Climate Drones: A New Tool for Oil and Gas Air Emission Monitoring

by Lucas Satterlee

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Summary

In recent years, the proliferation of commercial drone or unmanned aircraft system (UAS) applications in the United States has generated significant discussion and controversy among legal scholars and practitioners attempting to navigate this budding industry. The drone phenomenon is just starting to catch on in the area of environmental monitoring and enforcement. There is immense potential for using drones to maximize an operation's efficiencies while also reducing its environmental impact; one area that is particularly ripe for UAS integration is methane emission monitoring in oil and gas operations. However, the legal framework has been slow to catch up with the rapid growth of UAS capabilities. This Article examines the FAA's regulatory process and identifies the best pathways for companies to integrate drones into their operations. It also addresses concerns related to the First and Fourth Amendments, in addition to the property rights conundrum surrounding the use of drones by agencies and other entities that conduct environmental monitoring.

New technologies give rise to new but familiar legal issues. Unmanned aircraft systems (UAS)—more commonly known as drones—are well known for their military functions, but the potential for new public, civilian, and commercial UAS applications is immense and starting to catch on in the United States.[1] One area that is extremely ripe for UAS integration is environmental monitoring and enforcement. The ways in which UAS can help us better understand and solve some of our most challenging environmental problems is limited only by one's imagination. For example, imagine a fleet of autonomous drones designed to monitor and remove greenhouse gases and other airborne pollutants from the atmosphere.[2] It may sound like science fiction, but "with the convergence of artificial intelligence, quantum computing, and nanotechnology," deploying these climate-fixing drones could soon become a reality.[3] Aside from these future applications, there are numerous ways drones are already being used to better the environment.

While only a handful of entities are currently using UAS in their operations, the limiting factor is not science or technology: it's the law. So far, the regulatory framework has been slow to catch up with the rapid growth of UAS capabilities.[4] There are also constitutional concerns and property rights issues surrounding the use of drones by government agencies and other entities in the area of environmental monitoring. Lawmakers have enacted statutes that may limit the potential of these sorts of applications. That said, the widespread use of UAS for environmental purposes appears to be inevitable. The pace at which these drones are integrated depends in large part on the issuance of regulations by the Federal Aviation Administration (FAA). Moreover, the industry, government agencies, and even ordinary citizens will dictate how fast UAS become standard tools for environmental monitoring and compliance.

This Article narrows its focus to UAS integration in the context of air pollution monitoring in the oil and gas sector, but one can imagine how the analysis would be similar for other industries that oversee large operations and infrastructure and are under constant pressure to reduce their environmental impact.[5] Oil and gas systems provide a

1. Market analysts predict "over the next 10 years, worldwide production for UAS of all types of applications could rise from $4 billion annually to $14 billion." Bill Canis, Unmanned Aircraft Systems (UAS): Commercial Outlook for a New Industry 1 (Cong. Res. Service 2015) (R44192).
2. *See* David Preznuk, The Drone Age 6-7 (2016).
3. A group of these "drones—swarm, fleet, or flock," would be equipped with the "computing, analysis, and chemical compounds to monitor, analyze, and fix certain" atmospheric conditions by scrubbing the air and removing excess pollution; resulting in a "real-time molecular fix." *Id.* at 7 (explaining that this scenario "is within reality's grip").
4. *See* Canis, *supra* note 1, at 1.
5. Agriculture, real estate, construction, and electric utilities are among the other markets that anticipate rapid adoption of UAS. *Id.* at 9-10.

particularly important case study for several reasons. This sector is receiving significant attention as a prime market for UAS application and is also increasingly becoming a target for environmental enforcement agencies.

Part I explains why using drones to monitor oil and gas systems offers tremendous cost-advantages over current methods of environmental compliance, particularly in the area of methane emission monitoring. Part II navigates FAA's current regulatory process for granting authorization and identifies the best pathways for the industry to integrate drones into their operations. Part III identifies UAS opportunities for environmental enforcement agencies. Part IV addresses Fourth Amendment concerns that may arise should these agencies choose to add drones to their surveillance and inspection arsenal. Part V addresses how environmental groups can use these air-monitoring drones to supplement government enforcement, and argues that regulatory efforts to prevent their proliferation in this context may run afoul of the First Amendment privilege to gather information.

Many of the regulatory and constitutional issues that will arise in this context have not been addressed, and it is unclear how the law will eventually evolve around this new technology. This Article attempts to guide that framework in a way that finds the right balance between opportunity and concern over UAS proliferation in the oil and gas sector.

I. Capabilities and Advantages of Using UAS in the Oil and Gas Sector

A. *Broad Applications in the Oil and Gas Sector*

According to market experts, UAS are "poised to become the next major disruption to influence the oil and gas industry."[6] There is immense potential in using drones to maximize operation efficiencies while also reducing an operation's environmental impact.[7] Some of the UAS applications for oil and gas operations include: detecting gas leakage from pipelines, storage tanks, and other parts of industry infrastructure; emergency response and analysis from natural and man-made disasters (e.g., oil spill detection)[8]; environmental impact assessments[9]; and air and water quality monitoring and compliance demonstration.[10] Drones allow operators to gather much more data faster than they could in the past, potentially capturing "as much data available in the last 30 years within 45 minutes."[11] Finally, conducting certain operations with drones might cut down on the noise and traffic associated with unconventional development that has resulted in so much outrage among local communities.[12] Compared to manned aircraft or trucks, drones are much less intrusive in terms of "undue noise, nuisance, or threat to persons or property."[13]

B. *Methane and Other Air Emissions: Are Drones the Bridge to the Bridge-Fuel?*

One application that may see significant attention is natural gas (i.e., methane) leak detection. The role of natural gas in America's energy portfolio continues to rise, in large part because of the development of shale gas using unconventional extraction methods such as hydraulic fracturing.[14] Shale energy advocates tout the potential for abundant, cheap natural gas to be "a bridge-fuel to a low carbon future," since using natural gas to generate electricity is a cleaner-burning alternative to coal and can be used in conjunction with renewable sources such as wind.[15]

However, a significant concern cutting against this argument is the release of methane that either is burned off (i.e., flared as carbon dioxide) or escapes into the atmosphere throughout drilling and processing operations.[16] Because of its contribution to climate change, methane release is increasingly recognized as a global pollution problem.[17] Thus, if too much gas is lost in the extraction

6. The oil and gas drone industry is expected to grow at a rapid pace—a compound annual growth rate of 40% during the forecast period 2014-2020. Research and Markets, North America Oil & Gas Drones Market—Growth, Trends, and Forecasts (2015-2020) (2016).
7. *See* Preznuk, *supra* note 2, at 45. *See also* Anjli Raval, *Inspection Drones Take Off as Flying Robots Replace Rigworkers*, Fin. Times, Sept. 7, 2015.
8. *Id.* (describing the value of information-gathering using a small fleet of multi-sensor drones after an oil spill, train derailment, hurricane, or tornado disaster).
9. John Villasenor, *Observations From Above: Unmanned Aircraft Systems and Privacy*, 36 Harv. J.L. & Pub. Pol'y 457, 459 (2013) (noting that drones can be used for scientific applications such as wildlife tracking). *See also* Preznuk, *supra* note 2, at 84 (explaining how drones can use aerial imaging "to provide a baseline environmental impact assessment that shows environmentally sensitive areas" prior to construction).
10. Water-sampling drones are being tested that can "swoop down to scoop up water samples" and track oil leaks. Andrew Rosenblum, *Drones That Can Suck Up Water Hunt Oil Leaks, Invasive Species*, MIT Tech. Rev., Jan. 20, 2015, https://www.technologyreview.com/s/534271/drones-that-can-suck-up-water-hunt-oil-leaks-invasive-species/.
11. Research and Markets, *supra* note 6.
12. Katherine Lymn, *New Bakken Workers? Oil, Gas Industry Shows Interest in Drones*, Dickinson Press, May 18, 2014.
13. Matthew R. Koerner, *Drones and the Fourth Amendment: Redefining Expectations of Privacy*, 64 Duke L.J. 1129, 1133 (2015). However, at the same time, the "small size and practical anonymity of a drone can create understandable anxiety on the landowner's part." *See* Thomas J. Dougherty, *Drones for Electric Cooperatives: Ready for Take-Off?*, 51:8 Legal Rep. Service 4 (2015) (suggesting that companies should develop "a public education campaign to inform members that UASs are being added to" their operations).
14. Besides the hydraulic fracturing process, there are many other "locations in the oil and gas production infrastructure where methane can escape, such as loose pipe flanges, inefficient compressors, and outdated equipment." Mark Crawford, *Methane-Sniffing Drones in Fracturing Operations*, ASME, Feb. 2015, https://www.asme.org/engineering-topics/articles/energy/methanesniffing-drones-in-fracturing-operations.
15. Generating electricity with natural gas reduces the need to burn coal, and gas-powered plants are more flexible than coal or nuclear stations because they can be switched on and off, run at a quarter of capacity, and are "an excellent complement for renewable power sources." However, a glut of cheap natural gas can also make it "harder for new wind and solar plants to compete." Russell Gold, The Boom, 262-64 (2014) (illustrating that if renewable sources were "chipping away the dominant position long held by coal," then "[n]atural gas was smashing it with a sledgehammer").
16. Crawford, *supra* note 14.
17. Methane has a global warming potential more than 25 times greater than carbon dioxide. Although methane emissions from the oil and gas industry have decreased by around 15% since 1990, they are projected to increase

and processing of natural gas, the bridge-fuel prophecy totally falls apart.[18]

For all these reasons, "there is growing interest in identifying and controlling methane leaks" and other emissions from unconventional (i.e., hydraulic fracturing) operations.[19] Federal and state agencies are developing new rules and regulations to rein in air pollution from the oil and gas industry.[20] In addition to government agencies, many environmental and research groups have made exposing the extent of unreported methane emissions a critical part of their mission.[21] There is also "a growing industry focused on capturing fugitive methane emissions" from this sector.[22]

Since they come from open-area sources, reining in oil and gas methane emissions "is a daunting and costly problem to tackle."[23] It is critical that government institutions and the industry identify and encourage the best technological solutions to tackle this problem.[24] Right now, methane leak detection is typically conducted by attaching high-tech sensors to trucks, all-terrain vehicles, satellites, and manned aircraft such as helicopters.[25]

However, "methane-sniffing drones" are emerging as a "faster and more cost-effective approach" to detect these emissions over hydraulic fracturing operations.[26] The National Aeronautics and Space Administration (NASA) has even retrofitted an autonomous drone with methane sensors initially developed for its Mars Rover that can "detect parts-per-billion levels of methane" leaked from pipelines.[27] Other entities experimenting with this technology have proven that UAS can be deployed in situations where using conventional methods of emission detection would be too dangerous, disruptive, costly, and inefficient.[28] For private entities and government agencies, "the dramatically lower operating costs" of using drones compared to manned systems "provides a powerful economic incentive" for their rapid integration in the oil and gas sector.[29]

The industry is beginning to realize the potential benefits of integrating this technology into their operations, and many UAS manufacturers have developed specialized services to cater to the oil and gas sector.[30] Forward-thinking companies anticipating these additional regulatory requirements can start using these drones as a "cost-effective, voluntary, pollution prevention measure."[31] By being proactive, transparent, and accountable for their air emissions, oil and gas firms that adopt UAS might deter otherwise extensive government surveillance and inspection.[32] However, regulations restricting how and when drones can be used are curbing the pace of this technology's proliferation.[33]

II. Navigating FAA's Regulatory Framework for Companies Interested in UAS

A. *Current FAA Regulatory Framework*

FAA currently prohibits commercial UAS applications, except where it has granted an exemption permitting cer-

by 25% over the next decade unless additional steps are taken to reduce the emissions from this booming sector. In 2012, nearly 30% of methane emissions came from the oil and gas sector. The other main sources of human-related methane emissions are agriculture (36%), landfills (18%), coal mining (10%), and wastewater treatment (2%). The White House, Climate Action Plan: Strategy to Reduce Methane Emissions 4 (2014).

18. Gold, *supra* note 15, at 33.
19. Crawford, *supra* note 14.
20. In 2014, Colorado became the first state to require operators to reduce methane emissions throughout oil and gas production processes. In addition to methane, these regulations are designed to limit emissions of volatile organic compounds from venting and leaks in production operations. They "require operators to implement leak detection and repair (LDAR) programs" and replace or modify certain outdated high-polluting technologies. Colorado Air Quality Control Commission Regulations, 5 CCR 1001-9, Reg. 7, §§XII, XVII, XVIII. Several other states have followed suit, and the Barack Obama Administration is currently engaged in a cross-agency effort to reduce methane emissions from a wide range of sources, including oil and gas. The White House, *supra* note 17, at 4.
21. Crawford, *supra* note 14. These groups believe that "methane emissions are considerably higher than the official numbers from the EPA," since the Agency's "numbers are mostly based on industry provided estimates, not actual measurements." Joe Romm, *Methane Leaks Erase Climate Benefits of Fracked Gas, Countless Studies Finding*, Climate Progress, Feb. 17, 2016 (citing recent Harvard research observations).
22. Mark Jaffe, *Colorado Startups Pitch New Technologies to Scrub Oil and Gas Fields*, Denver Post, Oct. 2, 2014, *available at* http://www.denverpost.com/business/ci_26652246/colorado-start-ups-pitch-new-technologies-scrub-oil.
23. Crawford, *supra* note 14. *See also* Brian Gullett, The Role of Unmanned Aerial Systems/Sensors in Air Quality Research (U.S. Environmental Protection Agency (EPA), Office of Research and Development, National Risk Management Research Laboratory 2015) (noting that "open area sources are recognized for their importance to air shed pollution management" and their climate impacts "are of growing concern").
24. Crawford, *supra* note 14.
25. Environmental Defense Fund, *Cameras, Drones, and Lasers*, Wash. Post, Nov. 9, 2015, *available at* http://www.washingtonpost.com/sf/brand-connect/cameras-drones-lasers/. Sensor technology applicable to oil and gas operations includes: infrared ("for any application where temperature is vital to determining, stress, fatigue or potential failures"); light detection and ranging (LIDAR) (commonly used in making maps and atmospheric science); and multi/hyperspectral (broad applications in oil and gas exploration). Preznuk, *supra* note 2, at 35.
26. Crawford, *supra* note 14.
27. Travis Gray, *Commercial Drones in the Oil and Gas Industry: A Regulatory Incubator*, Vand. J. Ent. & Tech. L., July 13, 2015, http://www.jetlaw.org/2015/07/03/commercial-drones-in-the-oil-and-gas-industry-a-regulatory-incubator/; Kelsey D. Atherton, *NASA Now Has a Drone That Can Sniff Out Dangerous Gas Leaks*, Popular Sci., Mar. 30, 2016, http://www.popsci.com/nasa-drone-uses-mars-inspired-tech-to-protect-life-on-earth.
28. Villasenor, *supra* note 9, at 467. Researchers at Colorado State University are developing lighter and more sensitive methane sensors that can "discern between oil and gas related emissions and those from biogenic sources." CSU Ventures, *Portable Methane Sensor for Monitoring Natural Gas Leakage and Emissions*, https://www.ibridgenetwork.org/#!/profiles/8095653012844/innovations/28/ (last visited Oct. 16, 2016).
29. Villasenor, *supra* note 9, at 467. Currently, stack inspections can only be done "when production is shut down because of the risk to workers who have to climb the stack." Using drones allows a company to "save time and money" since the inspection can occur without having to shut down the operation. It also provides a safer substitute for workers. Lymn, *supra* note 12. Smaller producers may especially benefit from UAS because they cannot reasonably afford manned aviation support. *See* Henry H. Perrit Jr. & Eliot O. Sprague, *Drones*, 17 Vand. J. Ent. & Tech. L. 673, 676 (2015).
30. Renee Knight, *UAS Making Its Mark in Oil and Gas*, Inside Unmanned Sys., http://insideunmannedsystems.com/uas-making-its-mark-in-oil-and-gas/.
31. Holly Doremus et al., Environmental Policy Law 134 (6th ed. 2012).
32. Gregory S. McNeal, *Government-Operated Drones & Data Retention*, 72 Wash. & Lee L. Rev. 1139, 1151 (2015).
33. *See* Research and Markets, *supra* note 6.

tain classes of activities or specific operations.[34] The FAA Modernization and Reform Act of 2012 (FMRA) mandates that FAA conduct a "phased-in approach" to safely integrate UAS into the national airspace system.[35]

There are several different ways of getting airspace and equipment approval, but in general, one's options vary depending on who you are and how you want to fly.[36] The certification process for public aircraft is much simpler and more flexible in terms of getting around standard restrictions on flight.[37] Public drones just need to be carrying out a "government function."[38] Whether something qualifies as a government function is "determined on a case-by-case basis," but it probably includes certain applications by public universities, "such as atmospheric research."[39]

In general, to operate a UAS for civil use, "the aircraft must have an airworthiness certification, unless it is exempted from this requirement" under §333 of FMRA.[40] The §333 exemption mechanism was designed to streamline certain applications "in low-risk, controlled environments."[41] It empowers FAA with broad authority to permit certain types of operations before the rules are finalized.[42]

Otherwise, civilian operators can apply for a special airworthiness certificate (SAC) describing how their operations are designed to function and where they intend to fly.[43] Also, in early 2015, FAA started a rulemaking process to allow small UAS "weighing less than 55 pounds to fly in limited circumstances and locations during the daytime as long as there is a visual line of sight."[44]

B. Oil and Gas Companies Are a Prime Test Subject for UAS Integration

The most obvious regulatory barrier currently inhibiting the full potential of UAS in oil and gas operations is the restriction on operations occurring beyond the drone operator's line of sight.[45] Some of the most promising UAS applications—like surveying, monitoring, and inspecting pipelines or hydraulically fractured oil and gas fields—are advantageous precisely because of their ability to fly autonomously over large extended areas.[46] This restriction is "likely to be relaxed" in the long run,[47] but oil and gas entities need not wait for that to happen.

FAA has been instructed to establish a streamlined process for certain uses by taking a "risk-based approach to permitting," considering things like the location and nature of the mission.[48] Oil and gas operations are the perfect "technological incubator" to test more advanced applications of UAS without the current regulatory training wheels.[49] Besides the obvious environmental and economic benefits, FAA can use the oil and gas industry to safely "harness the experimental benefits of drone proliferation" such as autonomous flight and sense-and-avoid technology.[50] This is so because exploration and production activities typically occur in remote, offshore, or otherwise isolated areas.[51] Obviously, the chances of serious property damage or human injury are much less in these places than in densely populated cities or near airports.[52]

FAA seems to agree, since oil and gas companies were among the first operations to be permitted for applications beyond the line of sight.[53] As part of its 2012 legislative mandate to create permanent areas in the Arctic where small UAS are permitted to operate for research and commercial purposes, FAA permitted ConocoPhillips to test drone use for carrying out "marine mammal and ice surveys necessary to meet environmental and safety rules prior to sea floor drilling."[54] In 2014, BP was also given a waiver for the first commercial UAS exemption over land "to survey [its] pipelines, roads, and equipment at Prudhoe Bay, AK."[55] The remoteness, safety benefits, and minimal environmental impact on the sensitive Arctic ecosystem made it easier to justify these exemptions.[56] Since then, FAA has also granted exemptions to other companies wishing to use UAS to monitor large oil and gas facilities and for flare stack inspections.[57]

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34. Canis, *supra* note 1; FAA, *Unmanned Aircraft Systems*, http://www.faa.gov/uas/.
35. Jonathan Rupprecht, Drones: Their Many Civilian Uses and the U.S. Laws Surrounding Them 65 (2015) (citing FAA Modernization & Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11).
36. U.S. Government Accountability Office (GAO), Unmanned Aerial Systems: FAA Continues Progress Toward Integration Into the National Airspace 8 (2015) (GAO-15-610).
37. Rupprecht, *supra* note 35, at 76-80.
38. *Id.* at 76-77 (citing 49 U.S.C. §40125(a)(2)).
39. *Id.* at 77-88.
40. *Id.* at 73.
41. Canis, *supra* note 1, at 5.
42. Marc Warren, *UAS Integration: A Call to Action*, 27:2 Air & Space Law. 1, 21-22 (2014).
43. Canis, *supra* note 1, at 5.
44. *Id.* at 1 (noting that FAA may not finalize these regulations until late 2016 or 2017).
45. *See* Villasenor, *supra* note 9, at 475.
46. GAO, *supra* note 36, at 7; Gray, *supra* note 27.
47. Villasenor, *supra* note 9, at 475.
48. Michael Weller, *Unmanned Aircraft System/Drone Update—House Transportation Committee Announces FAA Reauthorization Act*, Nat'l L. Rev., Feb. 3, 2016, http://www.natlawreview.com/article/unmanned-aircraft-system-drone-update-house-transportation-committee-announces-faa.
49. Gray, *supra* note 27.
50. *Id.*
51. *See* Raval, *supra* note 7.
52. Gray, *supra* note 27. Granting authorization in remote areas is also less susceptive to political opposition. Perrit & Sprague, *supra* note 29, at 745.
53. FAA, *UAS in the Arctic*, http://www.faa.gov/uas/programs_partnerships/uas_arctic/ (last visited Oct. 16, 2016).
54. Canis, *supra* note 1, at 9. In early 2013, "FAA granted restricted category type certificates for the Scan Eagle X200 and Aero Vironment's PUMA, permitting them to conduct aerial reconnaissance pertinent to wildlife surveillance, oil spill monitoring, and tracking ice flows and migrating whales in Arctic oil exploration areas." Perrit & Sprague, *supra* note 29, at 735.
55. BP's operations at Prudhoe Bay make up the largest oilfield in the United States. Press Release, FAA, FAA Approves First Commercial UAS Flights Over Land (June 10, 2014), *available at* https://www.faa.gov/uas/legislative_programs/arctic/.
56. Gray, *supra* note 27.
57. Other energy companies that have been granted exemptions include Chevron USA (monitoring of oil and gas facilities) and Total Safety U.S. (flare stack inspections). Betsy Lillian, *The Latest Round of Commercial UAS Exemptions*, Unmanned Aerial, Feb. 24, 2015, http://unmanned-aerial.com/the-latest-round-of-commercial-uas-exemptions/; FAA, *FAA Grants Eight More UAS Exemptions*, https://www.faa.gov/news/updates/?newsId=81565 (last visited Oct. 16, 2016).

C. Developing a Test Site for Air Monitoring and Leak Detection of Unconventional Fields

While FAA continues to take a cautious approach to full-on UAS integration, the §333 exemption process provides a flexible pathway for oil and gas companies to continue finding innovative ways to integrate drones into their operations.[58] As the industry has already demonstrated, the oil and gas sector "offers a unique testing ground to safely and efficiently study the risks and benefits" of new UAS applications.[59] The industry should continue to use §333 "as an interim bridge for expedited" authorization until the new rules are issued.[60]

Building on the success of the Arctic initiative, FAA and industry could develop new test sites for air monitoring and leak detection operations. It could do this through a §333 exemption or an experimental certificate.[61] Due to the area's remoteness and extensive problems with venting, flaring, and unintentional leaking of natural gas, one promising test market could be the Bakken oil fields of North Dakota.[62] Further, North Dakota has emerged as a hotbed for UAS testing and innovation, christening its drone-only business park at the former Grand Forks Air Force Base as the "Silicon Valley of drones."[63] The state has spent nearly $34 million nurturing its UAS sector, highlighted by the conversion of the Grand Forks Air Force Base into the country's first drone-specific industrial park.[64]

Aside from developing test sites and using the §333 framework, Congress could amend the FMRA to provide FAA with specific instructions to streamline certain types of unrestricted oil and gas operations across the country.[65] As UAS continue to grow within the oil and gas sector, industry standards and best practices will begin to emerge.[66] This should alleviate some of the anxiety of companies unsure of how best to integrate UAS into their operations. Once FAA finalizes its rules for commercial UAS and removes some of the restrictions on line of sight, "product development will likely accelerate" and drones could become standard features of oil and gas operations.[67]

III. UAS Opportunities for Environmental Enforcement Agencies

The private sector is not the only forum where interest in drone use is gaining traction. Environmental agencies at the federal and state levels might soon use drones as a standard enforcement and compliance tool. This section will explain the advantages of using UAS technology over current environmental enforcement and inspection methods. It then suggests the U.S. Environmental Protection Agency (EPA) and its state counterparts should develop a clear policy framework in order to mitigate some of the unique privacy and constitutional concerns that will arise. While UAS could be used to address a range of environmental harms, the following analysis is concerned mainly with air pollution.

A. Current Methods and Limitations of Environmental Inspection Technology

Improving the capabilities of government agencies to conduct environmental enforcement activities can "generate long-term economic benefits to society and complying facilities by reducing public health costs and potential industry liability for damages and cleanup costs."[68] Environmental agencies collect certain types of data in order to establish the compliance status of entities subject to their regulation.[69] The mechanisms through which this process is carried out include "source reporting, monitoring, inspections, and the receipt of citizen complaints."[70] Because these agencies have limited resources in terms of funding and manpower, they typically "concentrate enforcement efforts on more serious or significant cases."[71] Despite a shrinking budget, EPA has steadily increased its oil and gas enforcement activity under the Barack Obama Administration.[72]

EPA and its state counterparts have several ways to ensure compliance with comprehensive environmental regulatory schemes like the Clean Air Act (CAA).[73] Ambient air monitoring is often used in conjunction with remote-sensing techniques to evaluate an entity's compliance status and target inspections.[74] Besides on-site inspections and

58. Warren, *supra* note 42, at 21 (explaining the success of the Arctic initiative and how "civil UAS can be accommodated in specific airspace even before they can be fully integrated into the [National Airspace System]").
59. Gray, *supra* note 27.
60. Warren, *supra* note 42, at 21. *See also* Kate Rosow Chrisman, *Can Energy Companies Legally Use Drones?*, Breaking Energy, Aug. 25, 2014 (arguing that the "BP approach is the way forward" until FAA implements new regulations).
61. GAO, *supra* note 36, at 16 (explaining that FAA is authorized to create test sites based on "factors including geography, climate, airspace use and a proposed research portfolio").
62. *See generally* Monika U. Ehrman, *Lights Out in the Bakken: A Review and Analysis of Flaring Regulation and Its Potential Effect on North Dakota Shale Oil Production*, 117 W. Va. L. Rev. 549 (2014) (explaining efforts North Dakota is taking to address its venting and flaring problem).
63. Joel Kotkin, *Oil Bust? Bah—North Dakota Is Still Poised to Thrive*, Forbes, Oct. 13, 2015, http://www.forbes.com/sites/joelkotkin/2015/10/13/oil-bust-bah-north-dakota-is-still-poised-to-thrive/#74aa3f5f1ffa.
64. Quentin Hardy, *A Silicon Valley for Drones, in North Dakota*, N.Y. Times, Dec. 25, 2015 (noting that "North Dakota has spent about $34 million fostering" its UAS business).
65. Congressmen attempted to do this with pipeline inspection activities in March 2016. *See* UAVs for Energy Infrastructure Act—S. 2684, 114th Cong. (2016) (explaining the bill's purpose to establish "a streamlined process to conduct pipeline inspection activities 'beyond the visual line of sight' . . . and (2) without any restriction on the time of the operation").
66. *See* Warren, *supra* note 42, at 23.
67. Canis, *supra* note 1, at 5.
68. Doremus et al., *supra* note 31, at 839.
69. *Id.*
70. *Id.*
71. *Id.* Inspections also tend to be particularly expensive. *See also* David James, *The Fourth Amendment, Future Methods of Environmental Enforcement, and Warrantless Inspections*, 33 Rev. Litig. 183, 201-03 (2014) (noting that EPA's budget "has steadily decreased over the past twenty years").
72. Recently—especially under the Obama Administration—EPA "has focused its resources on enforcement, exacting progressively tougher fines and penalties from non-compliant businesses." James, *supra* note 71, at 201-03.
73. 42 U.S.C. §§7401-7671q (2015), ELR Stat. CAA §§101-618.
74. Doremus et al., *supra* note 31, at 847.

satellite imaging, aerial manned overflights are an effective inspection method used by EPA.[75] The Agency can utilize high-resolution cameras or onboard thermal imaging and other remote-sensing technologies to provide positive proof from outside a site's immediate boundaries that the regulated entity is violating the law.[76]

More recently, EPA has explored air sampling using helium-filled tethered aerostats.[77] Since at least 2010, EPA has used these aerostats for sampling emissions from sources like oil plumes.[78] These tethered devices have worked well, but there are several constraints.[79] Maneuverability and limited 3D range are issues when navigating the aerostat around boundaries and obstacles like trees and power lines.[80] This method also drains considerable resources in terms of cost, equipment, and the large team required to conduct an operation.[81] Finally, if time is of the essence—as would be the case if there were an oil spill—the response of deploying a tethered aerostat can take weeks.[82]

B. Agencies Should Adopt UAS as a New Enforcement and Response Tool

Advancements in UAS and miniaturized sensor technologies make drones a much more efficient tool for aerial surveillance and monitoring in the context of environmental regulation.[83] Environmental enforcement agencies in other parts of the world are already using drones in unique ways to counter challenging pollution problems.[84] The U.S. Department of Justice recognizes that drones are evolving into "a viable law enforcement tool" and can be "cost-effective at a time of shrinking government resources."[85]

Federal agencies have already conducted experiments that demonstrate the potential of equipping drones with high-tech sensors for air detection and sampling applications.[86] These applications show particular "promise for enabling new methods" to better account for and "quantify emissions from hard-to-sample, open area sources," such as large oil and gas processing facilities and production fields.[87] Compared to tethered aerostats and manned aircraft, using a UAS is safer for personnel, requires less people and time to conduct its mission, permits greater mobility "for more efficient source sampling," "increases the ability to characterize difficult sources," and creates much less of a disturbance footprint.[88]

Besides the obvious cost advantages over current methods of aerial monitoring and surveillance, deploying UAS provides entirely new opportunities not previously possible with traditional technology. For example, in the area of disaster response, being able to quickly "assess the scene and determine the level of leakage or environmental exposure" is critical.[89] After catastrophic events with large emission plumes such as a train derailment or industrial fire, imagine sending out a fleet of drones "to quickly assess and record the entire scene," then sending back real-time video and data analysis so agencies can put together an immediate action plan prior to first responders arriving at the scene of the accident.[90] For an event like the 2010 *Deepwater Horizon* oil spill, future technological advancements may even permit a fleet of drones to contain and disperse the contamination before it gets too out of hand.[91]

For all these reasons, environmental agencies should be making a larger push for drone adoption so they can more effectively ensure compliance with environmental laws.[92]

IV. Industrial Privacy and Fourth Amendment Concerns

The new opportunities presented by using drones will inevitably give rise to new concerns over privacy invasion. A UAS would enable environmental agencies to conduct much more extensive surveillance by routinely flying over

75. *Id. See also* EPA Overflights and Fourth Amendment Searches, 4b Op. Att'y Gen. 784 (1980) (explaining that "aerial observations are used to detect discharges into water, emissions into the air, and hazardous waste disposal sites"), *available at* https://www.justice.gov/sites/default/files/olc/opinions/1980/09/31/op-olc-v004b-p0784.pdf.
76. James, *supra* note 71, at 205. *See also* Doremus et al., *supra* note 31, at 847 (noting that using remote sensors "is relatively inexpensive compared to other air monitoring methods such as stack tests").
77. Testing tethered aerostats for emissions sampling is part of a program at EPA's National Risk Management Laboratory. Michael Glickman, *U.S. Environmental Protection Agency Purchases Aerostat and Operator Training From Drone Aviation*, GlobeNewswire, Feb. 2, 2016.
78. *Id.* (noting that the Agency has used tethered aerostats to conduct gas and particle sampling instruments since 2010 at altitudes up to 400 feet).
79. Gullett, *supra* note 23, at 10.
80. *Id.*
81. *Id.*
82. *Id.*
83. *Id.* at 11. *See also* James, *supra* note 71, at 208 (noting that UAS can be equipped with on-board sensors used to detect air emissions "or even collect sample from the top of a regulated facility's stacks to test compliance").
84. China is using drones to monitor air and water pollution from large industrial sources. Jack Linshi, *China Is Using Drones to Fight Pollution*, Time, July 2, 2014. *See also* Costas Paris & Robert Wall, *Europe Tries Out Sniffer Drones for Policing Ship Emissions*, Wall St. J., Nov. 26, 2015 (explaining how Europe is employing emissions-sniffing drones "to catch ship operators skirting pollution limits").
85. U.S. Department of Justice, Policy Guidance—Domestic Use of Unmanned Aircraft Systems (UAS) (2015). The U.S. Forest Service has also expressed its interest in using UAS "to support a host of natural resource management activities, including forest health protection, wildfire suppression, research, recreational impacts, and law enforcement." U.S. Forest Service, *Unmanned Aircraft Systems*, http://www.fs.fed.us/science-technology/fire/unmanned-aircraft-systems (last visited Oct. 16, 2016).
86. *See* Gullett, *supra* note 23 (noting that recent designs can carry payloads of five kilograms for 15-20 minutes and cost between $50-$20,000).
87. *Id.*
88. *Id.* (noting that UAS decreases personnel from six to two and is complimentary with other current methods of sampling).
89. Preznuk, *supra* note 2, at 69.
90. *Id. See also* James, *supra* note 71, at 208 (noting that "EPA has already considered the idea of using UAs to track plumes and to help coordinate safety measures or evacuations").
91. With advancements in artificial intelligence, quantum computing, and nanotechnology, the drone fleet "could autonomously analyze the scenario and determine the area and density of contamination immediately." Next, the drones would "test and document the exact chemical makeup and devise an immediate treatment program, then create the remedy using nanotechnology to counteract the oil spill." Preznuk, *supra* note 2, at 102.
92. Rupprecht, *supra* note 35, at 125 (explaining that the "unique characteristics of UA make them an ideal tool to enhance a broad range of government functions"). *See also* Michael J. Schoen & Michael A. Tooshi, *Confronting the New Frontier in Privacy Rights: Warrantless Unmanned Aerial Surveillance*, 25:3 Air & Space Law. 1, 19 (2012) (explaining that EPA could use drones "to ensure industry compliance with environmental regulations").

regulated sites and facilities "to check for large leaks or unauthorized emissions rather than sending an inspector on foot to each facility."[93] An agency could verify compliance remotely and use data recovered from the UAS to ramp up further monitoring or target certain entities for physical inspections.[94] Hypothetically, if EPA uses these emission-sniffer drones to collect air emission samples from an oil and gas field without notice or going through the steps to obtain a warrant, an operator might challenge the collection and use of that evidence under the Fourth Amendment.[95]

The Fourth Amendment protects people and businesses from unreasonable searches and seizures.[96] There has been considerable scholarship in recent years concerning drones and the Fourth Amendment in the traditional criminal law context.[97] In the area of environmental regulation, the tense relationship between government agencies and regulated entities can be especially heated.[98] However, the Fourth Amendment's requirements are considerably relaxed for administrative searches.[99] There are two ways to approach this analysis, looking at (1) how EPA conducts its investigation in practice, and (2) where the theoretical use of warrantless drone surveillance might run afoul of the Fourth Amendment.

There is nothing in §114 of the CAA that requires EPA to give prior notice before conducting inspection or monitoring activities.[100] Nonetheless, EPA generally adheres to a practice of obtaining consent from a regulated entity "to enter the premises and 'to conduct compliance monitoring activities.'"[101] EPA also carries out its compliance monitoring and enforcement duties "as if administrative warrants are required while holding in reserve" Fourth Amendment arguments that justify warrantless surveillance.[102] The Agency takes this cautionary approach because obtaining the administrative warrant is relatively easy and because it would prefer to "avoid extended threshold litigation."[103] Therefore, if and when EPA adopts drones for aerial surveillance, there should be very little practical concern under the Fourth Amendment as long as EPA sticks to its policy of obtaining a warrant.[104] Nonetheless, should an environmental agency decide to employ warrantless drone tactics, there are several considerations worthy of scholarly analysis.

In the hypothetical Fourth Amendment challenge mentioned above, the first step a court would take is to determine whether a "search" has occurred.[105] If the court determines that no search took place, then the Fourth Amendment is not implicated and the inquiry is at an end.[106] If the court decides the drone surveillance constitutes a warrantless search, it will then determine whether the search was reasonable. There are also several circumstances and exceptions where courts have decided that a warrant is usually not required, such as emergencies; closely regulated industries; consent searches; open fields; and certain types of searches accompanying administrative investigations.[107]

The U.S. Supreme Court has not addressed the Fourth Amendment implications of drone surveillance, and it is unclear exactly how EPA drones fit into the Court's messy outdated bundle of Fourth Amendment jurisprudence.[108] Still, there is enough precedent to make some interesting observations.

A. Has There Been a Search?—Industrial Expectation of Privacy

In general, a search occurs when the government has infringed upon a reasonable expectation of privacy or "obtains information by impermissible physical intrusion."[109] Since at least 1980, it has been EPA's policy position that routine "overflights do not constitute searches as long as they occur at lawful and reasonable altitudes and use equipment no more sophisticated than commercially available equipment."[110] In the UAS context, this is not as straightforward as it may initially seem. Figuring out what constitutes a search under the Court's Fourth Amendment jurisprudence is "a fact-intensive analysis" that follows no particular straightforward test for all situations.[111]

Instead, the Court has developed several doctrines to help guide the determination of whether a defendant has a reasonable expectation of privacy. Besides holding that

93. Inspectors would be free "to focus on those facilities at which the UA detects unauthorized quantities of pollutants or which are otherwise at risk of noncompliance." James, *supra* note 71, at 214-15.
94. *Id.* (noting that this strategy "would permit agencies to use resources more efficiently by identifying at-risk facilities").
95. By being capable of flying much closer and for longer durations, "a hypothetical UA taking physical samples of emissions without a warrant is clearly more intrusive than" other types of warrantless aerial surveillance. *Id.*
96. U.S. Const. amend. IV.
97. *See generally* Tal Matiteyahu, *Drone Regulations and Fourth Amendment Rights: The Interaction of State Drone Statutes and the Reasonable Expectation of Privacy*, 48 Colum. J.L. & Soc. Probs. 265 (2015); Koerner, *supra* note 13; Villasenor, *supra* note 9.
98. James, *supra* note 71, at 183-84 (explaining that complex environmental regulations can be especially expensive and difficult to comply with).
99. *Id.* at 186.
100. William H. Rodgers Jr., Rodgers' Environmental Law §3:34, Enforcement—Recordkeeping, Inspections, Monitoring, and Entry (2015) (finding "the proper mix of announced and unannounced inspections" can be a tough balancing act for environmental regulators). *See also* Air Variance Bd. of Colo. v. Western Alfalfa Corp., 416 U.S. 57, 59 (1974) (sustaining the power of a health inspector to conduct air pollution testing at industrial facility under the open fields doctrine).
101. Rodgers, *supra* note 100 (explaining that "in 'the vast majority' of cases, EPA obtains the consent of the facility's management to enter the premises and 'to conduct compliance monitoring activities'").
102. *See id.*
103. Obtaining an administrative warrant "requires not some showing of probable cause in a criminal sense but only plausible grounds for taking a look," expressed normally as a twofold test of either suspecting violations or coming to call in accordance with an established inspection strategy. *Id.*
104. Villasenor, *supra* note 9, at 498 (explaining that when a warrant is involved, "a great deal of privacy is lost but, ultimately some minimal privacy is still maintained").
105. Koerner, *supra* note 13, at 1137.
106. *Id.*
107. *See* 68 Am. Jur. 2d *Searches and Seizures* §114.
108. Matiteyahu, *supra* note 97, at 269.
109. James, *supra* note 71, at 186.
110. EPA Overflights and Fourth Amendment Searches, *supra* note 75.
111. James, *supra* note 71, at 186.

commercial entities and operations conducted in open fields are entitled to a lesser degree of privacy, determining "whether a technology is in general public use, whether the observations are made from public navigable airspace, and the nature of the imaging (or other information-gathering) system" are critical inquiries.[112] These doctrines and their significance to drone use by environmental agencies are explained more below.

1. Industrial Expectation of Privacy and the Open Fields Doctrine

As a general matter, owners and operators of commercial property are entitled to significantly less privacy than "the sanctity accorded an individual's home," or curtilage.[113] The Supreme Court has never recognized a "commercial curtilage,"[114] and one can imagine courts being reluctant to extend this higher expectation of privacy to an industrial expectation "built around staging areas for assaulting the public by the clandestine release of pollutants."[115]

The "open fields" and "plain view" doctrines provide another justification for diminishing the expectation of privacy for some oil and gas operations. Open areas of a large industrial complex or development are similar to an "open field," where government agencies can extensively survey from a public vantage point without informing the target or obtaining a warrant.[116] Therefore, the owner/operator of an oil and gas field still has some reasonable expectation of privacy, but it will receive a lesser degree of protection from EPA drone surveillance.[117]

2. Are UAS Within a Lawful or Reasonable Altitude?—Publicly Navigable Airspace

The Supreme Court has placed very marginal Fourth Amendment limits on aerial surveillance.[118] From three cases decided in the 1980s, we know that the use of "public navigable airspace" becomes an important "threshold test for determining whether warrantless aerial observations" are conducted outside the target's reasonable expectation of privacy.[119] These cases—one involving EPA's surveillance of a large industrial facility—concerned "manned aircraft flying at altitudes of 400 to 1000 feet," and they stand for the idea that there might not be a violation of the Fourth Amendment when the aircraft flies in public airspace.[120] In these cases, the aircrafts were clearly flying above the public airspace, but drones monitoring a pollution source may want to fly much lower in order to get a more accurate image or air sample.

Determining exactly where one's reasonable expectation (i.e., private property) ends and public airspace begins is open to much speculation and depends on factual circumstances.[121] In the 1946 case *United States v. Causby*, the Supreme Court said that although "airspace is a public highway," the landowner is entitled to "have exclusive control over the immediate reaches of the enveloping atmosphere."[122] Unfortunately, the Court did not need to determine "what those precise limits are," but other cases following *Causby* have attempted to flesh out this boundary by extending private property to "the highest of the underlying land's trees, buildings, fences," or the height at which the owner can "occupy or use [the airspace] in connection with the land."[123]

Whether a government drone is operating within public airspace may also depend on the type (i.e., frame design) of the UAS and FAA regulations that apply to that type of operation or location. For example, FAA stipulates that, "except as necessary for takeoff or landing, fixed-wing manned aircraft must generally operate above 1000 feet when over congested areas, and above 500 feet over most non-congested areas."[124] If an agency operates its UAS above these minimums, they "are certainly in public navigable airspace."[125] However, FAA regulations explicitly exempt helicopters from these minimum requirements if "the operation is conducted without hazard to persons or property on the surface."[126] There are still more factors complicating this analysis, but an in-depth discussion of the many ways FAA classifies a navigable altitude is beyond the scope of this Article.[127]

Determining whether a UAS is flying in public navigable airspace is an open question, but we can at least speculate that "the black and white of FAA's navigable air-

112. Villasenor, *supra* note 9, at 486.
113. Donovan v. Dewey, 452 U.S. 594, 606 (1981); James, *supra* note 71, at 184 (explaining that "commercial premises tends to be on the low end of the privacy spectrum").
114. James, *supra* note 71, at 184-85.
115. Rodgers, *supra* note 100.
116. An agency can usually conduct extensive photography and other observations using instruments from the exterior of a regulated facility "without informing the facility or securing a warrant under the plain view and open fields doctrines." James, *supra* note 71, at 189-90. *See also* Air Variance Bd. of Colo. v. Western Alfalfa Corp., 416 U.S. 57, 59 (1974) (sustaining the power of a health inspector to conduct air pollution testing at industrial facility under the open fields doctrine).
117. James, *supra* note 71, at 188-90.
118. Hilary B. Farber, *Eyes in the Sky: Constitutional and Regulatory Approaches to Domestic Drone Deployment*, 64 Syracuse L. Rev. 1, 18 (2014) (explaining that "Congress has held a series of hearings to investigate the future of drones and the privacy and safety issues they present").
119. Villasenor, *supra* note 9, at 189-90 (citing *Ciraolo*, *Riley*, and *Dow Chemical*).
120. Farber, *supra* note 118, at 18; Villasenor, *supra* note 9, at 486 (reasoning that "in *Ciraolo*, *Riley*, and *Dow Chemical*, the Court considered the use of public navigable airspace to be important, though not necessarily determinative").
121. Villasenor, *supra* note 9, at 489-91 (explaining that trying to identify the precise boundary where public airspace begins "can lead to complex questions").
122. 328 U.S. 256, 264 (1946). *See also* Rupprecht, *supra* note 35, at 23 (explaining that *Causby* "gives a clue as to where private property rights of airspace end and navigable airspace could start").
123. Rupprecht, *supra* note 35, at 24 (citing cases that build on the *Causby* framework).
124. Villasenor, *supra* note 9, at 489-90.
125. *Id.*
126. 14 C.F.R. §91.119(d) (2012); Villasenor, *supra* note 9, at 490 (noting that the "risks posed to person on the ground by an emergency landing, though not nonexistent, are certainly modest compared to those posed by manned aircraft").
127. Complicating things further, "for at least some categories of unmanned aircraft, the traditional paradigm is inverted and FAA imposes altitude *maximums* instead of minimums. Public unmanned aircraft operated in accordance with Section 334(c)(2)(C) of FMRA must be operated at a height lower than 400 feet." *See* Villasenor, *supra* note 9, at 490.

space jurisdiction begins at 400 feet above ground level for helicopters and 500 feet for airplanes, unless the aircraft is taking off, landing, or having an emergency."[128] Besides the publicly navigable airspace inquiry, the three aerial surveillance cases decided by the Supreme Court also touched on the importance of the technology used to aid the observations.[129]

3. Advanced Sensors and Technology Diffusion

Fourth Amendment jurisprudence suggests that "the extent to which an expectation of privacy is 'reasonable' is tied, at least in part, to the level of technology diffusion" in the equipment used to aid the surveillance. Even though "[n]one of the key Supreme Court precedents definitively resolve" this issue, a regulated entity may potentially challenge the use of EPA drones on this ground.[130] That is, if EPA uses drones with sensory-enhancing technology not generally available to the public at large, its use might be in tension with the Fourth Amendment if conducted without the target's permission or pursuant to a warrant.[131]

In *Dow Chemical Co. v. United States*, EPA used a camera that permitted it to capture "a great deal more than the human eye could ever see," but its warrantless aerial surveillance was nonetheless constitutional.[132] What mattered for determining the expectation of privacy was the public availability of the technology, not necessarily its sophistication.[133] Therefore, whether warrantless UAS surveillance conducted by an environmental agency runs afoul of the Fourth Amendment rests in part on the type of sensor attached to the drone (i.e., whether such sensor technology is "unavailable to the general public or rarely used in the navigable airspace").[134] The types of sensory-enhancing technology that drones can be equipped with fall on a spectrum—from iPhone-controlled cameras available on Amazon to NASA's sniffer drone that can detect methane down to the part-per-billion.[135]

Despite the fact that this potential dilemma can be cured by obtaining an administrative warrant, "the relatively low cost of surveillance equipped UA and the opening of the [National Airspace System] will make this technology readily available for operation in public airspace."[136] In other words, it is only a matter of time before more advanced drones and sensor technologies are commercially available to the public at large.[137] As this technology becomes more available, an oil and gas operation's reasonable expectation of privacy in its methane emissions is diminished.[138]

4. Abandonment Doctrine

An agency might also have a good argument for warrantless UAS air emission sampling under the abandonment doctrine.[139] Courts have held that abandoned property, such as trash left near the curb of the driveway, irretrievable wastewater flowing off one's property, and "even a pile of garbage on the surface of an open field[,] may be seized without a warrant and admitted as evidence against the owner."[140] In the hypothetical, an environmental agency might argue that methane or volatile organic compounds emitted from oil and gas operations are not entitled to any degree of privacy because the gases are "effectively abandoned and exposed to the public."[141]

Like garbage and other wastes destined to permanently leave one's property, air emissions that are vented or flared into the atmosphere "are irretrievable and will eventually flow into public" airspace.[142] In many ways, there is little difference between using police dogs to sniff out odors of illicit drugs from garbage cans and methane-sniffing drones detecting unauthorized emissions from storage tanks.[143] Therefore, measuring or sampling the content of air emissions with an advanced drone from the public airspace might not amount to a search under the doctrine of abandonment.[144]

B. Closely Regulated Industry Exception

Even if a court determines that an agency's warrantless UAS surveillance is a search because the sensor technology is not generally available to the public, it may still be permissible under the Fourth Amendment's exception for closely

128. Rupprecht, *supra* note 35, at 25-26 (describing the "*Causby* bubble, up to 400 feet").
129. *See* Villasenor, *supra* note 9, at 486.
130. In sum, "*Ciraolo* and *Riley* involved naked eye observations," *Dow Chemical* dealt with "a camera that was both widely available and sophisticated for its time, but did not concern a home or curtilage," "[i]n *Kyllo*, the Court considered the thermal imager to be non-routine. And *Jones* concerned [Global Positioning System], not imaging." *Id*. at 516.
131. James, *supra* note 71, at 208-09 (explaining that "thermal imaging as used by the EPA might be in tension with *Kyllo* if it were conducted without consent or a warrant on the premises of a regulated facility"). *See also id*. at 190 (noting that even in an open field situation, "officials are barred from using specialized technology to discover more than they would with their unaided senses").
132. 476 U.S. 227, 230, 16 ELR 20679 (1986) (quoting Dow Chem. Co. v. United States, 536 F. Supp. 1355, 1367, 12 ELR 20607 (E.D. Mich. 1982)). *See also* Villasenor, *supra* note 9, at 487 (noting the Court's observation that "'[a]ny person with an airplane and an aerial camera could readily duplicate' the photographs at issue").
133. *Id*. (observing that in *Dow Chemical*, the "Court considered the wide public availability of the camera to be more relevant than its sophistication").
134. Schoen & Tooshi, *supra* note 92, at 20.
135. Villasenor, *supra* note 9, at 465; Gray, *supra* note 27.
136. Schoen & Tooshi, *supra* note 92, at 20. *See also* Villasenor, *supra* note 9, at 516 (noting that "in the quarter century since *Ciraolo*, the cost of sophisticated imaging technology has plummeted").
137. James, *supra* note 71, at 213-14.
138. *See id*. *See also* Farber, *supra* note 118, at 22-23 (predicting that "by the end of the decade, UAVs equipped with greater intensity cameras and other sensory-enhancing technology will be available to the general public").
139. James, *supra* note 71, at 190.
140. *Id*.
141. *See id*. at 209-10.
142. *Id*. at 209.
143. The Supreme Court has heard numerous cases involving "drug dogs detecting the odor of illicit substances." *Id*. at 217.
144. *Id*. (noting that "abandonment 'has already been extended by lower courts to sampling effluent and there is no reason to think remote' air sampling would fare differently").

regulated industries.[145] Some industries are so pervasively regulated that businesses effectively lose their reasonable expectation of privacy protection for government activities conducted within the scope of the regulatory scheme.[146]

If EPA conducts warrantless UAS surveillance without the private entity's permission using NASA's high-tech sensors, the Agency can still argue it so pervasively regulates air emissions from oil and gas sources that its actions are exempt from Fourth Amendment requirements.[147] Considering the comprehensive nature of the CAA and the industry-specific new source performance standards for oil and gas, entities subject to this regulatory scheme "may have no legitimate expectation of privacy against EPA observation for the purpose of detecting" the industry's methane or other air emissions.[148] There is a persuasive argument that many of the statutes enforced by EPA "are not specific enough to satisfy" the Supreme Court's test for closely regulated industries, but in reality, EPA avoids getting to this point by obtaining a warrant in the first place.[149]

In sum, because of EPA's practical approach of obtaining warrants, and under current Fourth Amendment jurisprudence, the Fourth Amendment would seem to pose very few restraints on an agency's use of a UAS to conduct air monitoring of oil and gas operations.[150] What remains somewhat murky is determining (1) how close (i.e., altitude) such drones could fly to the emitting sources, and (2) what types of sensors (i.e., commercially available) can be attached before a warrant is required. The extent to which oil and gas companies and other private entities adopt emission-sniffing drones will greatly influence the latter inquiry.[151]

C. *EPA Should Develop a Transparent Policy for Its Use of Drones*

Despite the latitude to conduct UAS surveillance granted under the Fourth Amendment, environmental agencies should be transparent and develop guidance policies for UAS applications. In February 2015, President Obama issued a memorandum directing federal agencies to develop a drone policy framework before adopting drone technology.[152] The interagency review is designed to create a comprehensive federal strategy to promote governmental UAS integration while making sure UAS applications are consistent "with the U.S. Constitution, federal law, and other applicable regulations and policies."[153] By issuing policy statements and explicitly recognizing the use of drones as an effective tool for investigating CAA compliance in a narrow range of industries, EPA mitigates privacy concerns, bolsters its closely regulated industry argument, and puts targets on fair notice.[154]

It might also eliminate some of the wild speculation of fear and anxiety that could mushroom into legislative handcuffs for environmental agencies wishing to conduct drone operations.[155] There have been several recent attempts by the U.S. Congress to limit EPA's authority to conduct aerial surveillance with drones.[156] Some of these lawmakers were inspired after receiving complaints from constituents and media reports suggesting EPA "was spying on Midwestern farmers with the same aerial drones used to kill terrorists overseas."[157] This "great rumor" was obviously false (i.e., EPA is not using Predator drones with laser-guided missiles to combat pollution), but the wild speculation reported on Fox News and social media stoked the fire of campaigners already hell-bent on limiting EPA's overreach by any means necessary.[158]

Now that the prospect of using drones for environmental enforcement is becoming a reality, another irrational rush of speculation regarding how EPA plans to use these UAS could ground the Agency's drones before they ever take off. Therefore, there is value in creating a transparent

145. *Id.* at 215 (noting that EPA's "regulatory scheme could satisfy the *Burger* requirements").

146. *Id.* at 184. To satisfy this test, EPA typically has to show:

> (1) a substantial government interest . . . would be promoted by controlling dangerous or harmful pollutants; (2) warrantless inspections are necessary to economically inspect the large number of at risk facilities with sufficient regularity; and (3) the relative ease of the fly-by inspections would permit the agency to conduct inspections routinely enough that the law is applied with "certainty and regularity."

Id. at 214-15.

147. *See* Rodgers, *supra* note 100.

148. *See* EPA Overflights and Fourth Amendment Searches, *supra* note 75.

149. Some critics argue that the statutes enforced by EPA "encompass too many industries to make any one industry closely regulated or not do contemplate regularly schedule inspections." James, *supra* note 71, at 199-200 (explaining that "neither the boilerplate language in permits nor its authorizing statutes give it authority to conduct warrantless searches").

150. *See* Matiteyahu, *supra* note 97, at 306 (explaining that "current Fourth Amendment Jurisprudence would seem to allow unmanned aerial vehicles operating in legally navigable airspace to observe" certain activities).

151. Marc J. Blitz et al., *Regulating Drones Under the First and Fourth Amendments*, 52 Wm. & Mary L. Rev. 49, 141 (2015).

152. Presidential Memorandum, The White House, Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems (Feb. 15, 2015), *available at* https://www.whitehouse.gov/the-press-office/2015/02/15/presidential-memorandum-promoting-economic-competitiveness-while-safegua. *See also* Canis, *supra* note 1, at 14 (explaining that the presidential memorandum directs "federal agencies to look at privacy guidelines with regard to UAS").

153. McNeal, *supra* note 32, at 1144-45; Andrew Meola, *Here's How the U.S. Government Can Accelerate Drone Deliveries*, Bus. Insider, Mar. 22, 2016.

154. *See* Koerner, *supra* note 13, at 1137 (explaining that Fourth Amendment jurisprudences seeks to find "an appropriate balance between government's investigative and prosecutorial powers and an individual's constitutional rights"). *See also* Donovan v. Dewey, 452 U.S. 594, 606 (1981) (suggesting that warrantless inspections of industrial property are permissible as long as the agency's statute is carefully crafted).

155. Blitz et al., *supra* note 151 (explaining that the lenity provided under the Fourth Amendment is curbed if directly or indirectly restricted by Congress).

156. In 2012, the U.S. House of Representatives sponsored a bill that attempted to "prevent the EPA from conducting warrantless aerial surveillance using manned or unmanned aircraft, except under limited circumstances." This legislation "stemmed from constituents' apparently mistaken concern that EPA was using drones to monitor their farms, ranches, and other businesses." This bill was later amended to propose a "one year moratorium on the EPA's ability to conduct manned or unmanned aerial surveillance." Schoen & Tooshi, *supra* note 92, at 21.

157. David A. Fahrenthold, *Reining in the Rumors About EPA "Drones,"* Wash. Post, June 18, 2012.

158. *Id.* (explaining how the rumor spread after "Fox News Channel's Megyn Kelly told viewers: 'These are the same drones we use to track down al-Qaeda terrorists'").

drone guidance policy other than keeping agencies within constitutional bounds.[159] Besides the industry, government agencies, and partisan paranoia, environmental groups and ordinary citizens have the potential to influence the pace at which climate drones become a reality.

V. Environmental Groups, Legal Impediments, and the First Amendment

Private citizens, environmental organizations, the press, and other entities play an important role in enforcing this country's environmental laws.[160] Government officials have limited resources and sometimes lack the political will to address certain environmental problems.[161] Besides exposing polluters through public information dissemination and submitting evidence of wrongful conduct to government agencies, many federal environmental statutes contain provisions that authorize ordinary citizens to enforce compliance and "supplement governmental enforcement" by filing a lawsuit.[162]

A. Democratizing Environmental Enforcement With Eco-Drones

Using drones to collect images, measurements, and other resource data offers immense opportunities for environmental groups to learn more about the extent of environmental problems and submit incriminating evidence to government officials.[163] The agility, range, low cost, and ability to efficiently collect and sample resource data from a distance make drones "the ideal tool for environmental monitoring."[164] UAS might also provide a data gap filler between satellite imaging and ground surveying.[165] Sometimes called "eco-drones," these technological innovations are already seeing nongovernmental organization applications in surveying wildlife; deterring poaching and illegal whaling activities; plume tracking; and monitoring ecosystem health, groundwater discharge, and air quality.[166]

Capturing high-resolution video images using drones could facilitate "a fundamental shift" in the ability of an activist "to authenticate and document" observations of activities that are potential (but often unenforced) violations of environmental law.[167] For example, using a drone to survey a large area and documenting evidence of an endangered species or its habitat can validate unconfirmed suspicions that such species is directly in the path of a proposed project.[168] Even the threat or awareness of UAS capabilities might serve as a deterrent to illegal conduct.[169] If an oil and gas operator thinks it is being monitored from above, this should cause the operator "to alter their behavior towards that which is more socially desirable."[170]

Besides providing more accurate and self-authenticating evidence to enforcement agencies, in today's world of blogs and social networking websites, UAS images and videos can be quickly "disseminated to a wide audience" without being filtered through a third party.[171] Exposing wrongful conduct in this way is especially relevant in an era where posting a video on the Internet can generate mainstream media attention at viral speeds.[172] This sort of "pervasive image capture" greatly expands those unofficial voices that otherwise do not have a platform to hold powerful companies accountable for their environmental degradation.[173]

Thus, using eco-drones has the potential to expand "free speech, transparency, and the promotion of democracy" in profound ways.[174] By empowering individuals and public interest groups with the ability to monitor polluting activities in ways unimaginable in the past, the potential to democratize environmental enforcement is perhaps one of the greatest attributes of civil UAS proliferation.[175]

However, there are some limitations to the proliferation of these nongovernmental UAS applications. Taking a video of vapor emanating from a storage tank might paint some of the picture in terms of volume, but without enhanced sensor technology that can measure the content

159. *See* McNeal, *supra* note 32, at 1146 (explaining that "oversight and accountability of Federal drone operations will require creation of new procedures or modification of existing procedures").
160. Doremus et al., *supra* note 31, at 840. Citizen efforts are particularly vital in the wide expanses of the western United States where environmental groups have for a long time collected resource data and reported their findings to government officials. Dan Frosch, *Wyoming Trespass Laws Under Fire by Environmentalists, Photographers*, Wall St. J., Feb. 18, 2016.
161. Justin Pidot, *Forbidden Data: Wyoming Just Criminalized Citizen Science*, Slate, May 11, 2015, http://www.slate.com/articles/health_and_science/science/2015/05/wyoming_law_against_data_collection_protecting_ranchers_by_ignoring_the.html.
162. Doremus et al., *supra* note 31, at 840.
163. *See* Cristina Banahan, *Back to the Future: Environmental Drones Crash Into Constitutional Protections*, Vt. J. Envtl. L., Aug. 11, 2014 (pointing out that drones give environmental groups "an innovative way to ensure compliance" by collecting images "at a distance while providing environmental groups with important information about ecosystems or with incriminating evidence").
164. Kurt W. Smith, *Drone Technology: Benefits, Risks, and Legal Considerations*, 5 Seattle J. Envtl. L. 291, 292 (2015) (boasting that drones provide conservation groups with "a library of permanent baseline data at a fraction of the cost").
165. United Nations Environment Programme, A New Eye in the Sky: Eco-Drones 1 (2013).
166. *See* Smith, *supra* note 163, at 293-94; Banahan, *supra* note 163. *See also* Adam Martin, *Using Drones to Capture Environmental Violations Makes Perfect Sense*, Wire, Jan. 25, 2015 (noting activists and governments using drones to target Japanese whaling activities, monitor illegal logging, and model climate patterns).
167. Justin F. Marceau & Alan K. Chen, *Free Speech & Democracy in the Video Age*, 116 Colum. L. Rev. 67 (forthcoming 2016).
168. *Id.* at 17.
169. *Id.* at n.151.
170. *Id.* (explaining that the mere threat of recording is "the sort of thinking that undergirds efforts to spur video recording of all police interactions").
171. *Id.* at 17. *See also* Seth F. Kramer, *Pervasive Image Capture and the First Amendment*, 159 U. Pa. L. Rev. 335, 408 (2011) (explaining how "pervasive image capture provides important elements of public discourse both in . . . networks and newspapers . . . and in . . . blogs and social networking websites").
172. *See* Kramer, *supra* note 171, at 338.
173. *See id.* at 408.
174. Marceau & Chen, *supra* note 167, at 3. *See also id.* at 16 (noting how certain types of recording enhance truth and promote public discourse).
175. Banahan, *supra* note 163 (explaining how interest groups with sparse resources can use drones to "monitor illegal activity at an increasingly affordable price"). *See also* Blitz et al., *supra* note 151, at 55 (arguing that drones hold the promise of "democratizing the skies—previously the exclusive domain of the few").

of the emissions at a molecular level, the utility of this evidence is somewhat limited. The methane-sniffing drones available to oil and gas companies and EPA are probably too expensive for most environmental organizations.[176] Therefore, even though prices of UAS and sensor technologies are falling rapidly, cost may still be a key limitation for many groups with small operating budgets.[177] Yet, the biggest challenges are FAA regulatory roadblocks and state legislation restricting civil use of drones based on privacy concerns.[178]

B. Regulatory Roadblocks, Privacy Concerns, and the First Amendment

Like governmental drone applications, there are also serious safety and privacy concerns with civil UAS integration. Academics and the media have largely focused on UAS privacy in the Fourth Amendment context, but "it is nongovernment use that is likely to raise some of the most significant" regulatory and constitutional challenges.[179] For environmental organizations and individual activists, the key issues revolve around FAA authorization, privacy, and constitutional concerns implicating the First Amendment privilege to gather information.[180]

1. Nongovernment UAS Authorization and Aircraft Classification

An environmental group's UAS will not be considered a public (i.e., governmental) aircraft, and it can hardly be said to operate as a "commercial" civil-aircraft operating for "business purposes."[181] Under FMRA, FAA recognizes that certain drones classified as "model aircraft" are generally exempt from their comprehensive regulatory scheme as long as they are "flown strictly for hobby or recreational use."[182] Since it is much easier to operate as a model aircraft—rather than going through the long and painstaking process of obtaining a certificate or exemption—environmental groups might be tempted to claim they are operating their UAS as a model aircraft.[183]

Many people have attempted to do this, but relying on a model aircraft exception is not advisable.[184] FAA has made clear its authority and willingness to prosecute and levy substantial fines on unauthorized operations.[185] Even a drone that is legally operating under this hobbyist category "may retrospectively be deemed illegal if the resulting video" or data is "subsequently used for a commercial purpose."[186] "Commercial" seems to be a term of art since FAA sent cease-and-desist letters to a nonprofit search and rescue organization that used its UAS to aid in finding missing persons.[187] Apparently, FAA deemed its operation "commercial" because the organization accepted donations, which draws comparisons to how most environmental organizations function.[188]

So, where does a nonprofit environmental organization's use of a UAS fit into FMRA's authorization scheme? To avoid any confusion, perhaps FAA should delineate a "third category of non-commercial," civil UAS.[189] But what if an individual flying strictly for recreational purposes unintentionally captures images of conduct that constitutes a violation of environmental law?[190] Will FAA go after that individual if he hands over the footage to government agencies that pursue enforcement actions? Based on the situation discussed below, the answer is likely no.

In 2011, a hobbyist flying his drone near a Dallas-area meat packing plant captured images that showed the facility dumping something suspicious into a nearby river.[191] After contacting federal and state authorities and showing them the images, the Texas Environmental Crimes Task Force issued a warrant and investigated the property.[192] The investigation revealed that the facility was channeling pig blood from the slaughterhouse into a nearby river without being "linked to a waste water system."[193] This incident demonstrates the utility ordinary citizen drone use can have in preventing potential endangerments to public health and welfare.[194] However, what "if a well-meaning but overzealous environmental group conducts daily flights" over an oil and gas operation and continuously reports violations to EPA or state authorities that turn out not to be violations after all? Certainly, this hypothetical paints a less utopian picture of environmental watchdog drones and their impacts on privacy.[195]

2. Privacy Concerns and Attempts to Limit Environmental Activism

An environmental group's constant unfounded hectoring of an oil and gas operation using drones could result in "costly and time-consuming on-the-ground" investi-

176. Rosenblum, *supra* note 10.
177. *Id.*
178. Farber, *supra* note 118, at 18.
179. Villasenor, *supra* note 9, at 498-99.
180. *Id.*
181. Rupprecht, *supra* note 35, at 48-49 (explaining that "[t]he term 'business purposes' is nowhere defined, while the term 'commercial operator' is defined as '"a person who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property other than as an air carrier"').
182. FAA Modernization & Reform Act of 2012, Pub. L. No. 112-95, §336(a)(1), 126 Stat. 11. *See also* Warren, *supra* note 42, at 23 (explaining the temptation to claim model aircraft status).
183. Rupprecht, *supra* note 35, at 45 (explaining why it is much easier to fly as a model aircraft).
184. James Sabovich & Karyn Marsh, *Hope for Environmental Drones Is Still Up in the Air*, Law360, Apr. 3, 2015.
185. *Id. See also* Rupprecht, *supra* note 35, at 97 (detailing the high-profile *Pirker* case that seems to suggest FAA's position on model aircraft).
186. Canis, *supra* note 1, at 2.
187. Richard C. Balough, *Under Current Law, There's No Place for Commercial Drones*, 29-May C.B.A. Rec. 34, 36 (2015).
188. *Id.*
189. Rupprecht, *supra* note 35, at 128.
190. Villasenor, *supra* note 9, at 511.
191. *See* Martin, *supra* note 166.
192. *Id*; Villasenor, *supra* note 9, at 506.
193. Villasenor, *supra* note 9, at 506.
194. *Id.*
195. *Id.*

gations that constitute an inefficient use of government resources.[196] Moreover, the group might post UAS-captured images on the Internet that ends up exposing a company trade secret.[197] These sorts of privacy issues and the regulatory responses they generate "are going to cause many roadblocks" for environmental groups wishing to add drones to their arsenal of activism.[198]

Obviously, a company could seek an injunction against an environmental group it thought was flying too close and disrupting its operations. This actually happened in May 2015, when a federal judge issued an injunction prohibiting Greenpeace from using drones to protest over Shell's planned offshore drilling site in the Arctic.[199] Shell's complaint alleged that "[t]he close presence of . . . aircraft such as drones . . . and individuals with uncertain and unpredictable motives and intentions" to the company's drilling operations "presents unacceptable and irreparable risks to safety, property, and the environment."[200] Given the possibility of being slapped with an injunction or hefty fine for violating state trespass laws, environmental organizations contemplating drone use "would be well advised to give careful consideration to the common law and statutory invasion of privacy frameworks" that govern in jurisdictions where they operate."[201]

Unfortunately, defining the extent of a business owner's property rights in the airspace above their land brings the *Causby* confusion back into the fray.[202] Given that courts have not designated a specific altitude that demarcates the extent of private airspace rights, whether the drone commits a common-law trespass becomes "a case-by-case factual determination."[203] However, some states are enacting legislation that defines the exact altitude where flying one's drone constitutes trespassing onto private property.[204] Concerns over privacy have also prompted states to enact statutes that effectively ban UAS applications for environmental monitoring altogether.[205]

Some of these anti-UAS laws prohibit flying a drone over private property without the owner's consent, and can result in civil or criminal prosecution or damage claims.[206] The broad language of these statutes would prohibit many of the eco-drone applications mentioned throughout this Article.[207] For example, the Texas statute prohibits flying over and taking pictures of private property "with the intent to conduct surveillance."[208] In fact, this particular statute was introduced in part because of concerns that "environmentalists could keep tabs on livestock ranches or oil pipelines."[209] Though not drone-specific, laws that restrict the collection of resource data could also derail the proliferation of eco-drones in some states.

In 2015, the Wyoming Legislature passed two laws that make it a crime to collect "resource data" from public and private lands without obtaining the owner's permission.[210] The laws are unique in the way they prevent citizens from collecting the type of evidence that, if submitted to government agents, might reveal potential violations of federal environmental law.[211] A coalition of environmental, media, and academic groups point out that the state's real motive is "to conceal the fact that many of its streams are contaminated."[212] So-called "Ag-Gag" laws draw similar comparisons in terms of how broadly they prohibit recording and collection activities that might otherwise expose wrongful conduct.[213]

Drones monitoring air quality over oil and gas fields would seem to fall within the ambit of such laws. At least one environmental group has "halted plans for an air quality monitoring project around oil and gas wells because of concerns about" Wyoming's data trespass laws.[214] Hypothetically, if the group flew a drone in public airspace, an array of constitutional challenges might be available to

196. *Id.*
197. *Id. See also id.* at 504-05 (noting that "images acquired by UAS could easily convey facts not previously known to the public, and, upon publication, could be an actionable invasion of privacy").
198. Rupprecht, *supra* note 35, at 122.
199. Shell Offshore, Inc. v. Greenpeace, Inc., No. 3:15-cv-00054-SLG, 45 ELR 20071 (D. Alaska 2015); Martin, *supra* note 165.
200. Shell Offshore, Inc. v. Greenpeace, Inc., No. 3:15-cv-00054 HRH, at 8 (D. Alaska 2015).
201. Villasenor, *supra* note 9, at 504-05.
202. *See* Dougherty, *supra* note 13, at 3.
203. *Id. See also* Pierce Giboney, *Don't Ground Me Bro! Private Ownership of Airspace and How It Invalidates the FAA's Blanket Prohibition on Low Altitude Commercial Drone Operations*, 67 Fla. L. Rev. 2149 (2015) (explaining how the Supreme Court "has left undefined the precise limits of 'superadjacent' airspace").
204. *See* Dougherty, *supra* note 13, at 3.
205. In 2015, 45 states considered 168 drone bills, and 20 states enacted legislation. Jeff Thaler, *Game of Drones: The Future of Environmental Enforcement and Monitoring Is Overhead*, Am. C. Envtl. Law., Mar. 8, 2016, http://www.acoel.org/post/2016/03/08/GAME-OF-DRONES-THE-FUTURE-OF-ENVIRONMENTAL-ENFORCEMENT-AND-MONITORING-IS-OVERHEAD.aspx.
206. *See* Ray Carver, *State Drone Laws: A Legitimate Answer to State Concerns or a Violation of Federal Sovereignty*, 31 Ga. St. U. L. Rev. 377, 380-82 (2015) (describing scope of different state drone laws).
207. *See* Thaler, *supra* note 205.
208. *See* Balough, *supra* note 187, at 54. *See also* Carver, *supra* note 206, at 394 (describing the Texas drone statute).
209. Matiteyahu, *supra* note 97, at n.140.
210. The Wyoming Legislature revised the statutory provisions in 2016. While most of the language remains the same, the revised statutes eliminated the reference to "open lands" in an attempt to clarify that they apply only to private lands. Wyo. Stat. Ann. §§6-3-414, 40-26-101; Dustin Bleizeffer, *Court Will Hear Case Against Data Trespass Laws*, High Country News, Jan. 1, 2016.
211. Wyoming's laws are "are unique in singling out the collecting of data to be turned over to government agencies." Frosch, *supra* note 160 (explaining that Wyoming's laws might even make it a crime to photograph Yellowstone National Park if that photo was later submitted in a contest sponsored by the National Weather Service).
212. *See* Pidot, *supra* note 161 (describing how a small organization has found E. coli bacteria strains "in a number of streams crossing federal land in concentrations that violate water quality standards under the Clean Water Act"). *See also* Press Release, Natural Resources Defense Council, Judge Signal's Wyoming's Data Trespass Laws Likely Unconstitutional (Dec. 29, 2015) (explaining how "the laws punish communication to government agencies of photos and data taken on open land, criminalizing otherwise lawful advocacy in an attempt to undercut protection of public lands and the environment"), *available at* https://www.nrdc.org/media/2015/151229.
213. "Ag-Gag" laws have become a top priority of some legislators whose constituents have significant ties to the commercial food industry. These laws were enacted "in direct response to activities of" activists who have "recorded severe animal abuse" and as a result "exposed numerous illegalities and atrocities at the hands of their employees." Such laws are "striking in the scope of their recording prohibitions." Marceau & Chen, *supra* note 167, at 4.
214. *See* Frosch, *supra* note 160.

squelch Wyoming's data resource law and other statutes that attempt to chill the ability of drones to expose industrial misconduct.[215]

3. Drones and the First Amendment Privilege to Gather Information

Merging drone technology with environmentalism has the potential to equip public interest groups with a formidable new accountability tool.[216] Individuals worried that state anti-drone and data trespass laws will stunt the growth of this potential may find recourse in the Constitution.[217]

Besides the fact that many of these laws are likely to be preempted by federal law,[218] there are significant concerns regarding their effect on a drone-user's First Amendment privilege to gather information.[219] The freedom to collect information is not confined to the press and "encompasses a range of conduct related to the gathering and dissemination of information."[220] Many scholars and more recent First Amendment jurisprudence recognize this right to record and gather information.[221] It is by no means a stretch of the imagination to insist that such a constitutional privilege extends to the ability of environmental organizations collecting resource data using drones operating in public airspace.

One of the underlying purposes of the First Amendment is "the promotion of democratic self-governance and the search for the truth."[222] Eco-drones "may substantially inform public discourse" by exposing an industry's negative externalities on public health and the environment, in addition to supplementing government enforcement when it is deficient or captured.[223] Although "the First Amendment does not invalidate every incidental burdening" of protected speech from the enforcement of laws of general applicability,[224] using drones to monitor air emissions from the oil and gas industry is a matter of "public concern."[225] The Supreme Court has often professed that "speech on 'matters of public concern' . . . occupies the highest rung of the hierarchy of First Amendment values, and is entitled to special protection."[226]

Therefore, when a drone is attempting to reveal a public concern like air pollution that can cause serious health effects and contributes toward climate change, "privacy concerns are much less likely to be deemed a significant, let alone a compelling interest" to justify laws that unreasonably prohibit their integration.[227] Drone laws aimed at preventing their weaponization, enforcing "peeping tom" and trade secret statutes, or restricting flying near densely populated areas or airports may be legitimate, but there is no compelling reason to criminalize their ability to gather resource data.[228] Restricting certain types of drones from "flying near vulnerable infrastructure" might be legitimate in some circumstances, but a small eco-drone used to monitor air emissions that leave the immediate bounds of private property is unlikely to cause any physical damage even in the unlikely event of a crash.[229] However, whether the First Amendment will protect these drone recordings depends on where they are flown.[230]

A right to record resource data would attach "only if the person making the recording has a legal right to be present at the location where the recording takes place."[231] Therefore, an FAA-authorized eco-drone would receive the most free speech protection when flying in public airspace over oil and gas operations conducted on public lands.[232] In many ways, monitoring air pollution from public airspace to ensure that oil and gas companies are comply-

215. *See* Marceau & Chen, *supra* note 167, at 5 (explaining how sometimes laws distort "discourse by chilling the speech on only one side of an important public debate").

216. Ari Rosmarin, *Drone Rules Are Already Colliding With the First Amendment*, ACLU, July 16, 2015.

217. Blitz et al., *supra* note 151, at 59 (explaining that legislatures restricting drone flight "have paid little attention to what may be a constitutional barrier to their efforts").

218. Although beyond the scope of this Article, several articles have touched on the preemption issue as it applies to the regulation of UAS. *See* Villasenor, *supra* note 9, at 513; Farber, *supra* note 118, at 8; Carver, *supra* note 206, at 382-95.

219. Villasenor, *supra* note 9, at 498-99. The Wyoming law is probably also unconstitutional since it "runs afoul of the Supremacy Clause" by interfering "with the purposes of federal environmental statutes by making it impossible for citizens to collect the information necessary to bring an enforcement lawsuit." For First Amendment purposes, Wyoming's laws abridge free speech guarantees because the scheme "singles out speech about natural resources . . . makes it a crime to engage in a variety of expressive and artistic activities" and "specifically criminalizes public engagement with" government agencies. Pidot, *supra* note 161. Recently, a federal judge rejected Wyoming's motion to dismiss the lawsuit, citing significant First Amendment concerns. *See* Bleizeffer, *supra* note 210.

220. In its 1972 decision *Branzburg v. Hayes*, the Court recognized that "[w]ithout some protection for seeking out the news, freedom of the press could be eviscerated." Villasenor, *supra* note 9, at 498-99. Some media groups even argue that FAA's approach of "placing a de facto ban" on commercial flight unless granted an exemption "violates the First Amendment because news gathering is not a 'commercial use.'" The same argument, if valid, would seem to apply to environmental groups. *See* Balough, *supra* note 187, at 53.

221. Blitz et al., *supra* note 151, at 60. Based on the history and purpose of free speech "there is a right to record . . . and it extends to private property." Marceau & Chen, *supra* note 167, at 67.

222. Marceau & Chen, *supra* note 167, at 44.

223. *Id.*

224. However, the freedoms conferred by the First Amendment are not unlimited. In *Branzburg*, for example, the Supreme Court recognized the existence of some bounds: "It is clear that the First Amendment does not invalidate every incidental burdening of the press that may result from the enforcement of civil and criminal statutes of general applicability." *See* Villasenor, *supra* note 9, at 499 (discussing *Branzburg* and the limitations on the freedom to gather information in the UAS context).

225. Speech deals with matters of public concern when it can "be fairly considered as relating to any matter of political, social, or other concern to the community" or when it "is a subject of legitimate news interest." Marceau & Chen, *supra* note 167, at 45-46 (arguing that the "use of electronic drones to engage in surveillance of industrial polluters is another example of recordings that have public significance").

226. *See* Snyder v. Phelps, 562 U.S. 443 (2011); Marceau & Chen, *supra* note 167, at 45.

227. *See* Marceau & Chen, *supra* note 167, at 45-46 (arguing that "bans on drone recordings to reveal the conduct of industrial polluters would be at risk for invalidation," but not drones used to record nude sunbathers).

228. *See* Rosmarin, *supra* note 216.

229. *Id. See also* Villasenor, *supra* note 9, at 490 (noting that the "risks posed to person on the ground by an emergency landing, though not nonexistent, are certainly modest compared to those posed by manned aircraft").

230. Marceau & Chen, *supra* note 167, at 36.

231. *Id.* at 33-35 (clarifying that the "right to record is limited to just that—recording," and does not attach "to a person who breaks into a private residence or the Oval office to record a video, even if the content relates to a matter of great public concern").

232. *Id.* at 34.

ing with environmental laws is similar to "upholding the right of a citizen to record the actions of police in a public space."[233] Therefore, if an activist (and his or her drone) is lawfully operating with FAA authorization in the public airspace (i.e., not trespassing), there is a strong argument that a constitutional right to record and gather air resource data will attach.[234]

This makes it critical for environmental groups to seek FAA authorization and to make sure radical members who might use the drones for illegal tactics or commit a clear violation of trespass are prevented from doing so.[235] Utilizing eco-drones in this context demonstrates the need to define "the precise limits of superadjacent airspace" so oil and gas operators and those wishing to monitor their activities know exactly where private property ends and the public highway of the sky begins.[236]

VI. Conclusion

Like any new technology, drones provide unique opportunities, concerns, and chances to clarify legal doctrines.[237] UAS used to monitor important public concerns like air pollution from oil and gas activities should not be altogether grounded by overly broad anti-drone statutes and data trespass laws. At the same time, drones can be misused, so it is important for government agencies, environmental groups, and companies to find the right balance by putting reasonable frameworks in place so UAS are operated safely and in accordance with reasonable expectations of industrial privacy.[238] As these entities continue to vet the technology and the legal landscape becomes clearer, we may soon see drones improving industry compliance and facilitating democratic discourse in environmental monitoring.[239]

233. Villasenor, *supra* note 9, at 498. *See also* Banahan, *supra* note 162 (advocating that environmentalists argue that their drone activities are similar to "how the videotaping of police officers helps keep their conduct in check").
234. Rosmarin, *supra* note 216 (arguing that "[u]nless we are prepared to ban drones from our airspace altogether, it should not be a crime to photograph infrastructure visible in public").
235. *See* Rebecca K. Smith, *"Ecoterrorism?" A Critical Analysis of the Vilification of Radical Environmental Activists as Terrorists*, 38 Envtl. L. 537, 544 (2008) (describing illegal tactics used by environmental activists).
236. *See* Giboney, *supra* note 203, at 2149.
237. Schoen & Tooshi, *supra* note 92, at 19.
238. *Id.*
239. Jack Nicas, *FAA Gives Approval to BP to Use Commercial Drones*, Wall St. J., June 10, 2014.