to pre-screened and pre-authorized users.

Mobile GIS, GPS, and LBS

Using GIS in the field for data collection directly into a GIS database is referred to as mobile or field GIS. The goal of a mobile GIS is to link the maintenance crews with the most recent GIS data to make their job easier and more efficient. Location Based Services (LBS) allow wireless transmission to a GPS location from the field (e.g., a sewer cleaning truck) and display it (even in real time) on a GIS map via wireless Internet.

Field Inspections

Mobile GIS technology is being used to inspect manholes, catch basins, inlets, and outfalls; to document smoke and dye tests; and to review TV inspection of sewer pipes. GIS is integrating field inspections, digital photos and videos, and GPS data in one manageable system. "Video mapping" is allowing digital photos and videos to automatically find their correct geographic location on the maps, and users to click on map features to review the inspection results, photos, and videos. Figure 1 shows how a user can click on a sewer pipe in an ArcGIS map to watch its CCTV inspection video. This approach implements a paperless system that frees up office space and saves staff time. As a side benefit, digital sewer inspection data can be integrated into hydraulic model calibration (Cheng, Barden, Burgess, & McGill, 2008).

Figure 1 Integration of GIS and TV inspection video.

As a real-life illustration scenario, there are five GIS-based approaches for sewer system inspection:

1. Paper-Spreadsheet-GIS: This most basic approach collects inspection data on paper forms, enters inspection data in a spreadsheet, and then links inspection spreadsheet with GIS.
2. Paper-GIS: This approach collects inspection data on paper forms and then enters inspection data in GIS.
3. Database-GIS: This approach collects inspection data in a database (or spreadsheet) and then links inspection
4. All GIS: This approach collects inspection data directly in GIS.
5. Wireless GIS: This most advanced approach collects inspection data directly in GIS and uploads it to a server using wireless technology in real time or near real time.

Maintenance Management

A Computerized Maintenance Management System (CMMS) is a software package that maintains a computer database of information about a utility's assets and maintenance operations. This information helps maintenance workers do their jobs more effectively. For example, they can determine the last time a manhole was inspected. A typical CMMS package provides capabilities for inventory control, asset management, service requests, work orders, preventive maintenance, and routine inspections. GIS-based CMMS packages are most popular because people can see the condition and inspection status of their assets on a map. GIS is used to prepare inspection or maintenance service requests and work orders simply by clicking on an asset such as a sewer pipe or manhole (Shamsi & Fletcher, AM/FM/GIS Applications for Stormwater Systems., 2000). This approach simply takes a few minutes compared to the conventional method of locating and copying maps and typing the work order forms which usually takes several hours. Utilities that have successfully implemented GIS-based CMMS packages have seen dramatic improvements in worker efficiency and customer satisfaction.

Permit Compliance

CSO permits (e.g., National Pollution Discharge Elimination System [NPDES] permit in the United States) from regulatory agencies generally require periodic physical inspection and maintenance of sewer system infrastructure such as sewer pipes, manholes, pumping stations, diversion chambers, outfalls, inlets and catch basins.

Using a GIS-based inspection and maintenance system as described above, inspection and maintenance activities can be scheduled and documented for management review, presentations, and permit compliance. Inspection and maintenance status maps can be created to show the progress on a monthly, quarterly, or annual basis. For example, these maps can show color-coded pipes for completed vs. remaining TV inspections, or color-coded catch basins for cleaned vs. remaining structures.

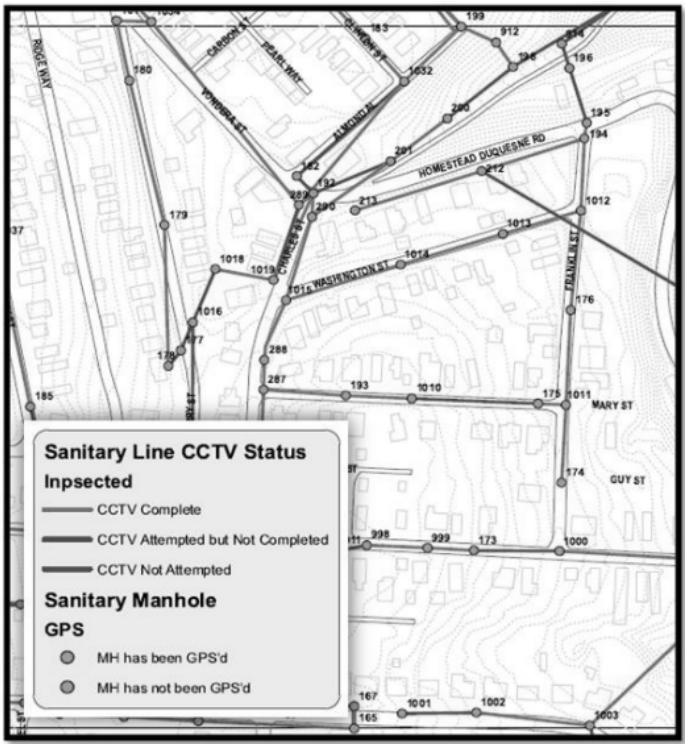


Figure 2 CCTV inspection and GPS survey status map.

Figure 2 shows a GIS map for a Consent Order municipality. It shows CCTV inspection status as completed, started but not completed (because of sewer problems), or not started at all. The manhole GPS survey status is shown as completed or not completed.

Decision Support System

These applications can be combined to create a sewer system rehabilitation decision support system. A typical application of such a system would be to automatically create projects and bid documents for immediate R5 designated repairs representing the worst type of problems based on National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) sewer defect codes. MWH Soft's (www.mwhsoft.com) InfoSWMM CapPlan is a GIS-based decision support software for wastewater infrastructure management and risk assessment. It uses CCTV data analysis to assess both the structural condition of the entire system and the probability and consequence of failure for each asset. Once a system's structural condition has been assessed using CCTV data, CapPlan generates a prioritized list of sewer pipes requiring rehabilitation or replacement. The most cost-effective rehabilitation methodology for each pipe (with one or more major defects or multiple minor defects) is then determined by considering several critical factors including hydraulic capacity needs,

methodology limitations, physical pipe characteristics (e.g., age, diameter, material), surface restoration, unit costs, length of point repairs to total pipe length, and other utility-specific criteria.

Technical Approach

There are two critical steps in using GIS for regulatory compliance:

(i) creating GIS maps of the sewer system and

(ii) implementing a GIS-based inspection and maintenance program. Figure 3 shows the approach for implementing step (ii).

As shown in Figure 3, a GIS-based inspection and maintenance can be implemented by using a commercial GIS software (e.g., ESRI's ArcGIS) that will link the sewer inspection and defect information contained in a database (e.g., WinCan) or spreadsheet to corresponding map features. Such a system can provide the Consent Order communities with GIS maps of problematic areas within a sewer pipe network, associated system repair activities (pipe lining, bursting, replacement, manhole repair and replacement, etc.) and the ability to output a series of reports detailing system damage, recommended remedial action, and cost estimates for the repair of damaged structures. Finally, the GIS maps and rehabilitation recommendation reports can be combined to generate what a project manager ultimately needs – bid documents for the repair work (See sample in Figure 4).

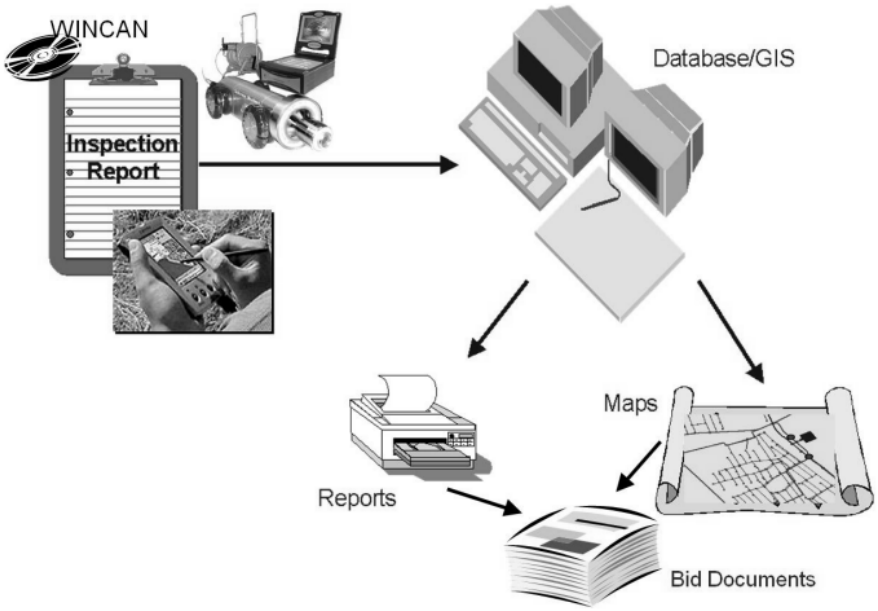
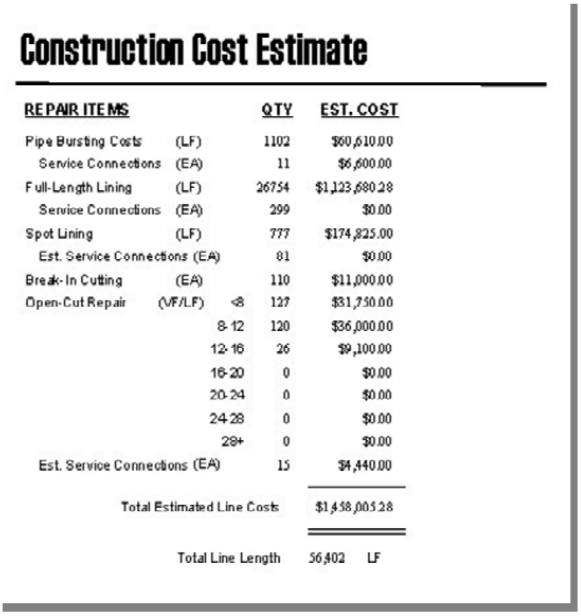


Figure 3 GIS-based inspection and maintenance approach.



Construction Cost Estimate

REPAIR ITEMS			QTY	EST. COST
Pipe Bursting Costs	(LF)		1102	$60,610.00
Service Connections	(EA)		11	$6,600.00
Full-Length Lining	(LF)		26754	$1,123,680.28
Service Connections	(EA)		299	$0.00
Spot Lining	(LF)		777	$174,825.00
Est. Service Connections	(EA)		81	$0.00
Break-In Cutting	(EA)		110	$11,000.00
Open-Cut Repair	(VF/LF)	<8	127	$31,750.00
		8-12	120	$36,000.00
		12-16	26	$9,100.00
		16-20	0	$0.00
		20-24	0	$0.00
		24-28	0	$0.00
		28+	0	$0.00
Est. Service Connections	(EA)		15	$4,440.00
Total Estimated Line Costs				$1,458,005.28
Total Line Length			56,402	LF

Figure 4 Sample GIS-based bid document.

Figure 5 shows a sample process flow chart for developing a GISbased sewer system inspection and maintenance application.

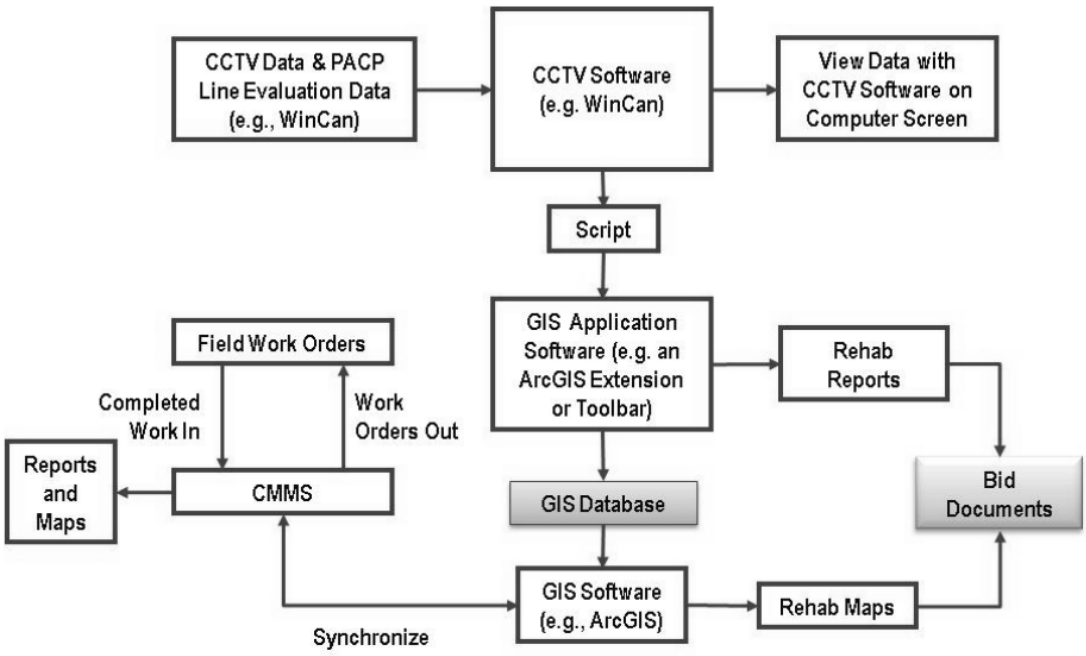


Figure 5 Sample process flow chart.

The recommended features of a GIS-based sewer system inspection and maintenance application are described below:

- Interface with CCTV database (e.g., WinCan™).
- Generate QA/QC reports
- Camera data
- GIS data
- Generate Segments of Concern report.
- Apply repair strategies.
- Generate repair schedules.
- Generate GIS maps for rehabilitation work (see sample map in Figure 6).
- The data management system generates cost estimates for manhole rehabilitation and line repair work by applying multipliers to unit repair costs. Unit costs are supplied by the project manager and entered the application. These cost figures may be modified at any time. The system will automatically update all aggregated costs based on the updated values.
- A variety of reports are automatically generated for use in bid documents and in tracking the rehabilitation effort from identification of a problem area through repair of each line and manhole.

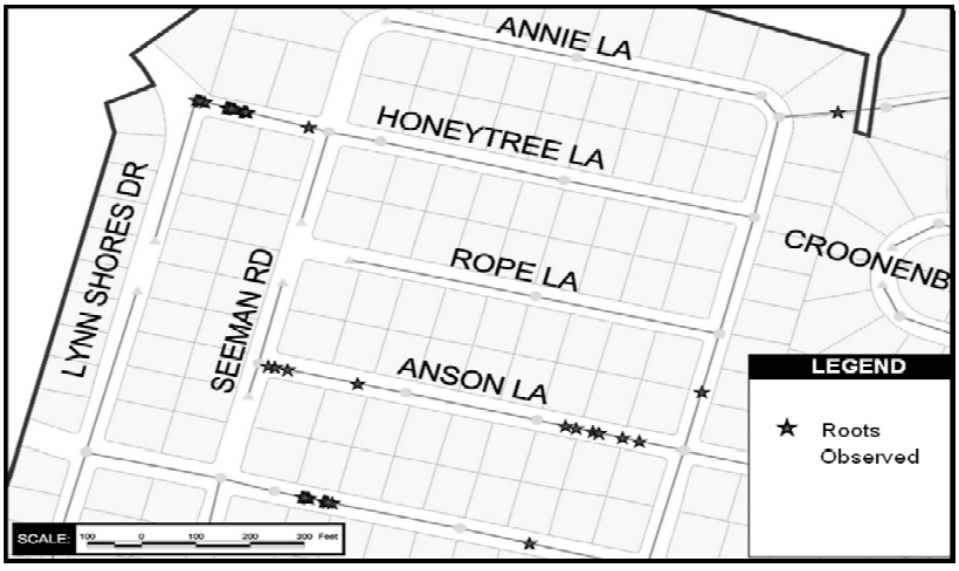


Figure 6 Sample rehabilitation map.

Case Studies

City of Hampton

The City of Hampton, Virginia has a population of 150,000 and 12,000 manholes and valves. The city conducted a GPS survey to collect coordinates for more than 8,000 manholes located in alleys, buried in yards, or covered with asphalt. The city stored attribute data in an external infrastructure database from GBA Master Series and linked it to ArcView GIS. The GBA software performs infrastructure inventory of manholes and pipes, work order management, and parts inventory management. It can also interface with the City's WinCan system used for CCTV inspection of sewers. The GBA GIS Toolkit, an extension of ArcView GIS, was used to synchronize data consistency between ESRI shapefiles, CAD, and the infrastructure management database. This application provided a GIS map linked to a comprehensive inventory, inspection, and maintenance management software program. The application also provided a graphic display of maintenance history and profile plots of user specified sewer segments (ArcNews, 2001).

Buncombe County

During the 1990s, the Metropolitan Sewerage District (MSD) of Buncombe County, North Carolina spent more than US$111 million rehabilitating the most problematic sewer lines in its system. MSD's aggressive sewer rehabilitation program successfully implemented numerous rehabilitation technologies. In 1999, MSD began assessing a method of comprehensive basin-wide rehabilitation. This approach evaluated every pipe in a drainage basin using CCTV footage and engineering analysis. After evaluating this comprehensive basin-wide rehabilitation method for four years, MSD determined that it was overly time- and capital-intensive. Seeking a more efficient and quicker method to fix the system, MSD developed and implemented a new GIS-based rehabilitation method called "pipe rating." The pipe rating method had five main elements (Bradford, Watson, Mann, & Konwinski, 2004):

(i) CCTV information,

(ii) (ii) a defect scoring system,

(iii) (iii) GIS database software,

(iv) (iv) Sanitary Sewer Overflow (SSO) history, and

(v) (v) engineering analysis. These components were combined to generate specific projects for problem lines

(Shamsi U. M., GIS Applications for Water, Wastewater, and Stormwater Systems. , 2005).

Allegheny County, Pennsylvania

Eighty-three (83) communities in Allegheny County have Administrative Consent Orders (ACOs) and Consent Order and Agreements (COAs). ACOs are enforced by the Allegheny County Health Department for the Sanitary Sewer Overflow (SSO) communities. COAs are enforced by the Pennsylvania Department of Environmental Protection (DEP) for the Combined Sewer Overflow (CSO) communities. These communities must complete various mapping, inspection, monitoring, and modeling tasks to develop overflow control plans. Consent orders mandate 1/5th of sewer system deficiency correction each year until 2010. GIS mapping with specific layers, attributes, and format is required by all consent orders.

Allegheny County Sanitary Authority (ALCOSAN) serves the eighty-three (83) consent order municipalities including the City of Pittsburgh. ALCOSAN was founded in 1946. It has a service area of approximately 225 square miles (580 km2) with a service population of approximately 900,000. Figure 7 shows the Allegheny County, ALCOSAN's service area, and seven planning basins of ALCOSAN's service area.

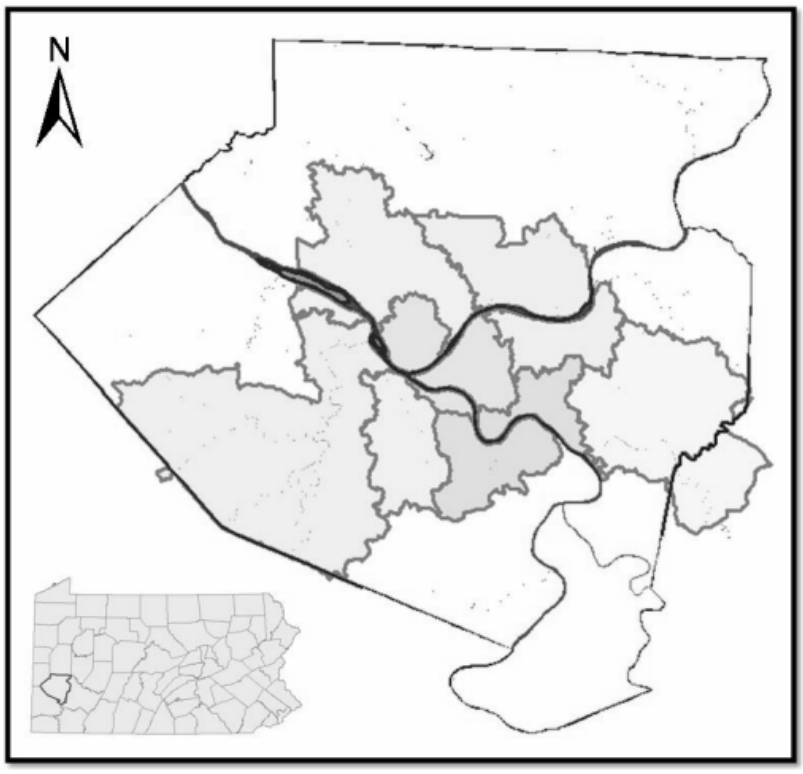


Figure 7 Allegheny County and ALCOSAN service area.

ALCOSAN's wastewater treatment plant has a capacity of 200 million gallons per day (MGD) (875 L/s) that will be expanded to 275 MGD (1200 L/s) in the future mainly for treating additional wet weather flow. On January 27, 2008, ALCOSAN entered a federal consent decree with the U.S. Environmental Protection Agency (EPA). Under the consent decree, ALCOSAN has agreed to upgrade its sewage systems serving Pittsburgh and 82 municipalities, to pay a US$1.2-million penalty for past Clean Water Act violations and undertake US$3 million in environmental projects. The settlement also requires ALCOSAN to submit a wet weather plan to EPA that would resolve most of the untreated discharges from the sewer systems by 2026. The required environmental projects include stream restoration work and other projects to better control storm water runoff.

Pittsburgh Water & Sewer Authority (PWSA), the largest Consent Order municipality, is using a GIS-based sewer system inspection program for 28,500 manhole inspections, 39,000 catch basin inspections, and 10,200 dye testing inspections. PWSA's inspection application uses ESRI ArcPad mobile GIS software on Panasonic Toughbook field computers. Created using ArcPad Application Builder software, the application records digital photos and videos using Envirosight's Quick View Zoom camera.

Virginia Beach, Virginia

The City of Virginia Beach is the most populous city in Virginia and the41st largest city in the United States, with an estimated population of 435,619 in 2006. The city is listed in the Guinness Book of Records as having the longest pleasure beach in the world. The city has televised over 200,000 ft (610 m) of sewer pipe and conducted over 1,000 manhole inspections. A field inspection database was programmed to collect manhole inspection data. Figure 8 shows the manhole inspection database form. The inspection data was exported directly from the field inspection database into the Hansen CMMS (see screenshot in Figure 9). This system can use GIS for compliance reporting and monitoring performance measures and creating reports and status maps of sanitary sewer inspection data. Hansen MMS can be synchronized with ArcGIS maps to display inspection data on GIS maps. This application can potentially isolate defect trends, show all PACP level 4 or 5 defects, and group the repair needs for cost effective rehabilitation.

Reasoning

A GIS-based inspection and maintenance program allows incorporating sewer system defect and rehabilitation data into a single database/mapping environment. Such an application can be used to track and report rehabilitation progress, generate bid documents for rehabilitation work, generate and update reports and maps to meet regulatory

requirements, and generate budgetary pricing for repairs and rehabilitation work. Though many cities in the United States are using GIS to map the inspection data, not all of them are using GIS to create rehabilitation maps and projects (Shamsi U. M., 2009).

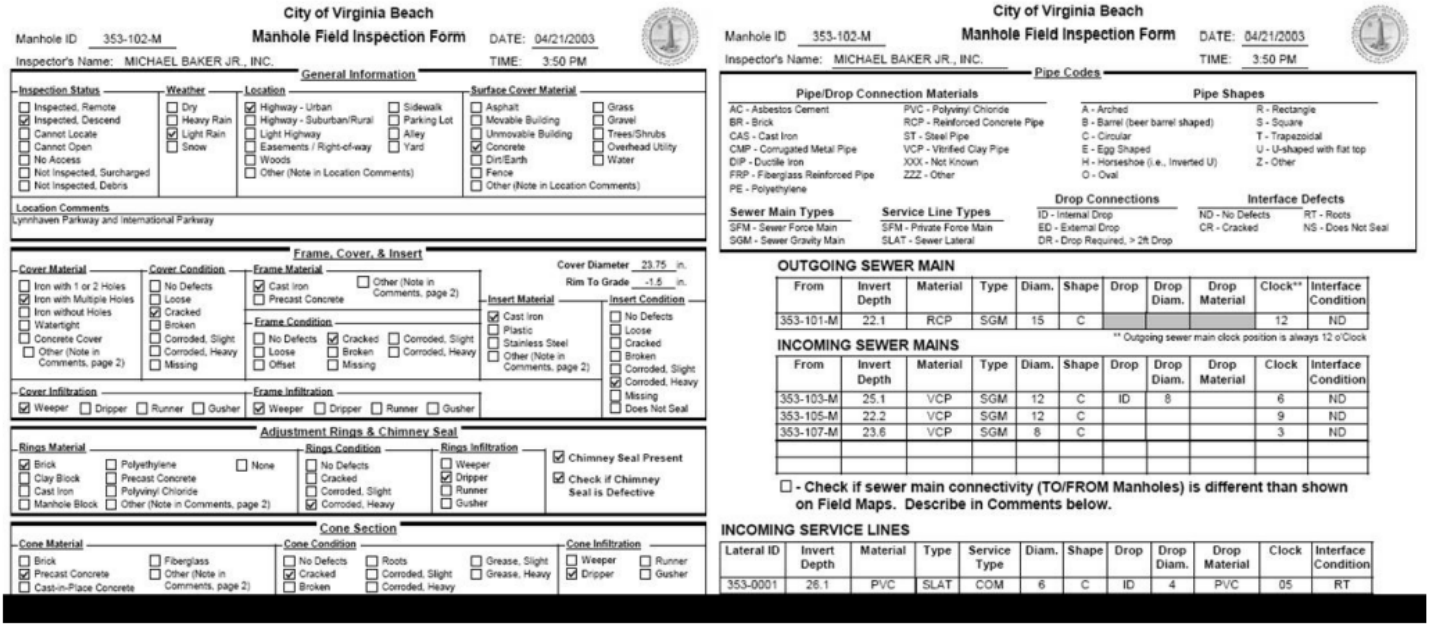


Figure 8 Virginia Beach manhole inspection form.

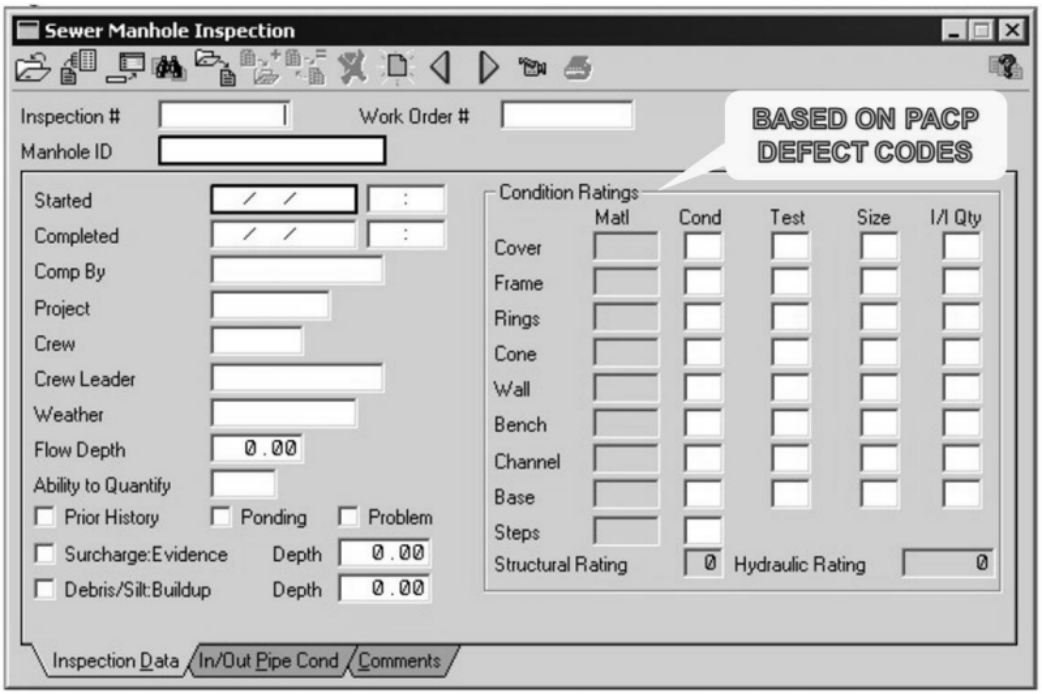


Figure 9 Hansen manhole inspection module.

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