Using Surveillance Technology to Protect Marine Resources in Maryland

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DEPARTMENT OF LEGISLATIVE SERVICES
OFFICE OF POLICY ANALYSIS
MARYLAND GENERAL ASSEMBLY

Karl S. Aro
Executive Director

Warren G. Deschenaux
Director

September 30, 2014

The Honorable Thomas V. Mike Miller, Jr., President of the Senate
The Honorable Michael E. Busch, Speaker of the House
Members of the Maryland General Assembly

Ladies and Gentlemen:

The protection and restoration of the Chesapeake Bay and its marine resources are essential to a healthy environment and vibrant economy in Maryland. The State's commercial and recreational fisheries generate millions each year and support thousands of jobs statewide. However, violations of natural resources laws, combined with chronic reductions in conservation law enforcement staffing, may undermine the State's management, protection, and restoration of some of Maryland's most-prized marine resources, including the Blue Crab, native oyster, and striped bass.

Surveillance technology is already in place in Maryland to enforce natural resources laws; as technology continues to advance, it will likely play a greater role in the coming years. In an effort to better understand how surveillance technology may be used to enforce natural resources laws and better protect our marine resources, this report will (1) describe the surveillance technologies already in place in Maryland; (2) identify other types of surveillance technologies, including vessel monitoring systems, automatic identification systems, and autonomous aircraft and watercraft; and (3) discuss the issues and considerations surrounding the use of surveillance technologies in natural resources enforcement and fisheries management.

We trust this report will prove useful to the General Assembly in better understanding how surveillance technology can be used to protect the State's marine resources. If you would like additional information regarding this report, please contact Ryane M. Necessary at (410) 946-5350.

Sincerely,

Warren G. Deschenaux
Director

WGD/RMN/km

cc: Mr. Karl S. Aro

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Introduction

Maryland's marine resources are vital to both the ecology and the economy of the State. In 2012, Maryland commercial fisheries yielded 73.4 million pounds of product with a dockside value of $77.9 million. The American Sportfishing Association estimates that in 2011, recreational anglers in Maryland spent approximately $549.0 million on retail sales, supported 6,209 jobs statewide, and generated nearly $52.0 million in State and local tax revenue.

Violations of natural resource and conservation laws have the potential to seriously undermine the management of Maryland's marine resources. Illegal and unreported fishing is particularly problematic. For example, it is estimated that 33% of oysters placed in State oyster sanctuaries between 2008 and 2010 were removed by illegal harvests. The value of illegally harvested resources can be tremendous. In a covert operation running from 2003 through 2007, State and federal enforcement agencies documented the illegal harvest, sale, and purchase of more than 900,000 pounds of striped bass from Maryland waters, with an estimated value of more than $4.5 million dollars. This type of illegal activity not only depletes fish stocks, it introduces uncertainty to management decisions – making it more difficult for regulators to estimate population sizes and set appropriate catch limits for marine species.

In recent years, the State has embraced robust enforcement, particularly of fishing laws and regulations, as a key component of natural resources management. Recent changes to State law have increased penalties for violators and made it easier for law enforcement officials to inspect fishing vessels suspected of engaging in illegal activities. Governor Martin J. O'Malley's Oyster Restoration and Aquaculture Development Plan also recognizes enforcement as a priority in the State's efforts to rebuild oyster populations in the Chesapeake Bay.

Surveillance technology is already playing an important role in these enforcement efforts, and it has the potential to play an even greater role in the coming years. This report provides an overview of how the Maryland Natural Resources Police (NRP) is currently using technology, particularly the Maritime Law Enforcement Information Network (MLEIN), to detect and deter natural resource violations in Maryland waters. It goes on to consider other existing and emerging technologies with potential application in Maryland.

Background: The Maryland Natural Resources Police

NRP is the enforcement arm of the Department of Natural Resources (DNR). In addition to enforcing the State's natural resource and conservation laws, NRP is responsible for maritime and rural search and rescue operations; public education in hunting, boating, and water safety; law enforcement in State parks and on other public lands; and maritime homeland security on State

waterways. NRP's jurisdiction extends statewide, and its officers are responsible for patrolling an immense area. Supported by a cadre of 200 reserve officers in a special volunteer program, NRP's 241 sworn law enforcement officers patrol over 470,000 acres of public lands, the Maryland portion of the Chesapeake Bay and its tributaries, coastal bays off Ocean City and Assateague, tidal waters up to three miles off the Atlantic coast, and over 9,000 miles of freshwater streams.

The broad area covered by NRP combined with the force's multiple responsibilities pose major challenges for conservation enforcement. A 2012 report to the General Assembly on NRP's level of service standards found that conservation patrols had decreased by 2% since 2004, statewide. In the eastern region of the State, where most commercial fishing and crabbing occurs, conservation patrols had decreased by an even greater amount – 16% during the same 2004 to 2011 period.[1] The report concluded that reductions in staffing had "tilted NRP more toward responding to calls for service than patrol and prevention," adding, "[i]t is evident that more hours of officer initiated patrols to identify and deter natural resource violations are needed."[2]

Efforts to rebuild NRP's capacity are already underway. The fiscal 2013 supplemental budget included funding for eight additional NRP officer positions and for the reinstatement of the NRP cadet program, which provides young adults who are not yet eligible to become officers an opportunity to receive on-the-job training and exposure to NRP's work. In addition to expanding the police force, however, NRP is also focusing on improving patrol effectiveness and efficiency through the use of monitoring and surveillance technology.

Maritime Law Enforcement Information Network

Description

Marine radar is an object detection system that uses radio waves to determine the location of vessels within a body of water. In 2010, NRP launched the MLEIN, a network of marine radar covering much of the Chesapeake Bay, its major tributaries, and Maryland's Atlantic coast out to a distance of about 24 miles. The system also includes several closed circuit cameras, which provide limited video coverage of vessel traffic in and out of port areas. A computer program overlays the video and radar information on color coded maps showing important landmarks, navigational buoys, and regulatory boundaries, which may be accessed via a secure web browser. NRP uses the MLEIN to monitor vessel traffic for homeland security, boating safety, and conservation enforcement purposes.

Marine radar is not new, but the MLEIN is considered cutting-edge technology for several reasons. First, the MLEIN allows officers to systematically track small vessels. Most maritime law enforcement bodies only monitor larger commercial vessels equipped with automatic

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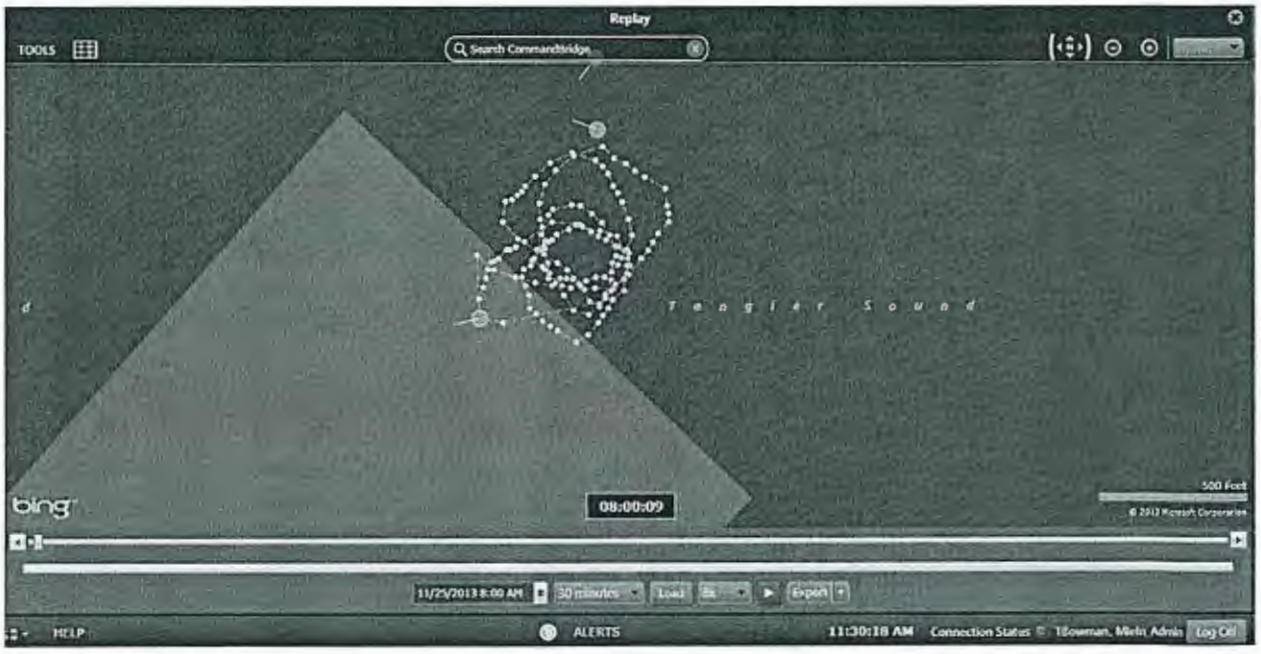
[1] Maryland Department of Natural Resources; *Maryland Natural Resources Police Level of Service Standards,* p. 18.

[2] *Id.*

identification systems[3], which "ping" the location of the vessel at specified intervals. The MLEIN uses advanced radar units capable of small target detection, allowing NRP to monitor the movements of small vessels throughout State waters. This is particularly important for fisheries enforcement in the Chesapeake Bay, where the majority of commercial fishing is done from work boats measuring less than 45 feet.

Second, the MLEIN is unique because it is a distributed system, capable of transmitting information to multiple, independent users in real time. The MLEIN is monitored 24 hours a day from NRP's Sandy Point facility, but it is also used by officers and units working in the field. For example, an officer can access the system from a laptop on one of NRP's patrol vessels, track a suspicious fishing boat in real time, and use that information to make immediate enforcement decisions. An officer can also use his or her laptop to set up an "electronic fence" around a particular area, such as an oyster sanctuary, and monitor vessel traffic in and out of that area. (See **Exhibit 1**).

Exhibit 1
MLEIN in Action



Note: A screen shot from the Maritime Law Enforcement Information Network (MLEIN) shows the movements of a vessel (dotted line) operating on the border of an oyster sanctuary (light gray area).

Source: Department of Natural Resources

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[3] Automatic identification systems are discussed in more detail later in this report.

Application

The MLEIN was funded largely through federal Port Security Award grants, and the system is integral to NRP's maritime homeland security mission. However, the MLEIN has also proven to be a valuable tool for conservation enforcement. Since the system became fully operational in 2013, four enforcement actions have been taken as a direct result of MLEIN surveillance. (See **Exhibit 2**).

Exhibit 2
Use of MLEIN in Conservation Enforcement Actions

Incident Type	Date	Location	Actions Taken
Oyster Sanctuary Violation	11/25/13	Tangier Sound	• Vessel detected encroaching on an oyster sanctuary in Tangier Sound • Two watermen cited for poaching • Seven bushels of oysters returned to the sanctuary
Oystering in Prohibited Area	12/11/13	Choptank River	• Two watermen charged with dredging on submerged lands reserved for tonging, improper tagging of an oyster container, and harvesting more than 200 feet within a prohibited area with prohibited gear • 20 bushels of oysters seized
Oystering in Prohibited Area	12/20/13	Choptank River	• Two watermen charged with harvesting oysters with a power dredge in a sail-dredge area and harvesting oysters more than 200 feet inside a prohibited area with prohibited gear
Oyster Sanctuary Violation	3/20/14	Tangier Sound	• Vessel detected entering oyster sanctuary in Tangier Sound and dredging for oysters • Two watermen charged with poaching • More than four bushels of oysters returned to sanctuary

MLEIN: Maritime Law Enforcement Information Network

Source: Department of Natural Resources

In addition to informing enforcement actions, the MLEIN has also been used to document evidence of illegal activity. In March 2014, the MLEIN images were introduced as part of the State's case against two watermen accused of removing oysters from a State sanctuary. The images showed the defendants' vessel making repeated passes through the sanctuary, helping to prove that the defendants' presence in the sanctuary was not accidental. This case marked an important milestone for the MLEIN, demonstrating that the MLEIN surveillance data could successfully be used in judicial proceedings.

The MLEIN has also had an indirect effect on conservation enforcement by influencing how NRP determines enforcement priorities and plans conservation patrols. Field officers use the system to gather intelligence on where and when particular fishing activities, such as dredging or crabbing, are occurring. Based on this information, they are able to tailor the hours and locations of patrols to target those activities. The MLEIN is helping to improve patrol efficiency – a key recommendation of the 2012 level of service standards report.

Vessel Monitoring Systems and Automatic Identification Systems

Description

Vessel monitoring systems (VMS) and automatic identification systems (AIS) are examples of "cooperative" or "participatory" surveillance systems. Unlike marine radar, which allows law enforcement to track vessel movements without the knowledge or consent of vessel operators, the VMS and the AIS require the cooperation of the regulated community. Both technologies use vessel-mounted transceivers to broadcast certain information about a vessel's identity and activities. This information can then be monitored by law enforcement personnel, fisheries managers, or anyone else with the necessary equipment.

The VMS are most commonly used in fisheries management. The VMS units use communications satellites to transmit detailed information about the activities of participating fishing vessels, including location (global positioning system (GPS) coordinates) and hours and days of operation. This data can be integrated with other records, such as electronic catch reports and vessel boarding and inspection data, to give regulators a comprehensive picture of a fishing vessel's activities. The VMS broadcasts are typically made every one to two hours, though some regulatory bodies require transmissions as frequently as every seven minutes.

The AIS are primarily used to track large ocean-going vessels for maritime safety and security purposes. The AIS integrate standardized radio transponders with GPS and other onboard navigational equipment, allowing a vessel to broadcast information on its identity, position, course, and speed as frequently as every two seconds. The AIS information is typically monitored by other AIS-equipped vessels as well as by harbor and port authorities and even some aircraft.

Application

One advantage of cooperative surveillance technology is that, unlike marine radar, it provides information on the identity of a vessel as well as on its movements. The large amount of information provided by this form of technology makes it a valuable tool for conservation enforcement, particularly in remote areas that are difficult to patrol. Many regional fisheries management organizations require commercial fishing vessels operating in international waters to be VMS-equipped. In the United States, the VMS are also required onboard vessels participating in certain federal fisheries, including:

- the New England scallop fishery;
- the South Atlantic rock shrimp fishery;
- the Gulf of Mexico reef fish fishery; and
- many Alaska fisheries.

The use of the AIS for conservation enforcement is more limited. Under international law, only vessels over 300 gross tons are required to be AIS-equipped. Consequently, less than 1% of commercial fishing vessels worldwide carry the AIS. However, some countries, including the United States, are beginning to extend AIS requirements to smaller vessels. This creates the potential for greater use of the AIS as a conservation enforcement tool in the future.

Commercial fishing vessels in Maryland are not currently required to carry any form of cooperative surveillance technology. In 2011, DNR proposed a voluntary pilot program to test the use of the VMS in the State's oyster fishery, striped bass fishery, or both. The proposal was ultimately abandoned, however, because of public concerns over cost (DNR planned to provide the VMS to participants in the pilot program, but watermen likely would have had to buy their own units if the department later decided to require the VMS on all fishing vessels) and privacy considerations.

Despite the failure of the proposed VMS pilot program, the potential for using cooperative surveillance technologies to enforce Maryland's conservation laws still exists. A 2010 report to the General Assembly on improving the effectiveness and efficiency of NRP recommends using the VMS to monitor vessels belonging to individuals with a history of commercial fishing violations. An individual who is convicted, *nolo contender*, or receives probation before judgment for certain serious violations could be required to carry the VMS on his or her vessel during a probationary five-year period. This would allow NRP to monitor the individual's activities more closely and help discourage repeat violations.

According to DNR, some aquaculturists have also expressed an interest in using the VMS, if it meant they could extend their hours of operation. Currently, State regulations restrict aquaculture operations to daylight hours. These restrictions are necessary to allow NRP officers

to visually identify aquaculture vessels (which are subject to different rules than other oyster harvesters) and ensure that unauthorized vessels do not try to operate in aquaculture lease areas. If aquaculture vessels were equipped with the VMS, however, NRP could verify the identity of such vessels remotely, and there would be less need for regulations restricting hours of operation.

Autonomous Aircraft and Watercraft

Description

Unmanned aerial vehicles (UAV), sometimes called drones, are remote-controlled or autonomous aircraft outfitted with imaging equipment and other sensors. UAVs are capable of performing many of the same functions as regular, human-piloted aircraft. However, the small size and prolonged hovering capability of UAVs, along with their comparative ease of use, makes UAVs an attractive option for maritime surveillance. UAVs may also offer cost savings over traditional aircraft. Currently, NRP air missions are flown with aircraft belonging to the Maryland State Police (MSP). **Exhibit 3** reflects a cost per flight hour comparison between a UAV and MSP's equipment: a Cessna fixed wing aircraft, a King Air fixed wing aircraft, and a helicopter. As displayed, the UAV system is slightly more expensive than the Cessna but is substantially less expensive than the King Air and the helicopter.

Exhibit 3
Comparison of UAV to Maryland State Police Aircraft

	UAV[1]	Cessna	King Air	Helicopter
Cost Per Flight Hour	$420	$299	$1,511	$5,881
Flight Hours[2]	1,350	1,350	1,350	1,350
Total	**$567,000**	**$403,650**	**$2,039,850**	**$7,939,350**

UAV: unmanned aerial vehicles

[1] Cost estimates are for the Aerovironment Puma AE Drone System, which the Department of Natural Resources (DNR) has identified as meeting Natural Resource Police mission criteria.
[2] Flight hours represent the amount of time DNR estimates a UAV would be used over a five-year period.

Source: Department of Legislative Services

Autonomous watercraft include unmanned surface vehicles, autonomous underwater vehicles, and hybrid vehicles capable of operating both above and beneath the water's surface. Like UAVs, autonomous watercraft can be equipped with a variety of sensors, including video

cameras, GPS, radar, and sonar. Some autonomous watercraft are powered by solar or wave energy, allowing them to operate for long periods of time without the need for human servicing.

Application

UAVs have potential application to each of NRP's mission areas: conservation enforcement, search and rescue operations, and maritime homeland security. UAVs could be used to quickly scan vast areas that would take hours to patrol in person. They could also be used to conduct covert video tracking of suspicious vessels identified via the MLEIN. Finally, UAVs could be used to monitor areas not covered by marine radar, such as on- and near-shore areas.

Although there are no immediate plans to acquire a UAV for the department, DNR has done some preliminary research on UAV technology. DNR reports that the ideal UAV for NRP purposes would be one that is capable of:

- being hand launched;
- flying over, and landing on, both land and water;
- real-time video transmission;
- sustained, extended flight (preferably over 40 minutes in continuous flight);
- use with minimal training of personnel; and
- flight control up to the current Federal Aviation Administration (FAA) maximum of 400 feet but with a minimum of .5 mile lateral flight control from the site of the controller.

The application of autonomous watercraft to NRP's enforcement mission is less clear. Autonomous watercraft were initially developed for military applications, including naval surveillance and reconnaissance missions. However, they are increasingly being considered for nonmilitary purposes. For example, the U.S. Coast Guard is currently looking into the use of autonomous watercraft for persistent surveillance missions in U.S. waters, including monitoring for drug smugglers, human traffickers, and illegal fishing vessels. Although it is possible that this technology will prove to be a useful tool for conservation enforcement in the future, it is too soon to determine whether it will have any role to play in Maryland waters.

Issues and Considerations

Integrating New Technologies with the MLEIN

One unique aspect of the MLEIN is its implementation through an evolutionary prototyping method. The system is designed to be flexible and adaptable, allowing NRP to constantly refine and improve the system to meet law enforcement needs. Consequently, the MLEIN could be modified to incorporate any one of the other surveillance technologies discussed in this report.

The MLEIN is already designed to incorporate AIS data, but this information is of limited use for conservation enforcement because most fishing vessels are not AIS-equipped. If AIS or VMS requirements were extended to Maryland fishing vessels, this information could also be integrated into the MLEIN system. This means an NRP officer could potentially view a vessel on the MLEIN and immediately know the identity of the vessel; which fisheries it was licensed to participate in; how long it had been on the water; and possibly even how many fish, crabs, or oysters it had harvested that day. Video feeds from a UAV could also be fed directly into the MLEIN system, providing NRP with yet another way to visually identify and monitor vessel activities.

Of course, surveillance technologies are not inexpensive, and the potential benefits of each additional technology must be weighed against its potential costs. **Exhibit 4** provides an overview of some of these considerations.

Privacy Concerns

The use of surveillance technology in conservation law enforcement raises significant privacy concerns. These types of technology are capable of collecting a massive amount of data, and there are currently few guidelines on how this data can be used and with whom it can be shared. Some of this data may have legitimate commercial applications. For example, NRP is investigating new software that would allow some MLEIN information to be delivered to the private sector, including privately owned port facilities. However, there is also the potential for data to be lost, stolen, or misused. This was one of the chief concerns with DNR's 2011 VMS pilot program proposal. Watermen worried that competitors might be able to access their VMS broadcasts and discover their secret fishing locations and oyster bars.

Exhibit 4

Comparison of Surveillance Technologies

Technology	Information Provided	Current Uses	Advantages	Disadvantages	Costs
MLEIN	Position; activity Visual identification where video coverage available	Conservation enforcement, homeland security, search and rescue, coordinating actions between agencies	Distributed system, can be accessed simultaneously by multiple individual users and can be integrated with other surveillance technology	Can monitor vessel position and activity, but cannot be used to identify vessel in most cases	$5.6 million development and implementation $240,000 annual operation
VMS	Position; identification Can be integrated with electronic catch data and vessel inspection information	Fisheries management in federal and international waters	Allows law enforcement to easily identify vessel and signals are relatively secure and difficult to fake	Helps show vessel location but cannot be used alone to verify vessel activity	$1,000 – $4,000 per unit $100 – $600 annual operation $50,000 – $500,000 for monitoring center
AIS	Position; identification; vessel type; navigational information	Required by the International Maritime Organization on all merchant vessels of 300 gross tonnage or more	Allows law enforcement to easily identify vessel and already monitored by NRP and many other law enforcement agencies	Signals are less secure than the VMS and broadcasts can be switched off or altered to show inaccurate vessel information	$5,000 per unit

Technology	Information Provided	Current Uses	Advantages	Disadvantages	Costs
UAV	Position; visual identification; activity	Military and some law enforcement agencies	Able to monitor on- and near-shore areas where marine radar is ineffective and allows covert video monitoring	Uncertain legal and regulatory landscape, and privacy concerns	$400,000 per unit $20,000 annual operation*
Autonomous Watercraft	Position; visual identification Could be equipped with AIS sensors	Military and scientists U.S. Coast Guard investigating law enforcement applications	High endurance – can operate for long periods without servicing and able to be deployed to remote areas	High chance of loss Low speed and limited payload	Unavailable

AIS: automatic identification systems
MLEIN: Maritime Law Enforcement Information Network
NRP: Natural Resource Police
UAV: unmanned aerial vehicle
VMS: vessel monitoring systems

*Cost estimates are for the Aerovironment Puma AE Drone System, which NRP has identified as meeting its mission criteria.

Source: Department of Natural Resources; Department of Legislative Services; Marine Conservation Biology Institute

Surveillance technology, particularly UAVs, raise concerns about constitutional privacy protections as well. The Fourth Amendment protects individuals from unreasonable searches and seizures by law enforcement. Whether the use of a particular surveillance technology constitutes an unconstitutional "search" depends on a number of factors, including the sophistication of the technology and where the technology is used. The plain view doctrine allows evidence to be obtained if found in plain view during a lawful observation, including utilizing aircraft to fly over an area. However, UAVs can be equipped with technology that is much more invasive than viewing with the naked eye. Because of their small size, UAVs are also less likely than aircraft to be noticed by surveillance targets. In response to these issues, several states have already adopted legislation limiting how UAVs may be used for law enforcement purposes. In Maryland, bills introduced during the 2013 and 2014 legislative sessions would have prohibited law enforcement agencies from using drones to collect evidence without a warrant. None of these measures succeeded, and UAV surveillance is likely to remain a key issue in future legislative sessions.

Legal and Regulatory Obstacles

There may also be legal and regulatory obstacles to the adoption of additional surveillance technologies. This is particularly true in the case of UAVs. At the federal level, the use of UAVs is tightly regulated by FAA. Public entities are permitted to fly UAVs in civilian airspace for limited purposes – including law enforcement, firefighting, border patrol, disaster relief, and search and rescue missions – but they must first obtain a Certificate of Authorization or Waiver from FAA. At the State level, many jurisdictions are considering or have already adopted statutory limitations on the use of UAVs.

Up until now, the shifting regulatory landscape has deterred widespread use of UAVs for law enforcement purposes. However, this situation is likely to change in the near future. In 2012, Congress passed the FAA Modernization and Reform Act, which directed FAA to safely integrate UAVs into national airspace by September 2015. FAA has identified six UAV test sites, including one in Maryland, to work toward this goal.

Cooperative surveillance technologies face fewer legal obstacles, in part because their use is already so widespread. State law grants DNR broad authority to regulate commercial fisheries, and this authority likely includes the ability to require VMS or AIS onboard commercial fishing vessels. However, given the unpopularity of DNR's proposed VMS pilot program in 2011, the department is unlikely to take further action on this issue without either a clear legislative mandate or increased buy-in from the regulated community.

Conclusion

The use of surveillance technology to protect marine resources is likely to increase in the near future. At the federal level, the National Oceanic and Atmospheric Administration is gradually expanding VMS requirements: as of September 1, 2014, vessel owners with limited

access longfin squid and mackerel permits will be required to purchase, install, and operate a VMS unit. At the State level, NRP is in the process of acquiring additional cameras and radar units to extend the reach of the MLEIN. The use of UAVs by law enforcement agencies, including agencies responsible for the enforcement of natural resource laws, is also likely to increase as the federal regulatory framework for UAVs is finalized.

The increased use of surveillance technology for law enforcement purposes offers many potential benefits, but it also raises important legal and policy issues. Questions that are likely to arise in the near future include:

- What additional technologies, if any, should be incorporated into the MLEIN network?

- How should new surveillance technologies be funded, and should the regulated community (*i.e.*, commercial watermen) have to shoulder some of the economic burden?

- What limitations, if any, should be placed on the use of surveillance data in legal proceedings or for commercial purposes?

In answering these question, State lawmakers and regulators will have to balance the goal of protecting marine resources against the cost of acquiring and maintaining new technologies and the privacy concerns raised by State surveillance activities.

Information Resources

Federal Aviation Administration; Unmanned Aircraft Systems; *see* https://www.faa.gov/uas/

Marine Conservation Biology Institute; *Surveillance and Enforcement of Remote Maritime Areas (SERMA): Surveillance Technical Options*; see https://www.marine-conservation.org/media/filer_public/2012/03/26/serma_tech-options_v13.pdf

Maryland Department of Natural Resources; *Maryland Natural Resources Police Level of Service Standards*; *see* http://dnr.maryland.gov/fisheries/calendar/events/474/NRP_Level_of_Service_Report.pdf

Maryland Department of Natural Resources; *Improving the Effectiveness and Efficiency of the Maryland Natural Resources Police*; *see* http://dlslibrary.state.md.us/publications/Exec/DNR/SB987Ch367(3)_2010.pdf

National Conference of State Legislatures; *Current Unmanned Aircraft State Law Landscape*; *see* http://www.ncsl.org/research/civil-and-criminal-justice/current-uas-state-law-landscape.aspx

National Oceanic and Atmospheric Administration; Vessel Monitoring System Program; *see* http://www.nmfs.noaa.gov/ole/about/our_programs/vessel_monitoring.html

United States Coast Guard; Request for Information – Coast Guard Persistent Unmanned Marine Vehicle Market Research; *see* https://www.fbo.gov/index?s=opportunity&mode=form&id=794e5bf8c44083d3e7c0d92d10d4ee98&tab=core&cview=0