

EFFECTIVENESS OF NATURAL RESOURCE RULE AND REGULATION  
ENFORCEMENT IN O‘AHU HAWAI‘I

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## *Abstract*

The State of Hawai‘i’s Department of Land and Natural Resources (DLNR) implements rules and regulations to enhance, protect, conserve, and manage Hawai‘i’s unique and limited natural, cultural, and historic resources. Visitors and residents alike daily access Hawai‘i’s lands and oceans for recreation, subsistence, collection, and much more. The Division of Conservation and Resources Enforcement (DOCARE), DLNR’s enforcement arm, enforces State rules and regulations through education, observation, investigation, and punishment of natural resource violators. However, recent research suggests several gaps and barriers in DOCARE’s effectiveness, the ability to perform the duties defined in their mission statement – the enforcement of rules and regulations that serve to protect, conserve and manage Hawai‘i’s unique and limited natural, cultural and historic resources. Thus, to support improved effectiveness, there is a need to examine patterns of DOCARE’s activities and develop performance metrics to measure their effectiveness. My research aimed to understand DOCARE activities in time and space, perceptions of enforcement challenges that inhibit DOCARE’s effectiveness, and develop metrics by which to measure effectiveness, by answering the following questions: 1) What are the spatial and temporal patterns of enforcement observations and investigations? 2) What are the major challenges DOCARE faces in achieving effectiveness? 3) How can DOCARE overcome these challenges and measure progress towards effectively upholding natural resource rules and regulations? To address these questions, I developed a 2014-2018 geospatial database of DOCARE observations (i.e., monitoring) and investigations into potential violations of rules and regulations on the island of O‘ahu, which contains about 67% of Hawai‘i’s residents and spans 4250 km<sup>2</sup>. I then assessed annual and seasonal trends in observations and investigations. To enhance and situate geospatial findings, I conducted in-depth interviews with DOCARE officers regarding their perceptions of effectiveness and daily routines, from which I generated barriers to and opportunities for greater effectiveness. I also developed a set of criteria and indicators to assist DOCARE in measuring effectiveness. Results indicate clear spatio-temporal patterns in DOCARE activity. Coastal areas are the primary focus of DOCARE observation and investigation activity. DOCARE conducts more fishing investigations in the dry season and more hunting investigations in the wet season. About half of interview respondents felt that DOCARE is not effective and identified several major barriers to effectiveness. For instance, around 50% of DOCARE’s investigations focus on non-natural resource-related issues such as parking and traffic infractions and homelessness. Respondents also offered creative solutions to increase effectiveness, such as collaborative enforcement agreements with other law enforcement agencies on O‘ahu to increase the time DOCARE spends fulfilling its mission statement. The results of my research can assist DOCARE to better understand patterns of officer activity and contribute to their ability to improve the allocation of their limited resources to perform the duties laid out in their mission statement.

## *Table of Contents*

Acknowledgments.....	ii
Abstract.....	iii
Table of Contents.....	iv
List of Tables.....	vii
List of Figures.....	viii
List of Appendices.....	x
Introduction.....	1
Research Aim and Questions.....	5
Methods.....	7
Study Area.....	7
Observation and Investigation Dataset Development.....	8
Activity Codes: Level 1 (for Observations and Investigations).....	8
Activity Groups: Level 2 (for Observations).....	9
Violation Classification: Level 1, Violation Type: Level 2, and Violation Class: Level 3 (for Investigations).....	9
Species (for Investigation).....	10
Location (for Observation and Investigation).....	10
Natural Resource vs. Non-Natural Resource (for Investigation).....	10
Season (for Investigation).....	10
Data Specificity.....	10
Data Aggregation.....	11
Geo-Locating Observation and Investigation Data.....	11
Statistical Analysis.....	12
Semi-Structured Interviews.....	12
Interview Questions.....	12
Contacting and Selecting Respondents.....	13
Interview Coding.....	13
Survey.....	14
Development of Effectiveness Criteria and Indicators.....	15
Results.....	16
Overall Trends of Observations and Investigation.....	16
Patterns of DOCARE Observations.....	17
Temporal Patterns of Observations.....	19

Patterns of DOCARE Investigations.....	20
Temporal Patterns of Investigations .....	22
Fisheries Investigations .....	25
DOCARE Observations and Investigations .....	25
DOCARE Enforcement Districts and Top Observation and Investigation Locations .....	27
DOCARE Officer Demographics.....	27
DOCARE Challenges and Opportunities to Improve Effectiveness from Interviews .....	27
Resources – Challenges .....	28
Resources – Opportunities.....	30
Courts – Challenges.....	30
Courts – Opportunities.....	32
Duties – Challenges .....	33
Duties – Opportunities.....	34
Manpower – Challenges .....	34
Manpower – Opportunities.....	36
Arrests – Challenges .....	36
Arrests – Opportunities.....	37
Conflicts of Modern-day Law and Traditional Practices – Challenges.....	37
Conflicts of Modern-day Law and Traditional Practices – Opportunities .....	38
Public Image and Recognition – Challenges.....	38
Public Image and Recognition – Opportunities.....	39
Morale.....	39
Measuring and Achieving Effectiveness.....	40
Discussion.....	43
Spatial and Temporal Patterns of Enforcement Observations and Investigations .....	43
DOCARE Effort Allocation .....	44
Major Challenges DOCARE Faces in Achieving Effectiveness.....	46
Effectiveness Measurement and Achievement.....	46
Managing for Diverse Natural Resources .....	47
Limitations .....	48
Spatial and Temporal Data and Analysis .....	48
Interviews .....	49
Recommendations for DOCARE.....	50
Critical Transition Period for DOCARE.....	50

Spatial and Temporal Results to Assist Effectiveness .....	51
Opportunities for Implementing Recommendations .....	52
Conclusion .....	53
Appendices.....	54
References.....	59

*List of Tables*

Table 1. Examples of DOCARE Activity Codes (Level 1) and their assigned Activity Group (Level 2, observations)..... 9

Table 2. Investigation data organization and hierarchy ..... 9

Table 3. Example of Interview Coding..... 14

Table 4. Locations with high observation activity from 2014-2018 across the island of O‘ahu. The Primary Activity Group indicates the Activity Group that comprised the greatest observation time at each location. .... 19

Table 5. Most common Violation Classes (DOCARE investigations) by location across the island of O‘ahu..... 21

*List of Figures*

Figure 1. Four DOCARE districts across the island of O‘ahu..... 7

Figure 2. DOCARE investigation count and observation hours over time (2014-2018) across the island of O‘ahu..... 16

Figure 3. Time (hours) spent observing by Activity Group for 2014-2018 across the island of O‘ahu..... 17

Figure 4. Time (hours) spent observing by Activity Code for 2014-2018 across the island of O‘ahu..... 17

Figure 5. DOCARE observation intensity (hours/m<sup>2</sup>) for 2014-2018 across the island of O‘ahu18

Figure 6. DOCARE observation hours (all) by month from 2014-2018 across the island of O‘ahu. The center horizontal line displays the median and the box indicates the first (lower) and third (upper) quartiles. The whiskers (vertical) indicate the range of the data. The red dots represent outliers..... 19

Figure 7. Wet (A) and dry (B) season DOCARE observation intensity from 2014-2018 in investigations per m<sup>2</sup> across the island of O‘ahu ..... 20

Figure 8. Total (summed count) Violation Classes (DOCARE investigations) from 2014 to 2018 across the island of O‘ahu..... 20

Figure 9. DOCARE investigation intensity (# investigations per m<sup>2</sup>) from 2015-2018 across the island of O‘ahu..... 22

Figure 10. Annual trends in fisheries investigations by DOCARE from 2015-2018 across the island of O‘ahu. In plot B, the centerline displays the median, and the outer lines display the first (lower) and third (upper) quartile. The vertical blue lines indicate the range of the data. The red dots represent outliers in the data..... 23

Figure 11. Total DOCARE fisheries and hunting investigation Classifications by month, summed across years from 2015-2018 across the island of O‘ahu ..... 23

Figure 12. Wet (A) and dry (B) season investigation intensity from 2015-2018 in investigations per m<sup>2</sup> ..... 24

Figure 13. DOCARE fisheries Violation Classification from 2014-2018 across the island of O‘ahu..... 25

Figure 14. Fish species targeted during DOCARE investigations from 2014-2018 across the island of O‘ahu..... 25

Figure 15. Correlation between DOCARE officer observations and investigations by Activity Code from 2015-2018 across O‘ahu. Dots represent distinct Activity Codes. The Line represents the correlation coefficient, and the shaded area represents the 95% confidence interval..... 26

Figure 16. Occurrences of DOCARE observation hours (A) and investigation counts (B) by month from 2015-2018 across the island of O‘ahu ..... 26

Figure 17. Correlation between officer observations and investigations by month from 2015-2018. Dots represent distinct Activity Codes. The Line represents the correlation coefficient, and shaded area represents the 95% confidence interval..... 27

Figure 18. Comparison of DOCARE officer effort (observations 2014-2018, top) to fisher effort (bottom) across the island of O‘ahu..... 45

*List of Appendices*

Appendix 1. Coding dictionary for interviews ..... 54  
Appendix 2. Officer Demographics and Daily Operations Survey ..... 56  
Appendix 3. Example Interview Questions with DOCARE Officers..... 57

## *Introduction*

Natural resource governance in the form of norms, institutions, and processes determine who controls and stewards these resources, decision making, and how resource stakeholders may benefit from their use and conservation (IUCN 2016). Rules and regulations are designed as parts of natural resource governance to manage, balance protection, provide access to users, and promote stability of these resources through time (FAO 2002). Enforcement – the process of ensuring that people follow these rules and regulations – is an integral part of effective resource management (Gibson, Williams, and Ostrom 2005) and is vital to ensure that natural resource governance approaches meet conservation goals (Keane et al. 2008; Ostrom and Walker 2003; Heyes 2000; Arias et al. 2016). For the purposes of this research, enforcement includes education about rules and regulations, observations of the use of lands and waters, surveillance for illegal activities, and punishment of natural resource violators.

Compliance is determined by how well resource users follow the rules and regulations set forth to protect, conserve, and manage these resources (Mora et al. 2009). Enforcement increases compliance by deterring natural resource users from activities that fall outside the bounds of rules and regulations (Wellsmith 2011; Arias et al. 2016; Critchlow et al. 2017; Hilborn et al. 2006). Enforcement effectiveness is defined as the degree to which a conservation enforcement agency is able to uphold the rules and regulations that serve to protect, conserve, and manage natural, cultural, and historic resources. Enforcement effectiveness may depend on the persecution of violators, detection of offenders by enforcers, and/or compliance with rules and regulations (Wellsmith 2011; Arias et al. 2016; Critchlow et al. 2017; Hilborn et al. 2006).

National, state, and local government agencies play a central role in natural resource enforcement; however, several challenges inhibit their effectiveness. Inadequate resources and lack of funding is a theme common to most research outlining challenges faced by natural resource enforcement agencies (Eliason 2011; Wellsmith 2011; Akella and Cannon 2004). Limited funds may reduce the possibility of 24-hour surveillance, even though violations may occur outside of business hours (Eliason 2011; Wellsmith 2011; Akella and Cannon 2004). Enforcers may receive relatively low salaries, which makes it challenging to recruit and retain qualified personnel (Eliason 2011; Wellsmith 2011; Akella and Cannon 2004; Davis et al. 2015). Additionally, personnel often become overwhelmed with non-conservation related duties based on their assignment to protect and serve in all situations (Eliason 2011). (Akella and Cannon 2004). Additionally, the goals of natural resource enforcement organizations can conflict with other government rules and regulations. These conflicts may lessen the capabilities of conservation resource enforcers and reduce their enforcement power or contradict conservation laws (Eliason 2011; Akella and Cannon 2004; Wellsmith 2011). These counterproductive laws can result from a lack of law enforcement agency participation and inclusion in rulemaking processes (Mora et al. 2009). Akella and Cannon (2004) found that a lack of communication

between enforcement agencies and the judicial system can lead to reduced compliance with natural resource rules and regulations. Many judges lack knowledge and experience of natural resource-related regulations and may perceive natural resource cases as less critical than other court cases. As a result, these cases tend to be dismissed, and if not perpetrators are frequently issued lenient punishments (Akella and Cannon 2004; Eliason 2011; Wellsmith 2011). Soft sanctions against these offenders can often lead to a reduced deterrent effect of resource violators (Wellsmith 2011). Corruption, which is primarily cited as a problem in developing countries, can contribute to increased violations and decreased deterrence and compliance. Further, it is important to understand violation trends, which are often overlooked by conservation enforcement agencies (Wellsmith 2011). This lack of performance and violation monitoring is a crucial challenge that may reduce enforcement effectiveness and compliance (Akella and Cannon 2004).

Several strategies may increase the effectiveness of enforcement undertaken by natural resource enforcement agencies. Increased resources are key for improved enforcement effectiveness. For instance, in fisheries management, Mora et al. (2009) suggest that sufficient equipment and funding can lead to more effective patrols. Resources can provide training for enforcers, technology for improved detection, and allow for broader efforts across multiple violation types (Wellsmith 2011). Hilborn (2006) hypothesized that improved training and increased resources allowed for better patrol efficiency in detecting poachers.

Increasing the number, efficiency, and focus of patrols are strategies that can also lead to more effective enforcement. In a study of Alberta pike fisheries, Walker et al. (2007) found that increasing patrols over short periods increased anglers' perception of detection by enforcers, while signage describing penalties for illegal activities increased anglers' perceptions of the severity of sanctions, and thus increased compliance. Hilborn et al. (2006) found that increased patrols by wildlife enforcers reduced poaching efforts in the Serengeti National Park, Tanzania. Strategically allocating enforcement effort to patrol specific natural resource issues can lead to more effective enforcement (Mora et al. 2009). Spatial information has proven particularly useful for supporting natural resource law enforcement efficiency. For instance, in Queen Elizabeth Protected Area, Uganda, Critchlow et al. (2017) found that when rangers were more aware of enforcement data (e.g., the spatial distribution of illegal activities), detections increased in some cases by over 250%, without any additional resources allocated to the park rangers. In Cocos Island National Park, Costa Rica, Arias et al. (2016) developed a spatial understanding of illegal activities as well as temporal indicators, such as the lunar cycle, to increase the predictability of illegal fishing. They used these findings to more effectively allocate enforcer patrols to aid in the detection and deterrence of natural resource violations. Enforcement may also be most effective when it targets the small number of serious offenders that habitually violate the law, as these groups regularly operate outside the bounds of conservation rules and regulations (Mora et al. 2009; Wellsmith 2011).

Additional strategies involve strong collaboration among enforcement agencies, other government organizations, and natural resource managers. These collaborations can support effectiveness by increasing the visibility of enforcement efforts in the field (Walker, Foote, and Sullivan 2007). Such collaboration may include the use of specialized investigation units to focus on severe natural resource violations and the deployment of joint investigations between multiple enforcement entities to aid in the detectability and compliance of offenders (Hauck and Kroese 2006). Increased communication between conservation enforcement agencies and the judicial system may increase the magnitude with which violators are sentenced (Akella and Cannon 2004). Research indicates that educating enforcers and increasing their awareness of biological mechanisms (e.g., catch size limits) behind rule creation allows for better education of the public in the field (Hauck and Kroese 2006). Additionally, involving enforcers in rule creation can often lead to increased communication on the enforceability of these rules (Walker, Foote, and Sullivan 2007; Hauck and Kroese 2006). Utilizing community groups as informants can additionally aid in the effectiveness of patrols in the field (Hilborn et al. 2006).

Another strategy to improve enforcement effectiveness involves the establishment of special environmental courts, intended to try cases relevant to natural resource violations. These courts may increase the priority of natural resource cases in the judicial system, aiding in the prosecution and punishment of natural resource offenders (Hauck and Kroese 2006). Deterrence of potential offenders through the support of courts and their knowledge of the importance of these environmental cases can result in full sentencing for crimes (Du Réés 2001). Increasing the severity of punishments and convictions issued by these courts are critical tools in increasing deterrence and contributing to effective enforcement (Wellsmith 2011; Mora et al. 2009). Further, expanding training for prosecutors and judges can increase the seriousness with which crimes are viewed (Akella and Cannon 2004; Wellsmith 2011).

The State of Hawai‘i is highly dependent on its unique natural resources – including coral reefs, state parks, and upland forests and rivers – for both its economy and the wellbeing of residents. In 2017, Hawai‘i’s resident population was approximately 1.4 million, with nearly 10 million annual visitors to Hawai‘i, who contributed around 17% to the State’s economy (Chun et al. 2017). Tourists travel to Hawai‘i to enjoy the culture, climate, and natural resources (State of Hawaii 2017a; Pauline, Knox, and Lowry 1995; HTA 2016). Yet, the State has dedicated relatively limited resources to enforcing natural resource regulations. In 2020 approximately 0.8% (\$65,240,566) of the State operating budget was allocated to the Department of Land and Natural Resources, which is tasked with the enhancement, protection, conservation, and management of Hawai‘i’s natural, cultural, and historic resources (Department of Budget and Finance 2018; DLNR 2020a). These allocated funds were then distributed to the ten divisions and offices that make up DLNR (DLNR 2020b).

Natural resource regulations across Hawai‘i’s State lands and nearshore waters are enforced by the Division of Conservation and Resources Enforcement (DOCARE), which aims to “manage,

protect and conserve Hawai‘i’s unique and limited, natural, cultural, and historic resources” (DOCARE 2020). DOCARE is the only state-level enforcement agency for Hawai‘i. In 2018, less than 100 DOCARE Conservation and Resources Enforcement Officers patrolled and monitored lands and waters across the Hawaiian Islands including three million acres of marine waters, 23,000 acres of inland surface waters, the largest tropical forest in the nation, the 11th largest forest reserve in the country, 1.2 million acres of state-owned lands, two million acres of conservation lands, and one million acres of hunting lands (State of Hawaii 2017a). Thus, for this research, I define enforcement effectiveness using DOCARE’s mission statement as guidance: DOCARE is effective if it enforces the rules and regulations that serve to protect, conserve, and manage Hawai‘i’s unique and limited natural, cultural and historic resources.

Because fishing is a central source of recreation and subsistence in Hawai‘i, enforcing fishing-related rules is a major task outline for DOCARE by DLNR. Nearly one-third of all households in Hawai‘i are involved in the recreational-subsistence fishery, and fisheries provide Hawai‘i communities with economic, social, and cultural services (Hamnett, Liu, and Johnson 2006; Grafeld et al. 2017). Between 2009-2013, the non-commercial fishery caught 75% (1.5 million kg) of the nearshore fish landed in the State (Grafeld et al. 2017). A few Hawai‘i communities have the authority to manage their nearshore marine resources based on their fishing codes of conduct, developed with experienced and knowledgeable community members (Friedlander et al. 2000). Most communities do not have these designations, and in these cases, the State drafts rules and regulations which are enforced by DOCARE. Regulations control size, limit fish caught, designate seasons for specific fisheries, open or close areas to fishing, establish conservation areas (e.g., Marine Life Conservation Districts), and restrict fishing gear types. Despite the establishment of these regulations, compliance may not be possible due to a variety of reasons such as rule confusion, lack of knowledge, or language barriers (Eliason 2011; Wellsmith 2011).

DOCARE also plays a vital role in enforcing hunting regulations. Hunting provides food, recreation, and cultural value to hunters throughout Hawai‘i (Lohr, Lepczyk, and Johnson 2014; Adler 1995). DLNR manages State lands for hunting recreation (Lohr, Lepczyk, and Johnson 2014) and requires that hunters complete an education course to secure a license (State of Hawaii 2017b). Poaching, which entails hunting on private property without permission, or taking animals without a license, is illegal in Hawai‘i. Management encourages the removal of destructive feral livestock but limits hunting access. These mixed messages potentially contribute to poaching activities (Lepczyk, Hess, and Johnson 2011). Poaching can disrupt tropical plant production and density as well as reduce available game-species for hunters that operate within the boundaries of the law (Wright 2003).

While DOCARE’s efforts are critical for ensuring compliance with Hawai‘i’s rules and regulations, previous analyses indicate that the agency faces several challenges typical of other conservation enforcement organizations in the United States (Eliason 2011). Tanaka, Miyashiro,

and Kaulukukui (2012) studied the natural resource enforcement chain in Hawai‘i by qualitatively evaluating education, deterrence, rehabilitation, restoration, and community engagement on O‘ahu and Maui. The enforcement chain is made up of all aspects of reporting, investigating, citing, and hearing cases in court. The authors found that DOCARE lacks key means to achieve effectiveness, including funding and officer and support positions (Tanaka, Miyashiro, and Kaulukukui 2012). Moreover, the authors reported that 65% of survey respondents (nearshore fishers) did not believe that the current law enforcement system in Hawai‘i is effective. Of these respondents, 50% attributed this lack of success to DOCARE’s lack of enforcement, manpower, and resources. Generating an understanding of these challenges, and assessing what inhibits DOCARE, can assist in the development of opportunities to overcome these limitations. Despite these perceived issues, DOCARE could not measure its performance or the effectiveness of its enforcement operations due to a lack of a performance tracking system (Tanaka, Miyashiro, and Kaulukukui 2012). Thus, there is a great need to develop metrics by which DOCARE can measure its effectiveness as a first step toward improving its operations.

As summarized above, understanding spatial patterns of violations and allocated effort can help improve the efficiency of poorly funded and staffed enforcement agencies by strategically placing enforcers in highly violated areas (Milner-Gulland and Leader-Williams 1992; Critchlow et al. 2017; Arias et al. 2016; Davis et al. 2015). Specifically, optimizing officer patrol effort can assist in increasing the detectability of natural resource violations (Critchlow et al. 2017). Cataloging and assessing enforcement data can also attribute to improved enforcement. These measures can increase the understanding of officer effort and locations and violations of interest (Akella and Cannon 2004; Critchlow et al. 2017; Arias et al. 2016; Wellsmith 2011). Yet, there has been no spatial or temporal analysis of DOCARE’s movements or operations. Since 2010, DOCARE has collected annual data of daily geo-located staff operations (observations) and investigations via their Enforcement Management Information System (EMIS) database. This data presents an exciting opportunity to conduct a spatio-temporal analysis of officer effort for DOCARE. Specifically, these data provide a unique opportunity to evaluate the movements of DOCARE over space and time and contribute an understanding of their enforcement of natural resources.

### **Research Aim and Questions**

Given the lack of understanding of DOCARE’s activities related to the enforcement of natural resource rules and regulations, my research aimed to understand DOCARE officers’ movements in time and space, as well as their perceptions of enforcement challenges that inhibit their effectiveness (i.e., ability to perform the duties laid out in their mission statement). My study intended to address this overarching aim by answering the following questions:

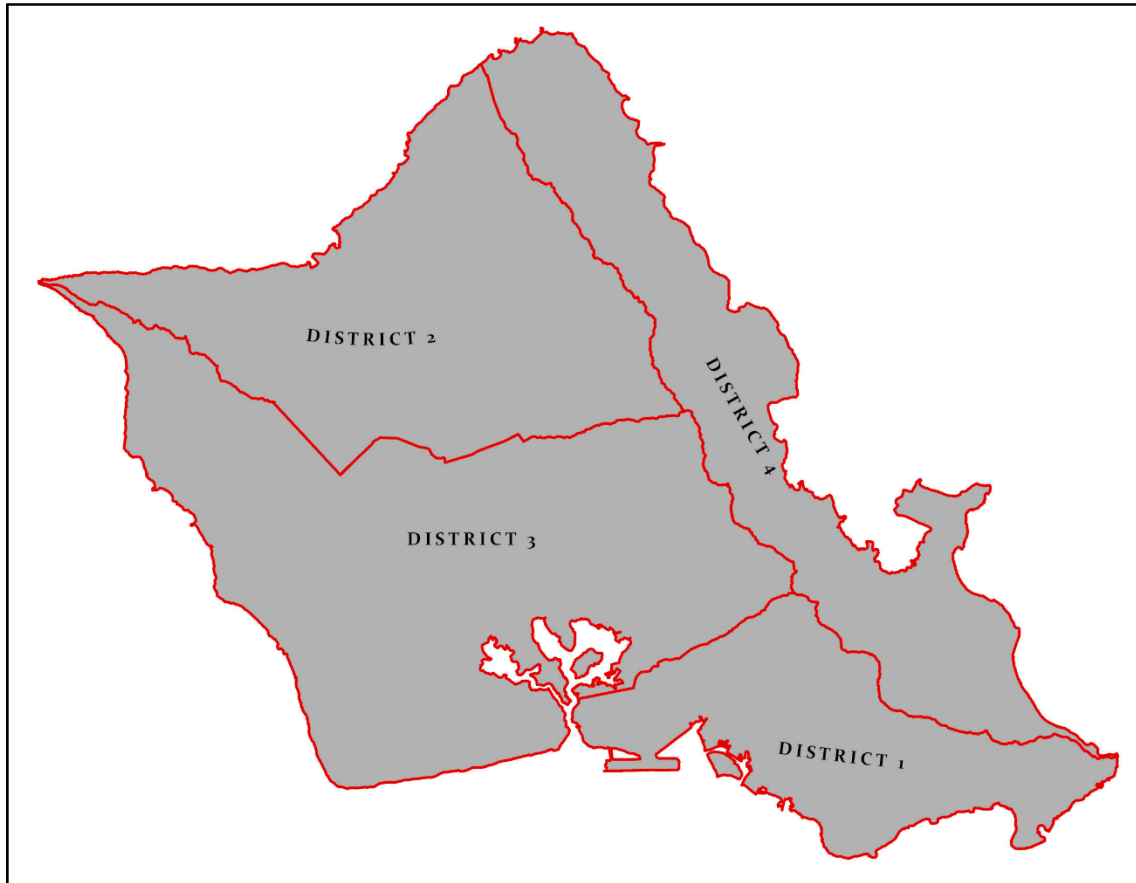
1. What are the spatial and temporal patterns of enforcement observations and investigations?
2. What are the major challenges DOCARE faces in achieving effectiveness?
3. How can DOCARE overcome these challenges and measure progress towards effectively upholding natural resource rules and regulations?

To answer these questions, I first developed an annual, 2014 to 2018 dataset of all DOCARE activities on the island of O‘ahu. I geo-located these data and analyzed spatio-temporal trends of DOCARE activities. Then, I conducted in-depth interviews with individuals associated with DOCARE and used the data collected during these interviews to understand challenges DOCARE faces, as well as opportunities to overcome these challenges. Additionally, these interviews allowed me to understand DOCARE more thoroughly and situate my quantitative findings alongside qualitative interview results. Lastly, I used interviews and outcomes from my spatio-temporal analyses to establish a set of measurable criteria and indicators for DOCARE to assess their effectiveness. This research can help DOCARE understand trends in officer activities across space and over varying temporal scales. Results of my interviews and analyses can provide a set of opportunities for enhanced enforcement as well as a way to measure that improvement. The results of this research also contribute to a broader understanding of natural resource enforcement effectiveness in resource-limited tourist-dependent islands and provide a methodology for utilizing enforcement data to better understand enforcement effectiveness.

## Methods

### Study Area

This research focusses on the island of O‘ahu, one of the seven Hawaiian Islands under DOCARE’s jurisdiction. In 2018, O‘ahu was home to 980,080 residents (87% of Hawai‘i’s population) and visited by nearly 6 million tourists, roughly half of the overall tourism to the State (Chun et al. 2017). In 2019, around 16 DOCARE officers and one branch chief were active on O‘ahu.



*Figure 1. Four DOCARE districts across the island of O‘ahu*

Six districts, or moku, make up the island of O‘ahu: ‘Ewa, Kona, Ko‘olaupoko, Ko‘olauloa, Waialua, and Wai‘anae. Within each moku are ahupua‘a, or tracts of land that traditionally extended from the mountains to the ocean, including one or more complete watershed(s) and all nearshore marine resources (Jokiel et al. 2011). For enforcement purposes, DOCARE has separated the island into four districts (Figure 1) based on the traditional Honolulu Police Department organization of Honolulu County (Redulla 2019). District 1 (485 km<sup>2</sup>) includes the metropolitan area of Honolulu. District 2 (602 km<sup>2</sup>) covers the north shore of the island. District 3 (922 km<sup>2</sup>) consists of the leeward side (West) of the island and central O‘ahu. District 4 (771 km<sup>2</sup>) covers the windward (East) side of the island. Conservation Resource and Enforcement Officers (hereafter referred to as “officers”) patrol these districts, enforcing natural resource rules

and regulations through observation, investigation, and citation of natural resource violators. In 2019, each district was covered by about four active officers on any given day.

### **Observation and Investigation Dataset Development**

DOCARE provided me with access to the O‘ahu section of their Enforcement Management Information System (EMIS) database, which contains data on observation and investigation activities performed by DOCARE officers on O‘ahu from 2014 to 2018. Observations refer to DOCARE’s daily operations effort in terms of management activities and proactive enforcement of natural resource violations, where officers actively patrol for potentially illegal activities. In observation reports, officers include the duration of an activity at a location, the mileage to arrive there, the type of activity, date, and time. Recorded observation hours are inclusive of all daily activities, including meals, meetings, and monitoring efforts. If the opportunity arises, officers can educate individuals before a potentially illegal activity happens. When officers come across ongoing violations in progress, they may use their discretion to perform an investigation (Redulla 2019). Investigations originate from reports via a phone call to the DOCARE dispatcher or the DLNR Tip App (available via smartphone), or after observation by an officer. Investigations are reactive enforcement actions conducted in response to perceived illegal activities. Investigation data included a report number, type of officer activity, classification, location, date, and time. Some investigations led to citations, which are tickets for confirmed violations. I excluded citations from the analysis due to a lack of spatial and descriptive data. The levels of this data range from most specific to more general. Level 1 refers to the most specific data provided, often an exact description of what the officer investigated or observation they performed. Level 2 is the first grouping of Level 1 categories, while Level 3 summarizes Level 2 categories.

I used R software (version 3.5.1) to prepare these data for further analysis. First, I removed all sensitive information. Then, data were cleaned and prepared as described below. After data cleaning, I further developed the dataset by adding ancillary information and level classifications for further analysis.

#### **Activity Codes: Level 1 (for Observations and Investigations)**

Each observation and investigation was associated with an Activity Code that represented the type of enforcement action, which was selected by the officer from a list of pre-existing choices. A total of 39 investigation and 54 observation Activity Codes were present in the dataset (Table 1).

Table 1. Examples of DOCARE Activity Codes (Level 1) and their assigned Activity Group (Level 2, observations)

<b>Activity Code: Level 1</b>	<b>Activity Group: Level 2</b>
1700 Small Boat Harbors	DOBOR
1210 Wildlife	DOFAW
1230 Natural Area Reserves	DOFAW
1400 Land Management	Land Management
1220 Na Ala Hele	Na Ala Hele
HR001 Meal	Time Off

\*\* The Division of Boating and Ocean Recreation (DOBOR), the Division of Forestry and Wildlife (DOFAW), Hawai'i trail systems (Na Ala Hele)

Activity Groups: Level 2 (for Observations)

For observations, I assigned each Activity Code to one of 17 Activity Groups to represent the agency, administration, division, or department that was the focus of each observation record.

For example, Small Boat Harbors (Activity Code) fall under the jurisdiction of the Division of Boating and Ocean Recreation (DOBOR), and thus DOCARE is performing enforcement for DOBOR (Activity Group, Table 1). In cases where there was no clear organization associated with the record (e.g., the observation code referred to time to eat a meal), I used a general activity (e.g., time off).

Violation Classification: Level 1, Violation Type: Level 2, and Violation Class: Level 3 (for Investigations)

Investigations include officer descriptions of the potential violation, which they term a “classification” (Level 1). These had to be cleaned because they were entered in free form and varied widely in their content. The original dataset contained about 2,500 unique classifications.

Table 2. Investigation data organization and hierarchy

<b>Investigation Data Type</b>	<b>Level of Category</b>	<b>Example</b>
Classification (from DOCARE)	Before Cleaned (n=2,500)	Lay nets prohibited
Violation Classification	Level 1 (n=244)	Lay Net
Violation Type	Level 2 (n=61)	Fishing Gear
Violation Class	Level 3 (n=21)	Fisheries

To standardize these descriptions, I developed a set of “Violation Classification” categories (Level 1) from the classifications that described major themes and assigned these to each investigation record. The resulting number of Violation Classifications was 244. I omitted records when officers did not provide this description (n=3). I assigned Violation Classifications

to Violation Types (Level 2; n=61), which were further generalized to Violation Classes (Level 3; n=21). For instance, the Violation Type “Fishing Gears” was made up of Violation Classifications “Throw Net,” “Lay Net,” “Pole Fishing,” “Scoop Net,” and “Traps.” “Fishing Gears” and other Violation Types such as “Undersized Fish/Take” were then assigned to the overarching Violation Class of “Fisheries.”

#### Species (for Investigation)

Investigation records related to fisheries (Violation Classification “Undersized Fish/Take”) frequently included the targeted species name. To discern the species that were the target of most investigations, I tagged each record with the species name.

#### Location (for Observation and Investigation)

In the observation database, officers often reported the location in the Activity field rather than the Location field, so I examined and used data in this field when searching for location information. Location data included in the EMIS database often included multiple place names and spellings for the same locations. In these cases, I chose a single name and assigned that location name to each record. For all records with location information, I used Google Earth Pro (version 7.3.0) to identify geographic locations associated with each record in the database. If I could not find the location via Google Earth Engine, I asked DOCARE personnel to point out the location.

#### Natural Resource vs. Non-Natural Resource (for Investigation)

To evaluate the number of investigations DOCARE initiated related to non-natural resource associated duties, I flagged each investigation as “natural resource” or “non-natural resource.” If the record fell under the DOCARE mission statement of “a natural, cultural, or historic resource,” it was considered a natural resource record. In contrast, anything else became “non-natural resource” (e.g., drug sales).

#### Season (for Investigation)

Hawai‘i experiences two main seasons, dry and wet. The dry season spans from May to October, and the wet season spans from November to April (Longman, Diaz, and Giambelluca 2015). Officers speculated that hunting and fishing practices follow these weather patterns as choice conditions can determine whether or not to fish or hunt (Interview with Officer 2019). To understand trends in investigations based on season, I assigned the record’s month to either the wet (November through April) or dry (May through October) season.

#### Data Specificity

After reviewing both the observation and investigation data, I found that it was challenging to pull useful information from observations due to their lack of descriptive detail. The Activity

Code, date, duration, location, and mileage were the only information present. The Activity Code lacked the specificity to determine what is being monitored, unlike the investigation Violation Classification data. Given this lack of detail, most of my results relied on analysis of investigation data.

### **Data Aggregation**

I aggregated observation and investigation data for further geospatial analysis. For observation data, I aggregated by the number of hours spent performing an observation across time (hours/year, month, and season), location (hours/location), and Activity and Activity Group (hours/Activity and Group). For investigation data, I aggregated the number of investigations by time (sum of investigations/year, month, and season), location (sum of investigations/location), and classification (sum of investigations/Violation Classification, Violation Type, and Violation Class across the entire dataset). 2014, an incomplete year for investigations, was removed from most of my analyses.

### **Geo-Locating Observation and Investigation Data**

To assess the spatio-temporal intensity of observations and investigations for each location in the cleaned database, I created or downloaded polygons associated with each location. When a location name was a Reserve Area (n=36 reserve areas in O‘ahu), Hunting Area (n=4), Na Ala Hele Trail (n=17), District (n=4) or Ahupua‘a (n=88), I used polygons provided by the Hawai‘i State GIS portal (Hawaii State Office of Planning 2020) to define that location. I generated a map of enforcement districts based on boundaries set by DOCARE. For other locations (e.g., harbors), I searched for place names in Google Earth Pro. Then, I delineated polygons in ArcGIS Pro (2.4.1) using the street base map in ArcGIS and ahupua‘a boundaries. In some cases, I used the street base map available in Google Maps to define boundaries due to its robust description of townships, roads, and areas (Google 2019). These locations were then created as polygons in ArcGIS Pro and labeled to reflect their location name in the database.

Next, I joined aggregated data for observations (hours) and investigations (count) to each of the six layers based on the location name (hunting, reserves, trails, ahupua‘a, district, or self-generated polygons). To evaluate the rate of observation or investigation across space, I calculated the density of observations (hours of observation/m<sup>2</sup>) or investigations (number of investigations/m<sup>2</sup>) for each polygon. I then summed these rates across all six layers to calculate the total observation or investigation intensity (hours or count/m<sup>2</sup>). The raster output (100m<sup>2</sup>) represents the intensity (hours or count/area) of DOCARE activity. I used the same methodology to summarize this intensity by season (dry or wet). I visually assessed maps for occurrences of higher-intensity locations, which are not representative of crime but instead officer monitoring efforts (observations) or reported or detected violations (investigations).

## **Statistical Analysis**

To understand the relationship between observations (hours) and investigations (count), by month and Activity, I calculated the Pearson's coefficient of correlation in R using the `ggpubr` package. For my Activity analysis, I removed observations at "Waimano Homeroad" and "Waimano Baseyard" as these hours represented office-related activities, not field monitoring activities.

To assess whether observation hours or investigation counts (e.g., were significantly different across years or months), I applied a one-way ANOVA test using the `aov` function in R.

For these analyses, I removed 2014 from both observations and investigations to account for the incomplete 2014 year of investigations.

## **Semi-Structured Interviews**

I conducted semi-structured interviews with DOCARE personnel and affiliates to ground-truth and supplement the analysis of enforcement activities. This information generated a better understanding of personnel and affiliates' perceptions of how to measure and improve effectiveness. Further, I garnered a better understanding of DOCARE and affiliate programs through specific questions about operations, and observations during ride-alongs.

### **Interview Questions**

I interviewed DOCARE employees and affiliates using a semi-structured format. I developed a set of open-ended questions based on themes that emerged from my literature review and initial conversations with individuals positioned with DOCARE. The semi-structured format allowed me the freedom to follow central pathways that emerged as a result of my questions and the respondents' answers (Hoshemnezhad 2015). The University of Hawai'i Human Studies Program Institutional Review Board reviewed and approved the interview methodology of human subjects in 2019 (IRB ID 2019-00122).

I designed my questions to provide a better understanding of perceptions of the current and potential effectiveness of DOCARE, and DOCARE operations and structure. I asked two main questions about DOCARE's effectiveness across all interviews: 1) How do you define effectiveness for DOCARE, with respect to natural resource regulations? and 2) Do you think that DOCARE is effective in its enforcement of natural resource regulations? Why or why not? I also asked two questions of all respondents focused on understanding barriers to effectiveness and opportunities for overcoming these barriers: 1) What are the biggest limitations to effectiveness for DOCARE and individual officers? and 2) What can DOCARE and individual officers do to become more effective? In addition to these four core questions, I asked supplementary questions about effectiveness, challenges, and opportunities based on the conversation and an individual's knowledge, position, and experience (Appendix 3). I used

observation during ride-alongs and site visits to supplement understandings gained from interviews.

### Contacting and Selecting Respondents

In 2019, DOCARE provided a list of the names and mobile phone numbers of all officers on O‘ahu. I contacted individuals from this list via phone and scheduled interviews when possible.

I contacted DOCARE officers who worked in different enforcement districts to gain an understanding of differences in operations between each district. I also included affiliates involved with, but not employed by, DOCARE, such as those from Makai Watch (DLNR 2020c) and involved in the prosecution of individuals cited by DOCARE officers. These interviews helped me to understand the community enforcement and legal aspects of DOCARE operations. I conducted four interviews in person at the Kalanimoku Building (administration headquarters) or Waimano Baseyard (O‘ahu branch office), one over the phone, one in person at the University of Hawai‘i, and four interviews during ride-alongs and field visits with on-duty officers. In total, I completed ten interviews, including seven with DOCARE officers and three with DOCARE affiliates. After ten interviews, I felt I had reached a saturation of information, meaning that respondents began to restate information I had already collected.

For all interviews, I recorded key quotes, observations, and content of interest manually. I provided consent forms to every respondent in which they consented to the interview and if they were comfortable being audio recorded. I recorded audio for ten interviews and used these in developing a transcript of the interview. After completing each interview, all information was compiled into one document and prepared for coding.

### Interview Coding

To analyze interviews, I coded all transcripts for similarities and common themes using an inductive approach. This inductive content analysis took specific statements from individuals and combined them with other similar accounts to create a more extensive statement (Hoshemnezhad 2015). The coding dictionary generated from these interviews can be found in Appendix 1.

Coding took place in stages. After the first reading of the transcription, I grouped the text by the main themes, which allowed me to familiarize myself with the interview. Initially, all themes were recorded and then grouped where relevant. Eight major themes emerged from this process: background, operations and effort, challenges, illegal activities, opportunities, effectiveness, Makai Watch, and legal.

On the second reading, I broke up these major-themed text blocks in each transcription into sub-themes. The sub-themes (n=40) captured the depth of each major theme (n=8). For example, I used the challenges theme to understand impediments to DOCARE’s effectiveness. Under this

theme, I identified ten sub-themes including what officers dislike about the job, sanctions and courts, administration and morale, manpower, public image and recognition, duties, conflicts of modern-day law and traditional practices, communication, and arrests.

I then moved all themes, sub-themes, and quotes into a tabular database for organization and analysis (Table 3). I created an annotation of each quote to quickly assess the meaning of the quote in the tabular dataset.

*Table 3. Example of Interview Coding*

<b>Code Theme</b>	<b>Sub Theme</b>	<b>Annotation</b>	<b>Quote</b>
Background	Recruitment	Why Became Officer	I grew up hunting with my dad in **, love the ocean, the mountains. My dad was a hunter. I would go hunting with him. I joined ** not knowing another opportunity was there when I actually applied. Positions back then opened up when people retired or passed away. Some of my friends from ** applied and got in and encouraged me to apply. I tried twice, and the second time I got into the ** branch specifically.
Opportunities	Community Support / Outreach	Increase Community Partnerships	We need to increase our partnerships with the community. Without them, we would really be in trouble. They are the eyes and ears of DOCARE.

*\*\*Specific information redacted to protect the identity of the officer interviewed*

I then paired challenges that emerged from the coding process with opportunities that were offered by respondents where applicable. I initially shaped opportunities from my analysis of interview data from the opportunities theme, as officers frequently had ideas for how to overcome challenges. For challenges without clear opportunities provided by officers during interviews and to further refine these results, I developed opportunities via my literature review and analysis.

### Survey

I developed a survey instrument to gather information about DOCARE officer demographics and activities (Appendix 2). The survey included questions about the officer’s age, place of birth, and years employed by DOCARE, as well as officer activities such as time spent on reports and responding to dispatched calls. I distributed the survey during a 2020 meeting of the O’ahu DOCARE branch, where all officers operational on O’ahu were present, and 15 officers completed the survey (88% of O’ahu DOCARE Branch represented).

### Development of Effectiveness Criteria and Indicators

Using my analyses of interview data, spatial and temporal patterns, and literature examples of how to improve enforcement, I developed criteria (n=7), indicators (n=18), and metrics (n=20) for measuring effectiveness for DOCARE. Criteria are standards that, if met, indicate that DOCARE is fulfilling its mission statement (i.e., upholding laws that serve to protect, conserve, and manage unique and limited natural, cultural, and historic resources in the state of Hawai'i). Indicators are proxy measures for each criterion, inclusive of metrics that assess the degree of achievement of each criterion. Each indicator is measured qualitatively or quantitatively with metrics.

## Results

### Overall Trends of Observations and Investigation

From January 2014 to December 2018, the DOCARE database included a total of 341,719 observation activity hours ( $68,344 \pm 4,644$  observation hours/calendar year, mean  $\pm$  standard deviation of the mean, Figure 2). Officers spent 46% of their total observation time performing field-based activities. The other 54% of observation time was dedicated to time off and duties such as meetings and management activities (e.g., meetings, maintenance, support services, and leave).

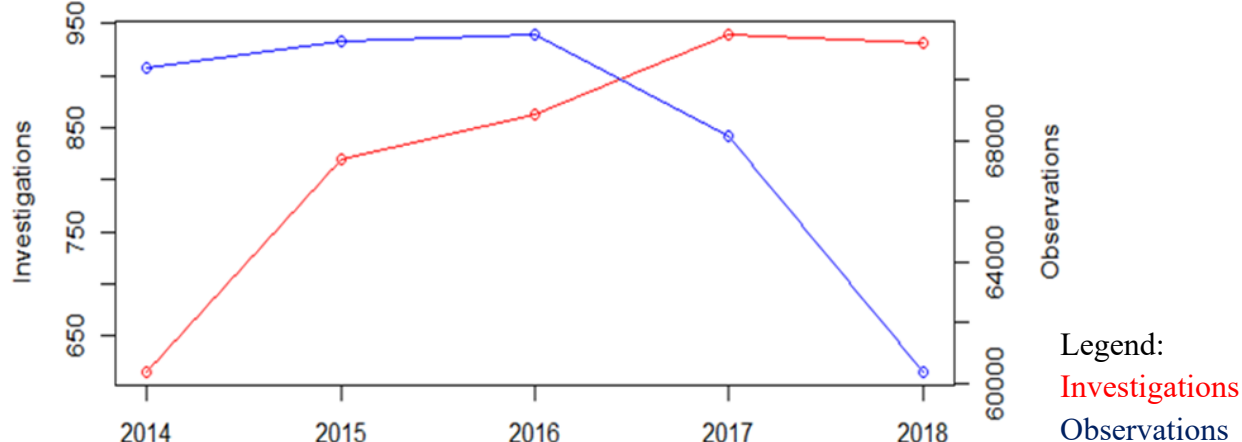


Figure 2. DOCARE investigation count and observation hours over time (2014-2018) across the island of O'ahu

A total of 4,658 investigations occurred between June 1, 2014, and December 31, 2018 ( $74 \pm 2.9$  investigations/month;  $888 \pm 29$  investigations/calendar year). Officers conducted the fewest investigations in 2015 (819 investigations) and the most in 2017 (939; Figure 2). Around 50% of all investigations focused on natural resources. In comparison, the other 50% focused on non-natural resource duties such as parking, drugs, alcohol, theft, traffic violations and accidents, arson, and other police-related duties.

Below, I review patterns in observation data and then investigation data.

## Patterns of DOCARE Observations

During the study period, DOCARE officers spent most of their time observing activities related to the rules and regulations of DOBOR, (28% of total time), fisheries (Division of Aquatic Resources [DAR], 27%), State Parks (20%), and the Division of Forestry and Wildlife (DOFAW, 10%, Figure 3). All other Activity Groups comprised about 25% of the total observation time for all years.

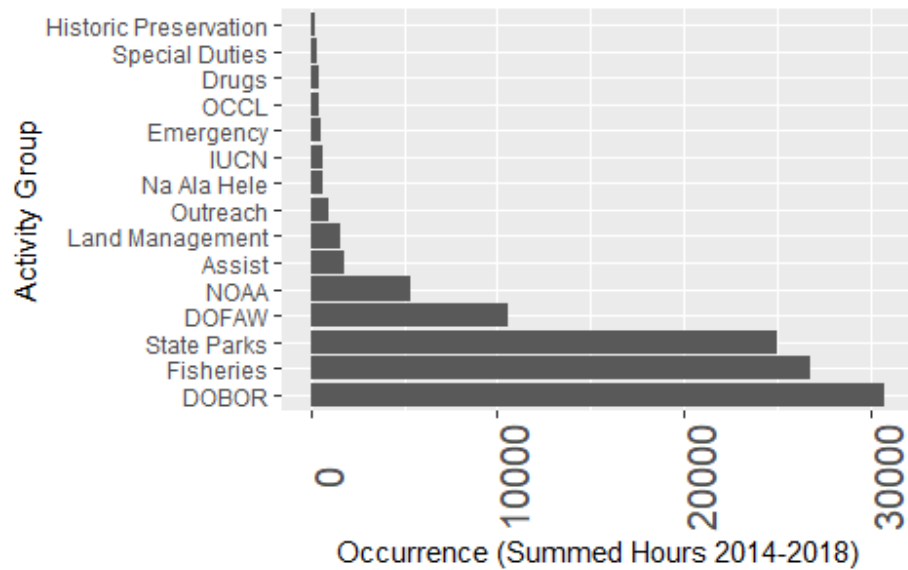


Figure 3. Time (hours) spent observing by Activity Group for 2014-2018 across the island of O'ahu

Breaking down the Activity Groups into Activity Codes shows the targets of officer observations.

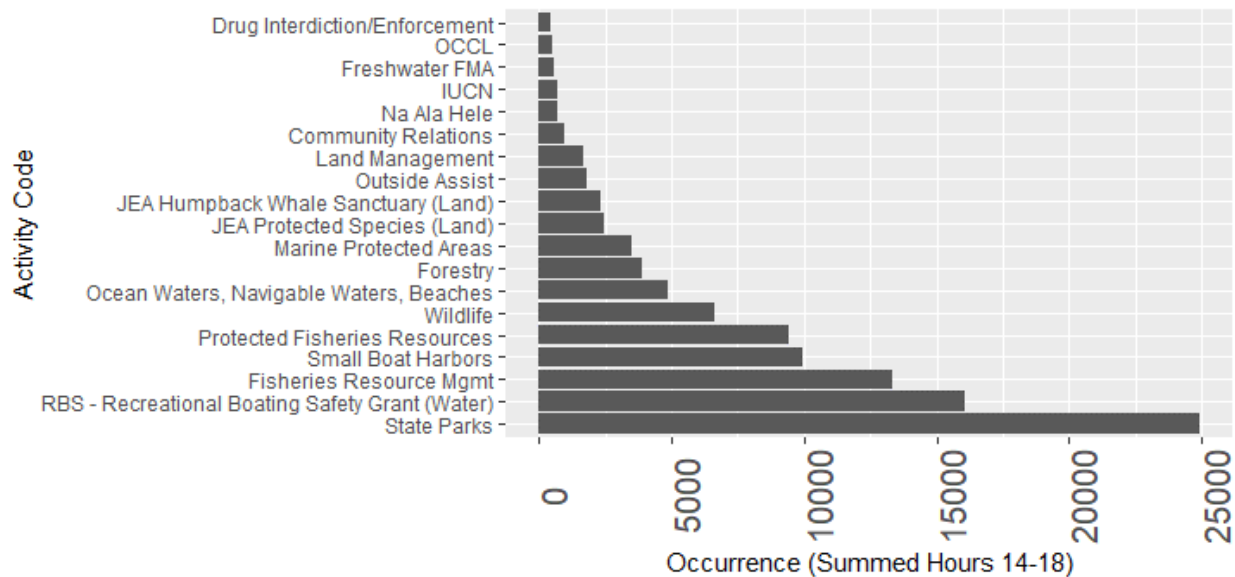


Figure 4. Time (hours) spent observing by Activity Code for 2014-2018 across the island of O'ahu

State Parks (19% of total time), recreational boating safety, water operations (14%), fisheries resource management (13%), small boat harbors (8%), and protected fisheries resources (7%)

were the most common Activity Codes (Figure 4). These top Activities Codes all fall under the Activity Groups of State Parks, Fisheries (DAR), and DOBOR.

Officers tended to focus their observation time on coastal areas (where land and ocean meet), including the Honolulu Metropolitan coastal area from Sand Island to Waikīkī, and Kāne‘ohe Bay (Figure 5;

Table 4). In some cases, officers reported observations over multiple locations (swaths) rather than specific locations, which may affect the observation intensity. If officers report their location as one location to another, they may only be observing at only those two locations or specific points along their path. However, to represent this in my mapping, all locations covered by officers in these swaths were included.

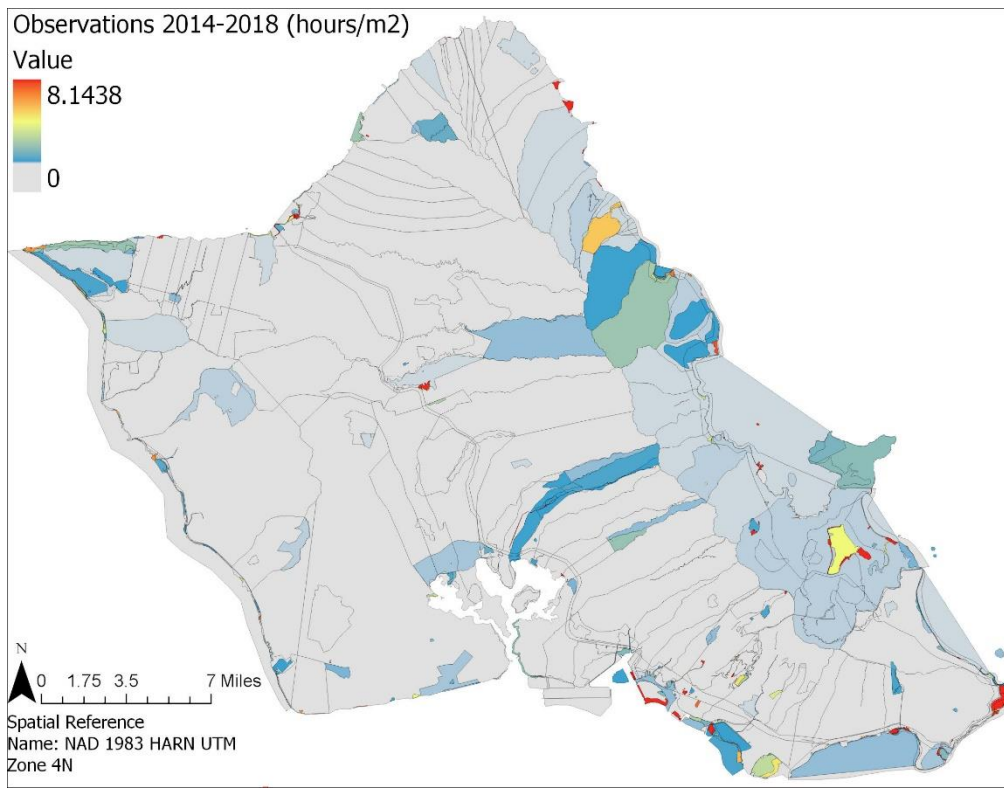


Figure 5. DOCARE observation intensity (hours/m2) for 2014-2018 across the island of O‘ahu

Across most of O‘ahu, officers reported no observations (area shown in grey), indicating that these areas may be unmonitored (Figure 5).

Table 4. Locations with high observation activity from 2014-2018 across the island of O‘ahu. The Primary Activity Group indicates the Activity Group that comprised the greatest observation time at each location.

Location	Ahupua‘a	District	Primary Activity Group	Total Hours (% of total hours dedicated to primary Activity Group)
Ka‘ena Point State Park – Mokulē‘ia	Kawaihapai	Waialua	State Parks	3,538 (92%)
Ke‘ehi Small Boat Harbor	Kapalama	Kona	DOBOR	2,571 (85%)
Ala Wai Small Boat Harbor	Waikīkī	Kona	DOBOR	2,954 (86%)
‘Ewa Forest Reserve	Honouliuli	‘Ewa	DOFAW	2,632 (91%)
Diamond Head State Monument	Waikīkī	Kona	State Parks	2,310 (96%)

### Temporal Patterns of Observations

Across all observations and years, December, July, and March had the most observation hours, while February and November had less observation hours (Figure 6). However, a one-way ANOVA test indicated that differences between months were not significant ( $p > 0.05$ ), suggesting no clear monthly pattern across all years of observations.

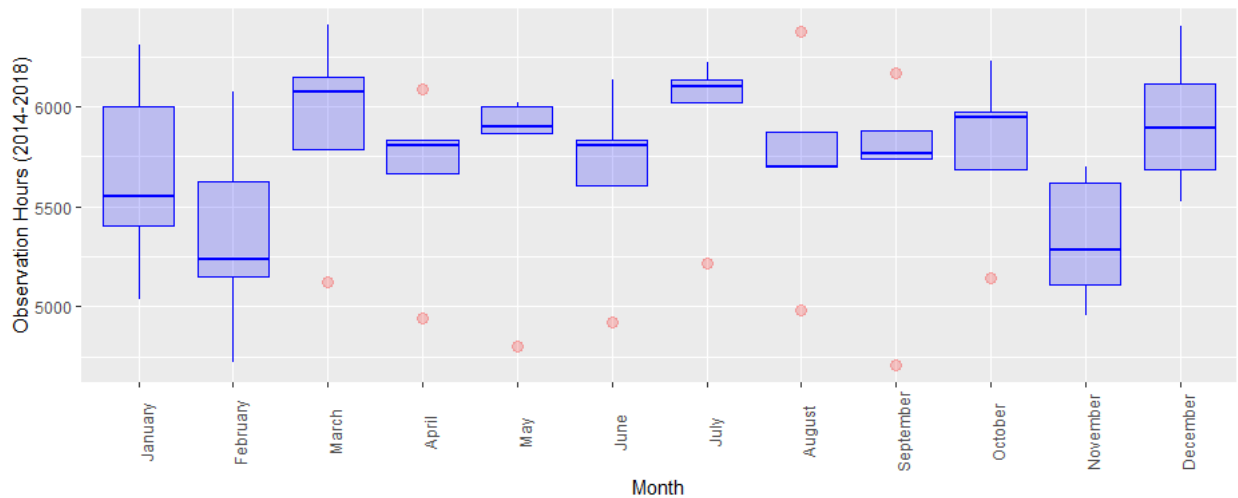


Figure 6. DOCARE observation hours (all) by month from 2014-2018 across the island of O‘ahu. The center horizontal line displays the median and the box indicates the first (lower) and third (upper) quartiles. The whiskers (vertical) indicate the range of the data. The red dots represent outliers.

However, the spatial location of observation activities displays some seasonality (Figure 7). Observation intensity (hours/area) for both wet and dry seasons was greatest in the district (moku) of Kona, and the ahupua‘a of Waikīkī and Honolulu. Officers may have also spent

relatively more time on the windward (East) side of O‘ahu than on the West or North regions, especially during the wet season (Figure 7). However, based on District 4’s reporting style, which often provided a range of areas rather than point-specific locations, it appears that these areas have broader coverage (more locations observed). Additionally, the west and north aspects of the island appear to have more observation intensity during the wet season.

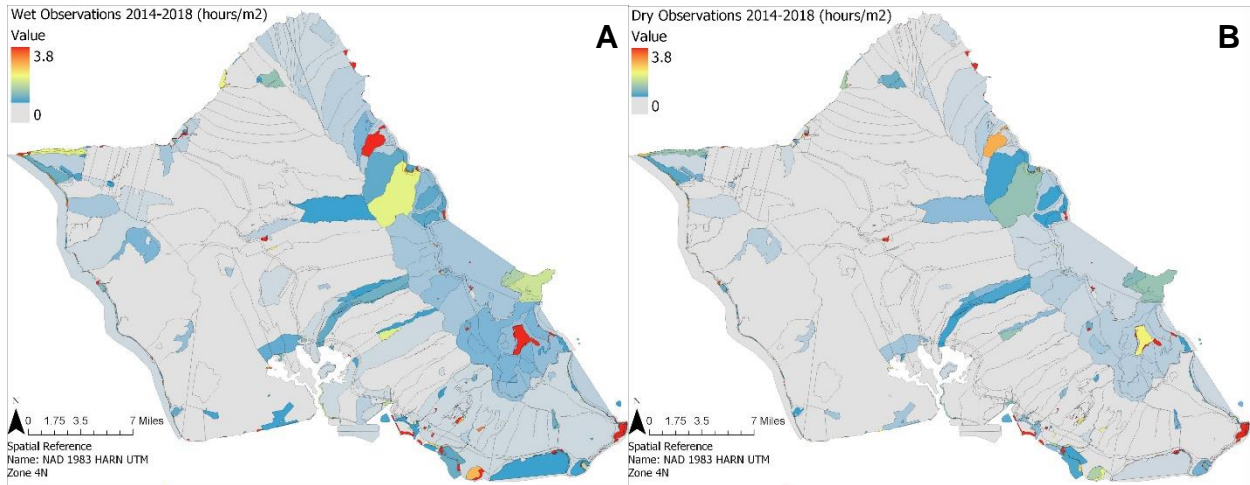


Figure 7. Wet (A) and dry (B) season DOCARE observation intensity from 2014-2018 in investigations per m<sup>2</sup> across the island of O‘ahu

### **Patterns of DOCARE Investigations**

From June 2014 to December 2018, fisheries accounted for 19% of all investigations (Figure 8), followed by human and vehicle trespass (12%), potential vehicle and traffic violations (11%), and potential vessel violations (10%).

A trespass violation involved illegal or unpermitted access to trails and roads closed by DLNR to protect public safety as well as plants and animals. Within the trespass Violation Class, “Prohibited Entry Closed Area” trespass (81% of all trespass records) and “Driving Off Designated Roads” (12%) were the most

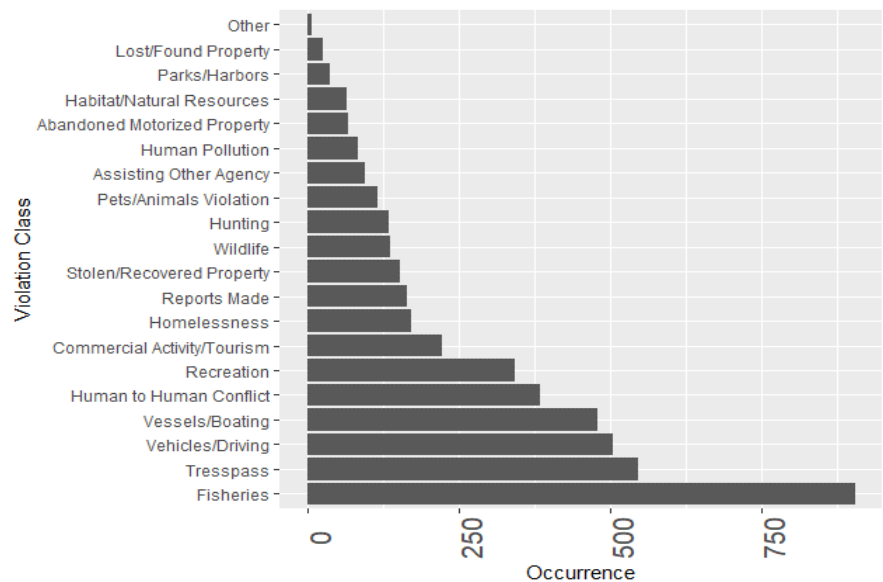


Figure 8. Total (summed count) Violation Classes (DOCARE investigations) from 2014 to 2018 across the island of O‘ahu

common type of Violation Classification. Diamond Head State Monument (30% of all trespass locations) and Ka‘ena Point (25%) were the most common locations for trespass violations (Table 5). Interviews suggested that trespass violations at Diamond Head State Monument, a key tourist attraction in Honolulu’s urban center, are likely homeless activities and individual hikers accessing “out-of-bounds” features of the crater or hike itself.

*Table 5. Most common Violation Classes (DOCARE investigations) by location across the island of O‘ahu*

<b>Location</b>	<b>Ahupua‘a</b>	<b>District</b>	<b>Most Frequently Investigated Violation Class</b>	<b>Second Most Investigated Violation Class</b>
Ka‘ena Point State Park – Mokulē‘ia (n=421)	Ka‘ena	Waiialua	Trespass (n=125)	Recreation (n=78)
Ke‘ehi Small Boat Harbor (n=414)	Kapalama	Kona	Vehicles/Driving (n=93)	Vessels/Boating (n=84)
Ala Wai Small Boat Harbor (n=311)	Waikīkī	Kona	Vehicles/Driving (n=64)	Vessels/Boating (n=50)
Diamond Head State Monument (n=244)	Waikīkī	Kona	Trespass (n=155)	Homelessness (n=32)

Off-road vehicle activities, only allowed through a permit received from the State Parks Division of DLNR, posed a significant issue at Ka‘ena Point, located at the northwest corner of O‘ahu. Vehicle and traffic violations that occur on State lands made up one-third of DOCARE’s investigations. These types of investigations typically occurred at DOBOR managed harbors and primarily consisted of parking tickets for illegal parking and parking violations. Potential vessel and boating investigations, the fourth most common investigation type, typically occurred at small boat harbors and launch ramps, including those in Ke‘ehi (18% of all vessel and boating investigations by location), Ala Wai (11%), and Maunalua Bay (8%). Thrill craft (21% of vessel and boating investigations), anchoring and mooring (17%), and motorized vessel prohibited entry into protected waters (14%) were the most frequent Violation Classifications of this Violation Class. For example, Maunalua Bay is an Ocean Recreation Management Area which bounds thrill craft users to a specific area of operation; however, users often illegally operate outside of this designated area.

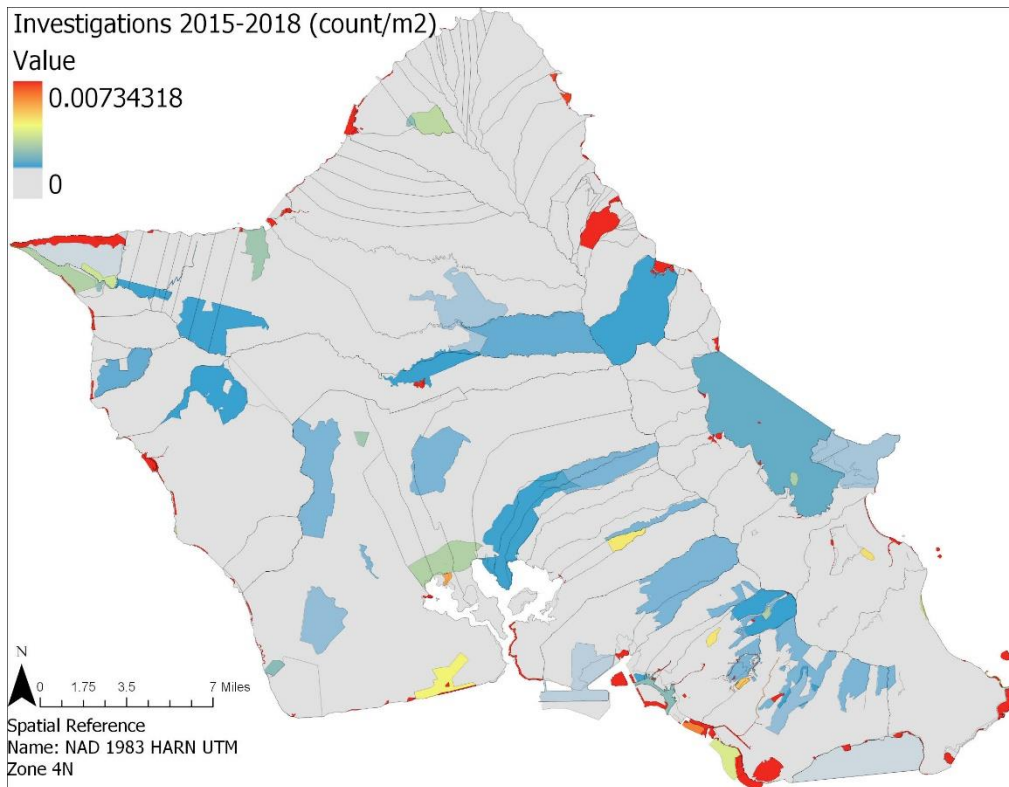


Figure 9. DOCARE investigation intensity (# investigations per  $m^2$ ) from 2015-2018 across the island of O'ahu

Based on my spatial analyses, 2015 to 2018 investigation intensity primarily occurred in coastal areas, including Maunalua Bay, Waikīkī, Kahana, Hale'iwa Harbor, Pūpūkea-Waimea Marine Life Conservation District, Poka'i Bay, and Wai'anae Harbor (Figure 9).

### Temporal Patterns of Investigations

DOCARE officers indicated that during the dry season, oceans are calm, and waters are clear due to reduced runoff, generating more investigations of fisheries violations. They also stated that the wet season prompts a higher frequency of hunting investigations because rains lead to fruiting for many montane plant species, leading to easier game tracking by hunters who are aware of these fruit tree locations (Griffin 1978; Diong 1982). These investigations may also come from increased reports of violations to the dispatcher or tip line.

A majority (57%) of fishing investigations (2015-2018) occurred in the dry season months (May to October, Figure 10). However, there was no significant difference in fishing investigation rate between months according to a one-way ANOVA test ( $p > 0.05$ ). In 2015 and 2017, the Waikīkī Fisheries Managed Area (FMA) was closed, while in 2015, Hawai'i corals experienced widespread bleaching, which may have contributed to lack of seasonality for fisheries investigations in those years (Rodgers et al. 2017, Figure 10).

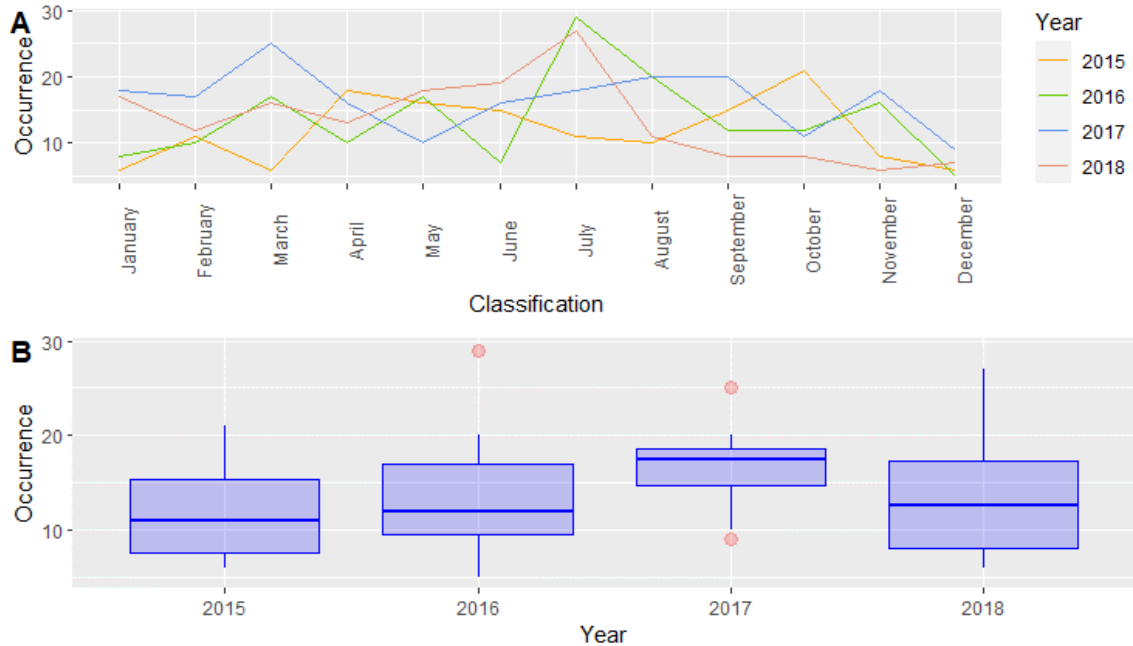


Figure 10. Annual trends in fisheries investigations by DOCARE from 2015-2018 across the island of O'ahu. In plot B, the centerline displays the median, and the outer lines display the first (lower) and third (upper) quartile. The vertical blue lines indicate the range of the data. The red dots represent outliers in the data.

Hunting investigations, though far less frequent than fishing investigations, also have no significant temporal trends (ANOVA p-value>0.05, Figure 11). The wet season made up most of the hunting investigations (58%).

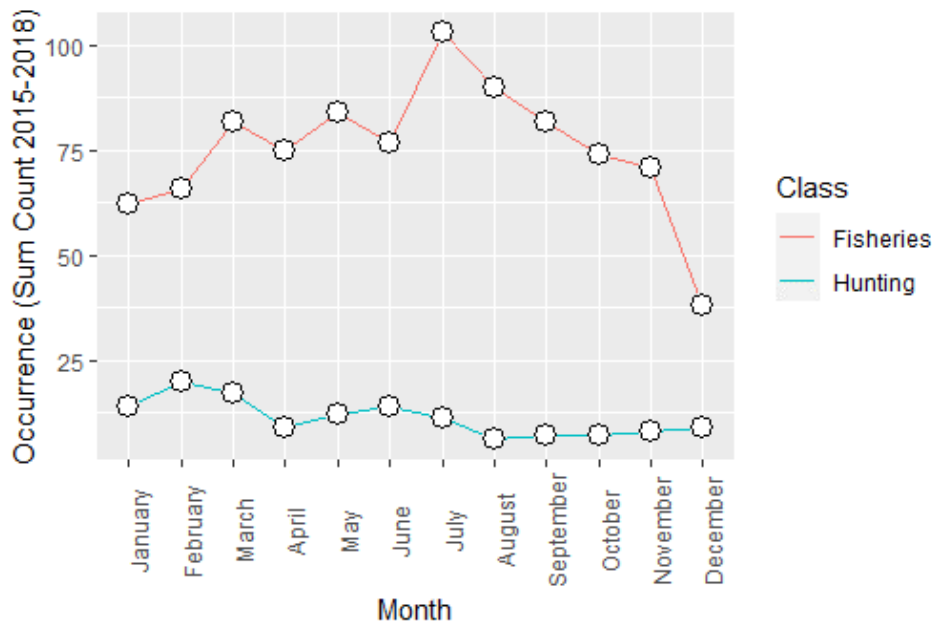


Figure 11. Total DOCARE fisheries and hunting investigation Classifications by month, summed across years from 2015-2018 across the island of O'ahu

Particular locations contributed to the all year investigation map from the dry map and other from the wet season map (Figure 9).

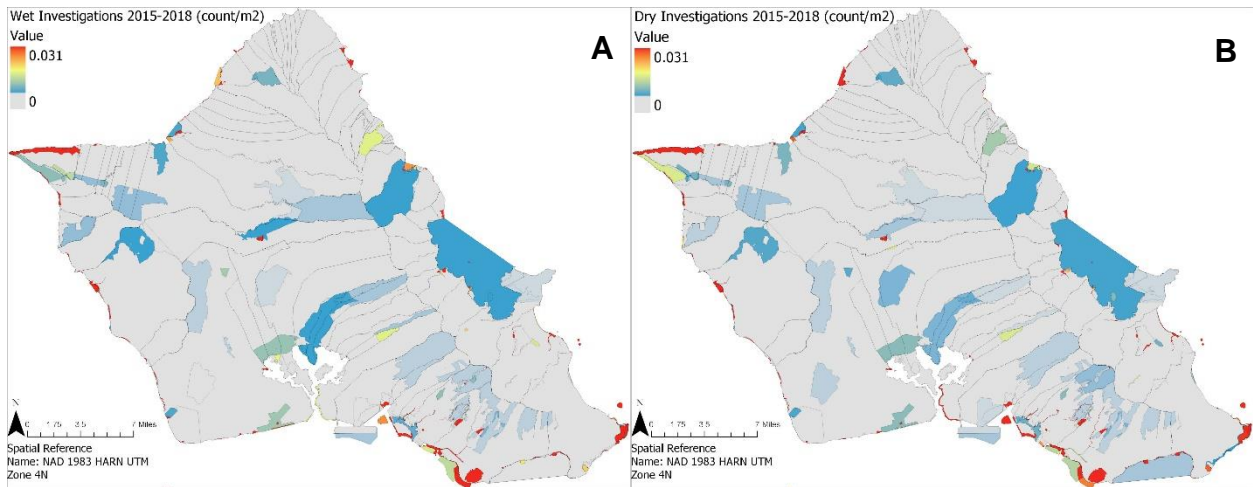


Figure 12. Wet (A) and dry (B) season investigation intensity from 2015-2018 in investigations per  $m^2$

Areas with greater investigation intensity in the wet season than in the dry season included Sacred Falls, He'eia Boat Harbor, and Kahana Bay on the windward side of the island, and the Waikīkī-Diamond Head Fisheries Managed Area and Palolo-Manoa Channel in Honolulu (Figure 12). In the dry season, more North Shore locations had high investigation intensity, including the Waimea-Pūpūkea Marine Life Conservation District, and the Hale'iwa Boat Harbor. Hiking trails in the Maunawili and Tantalus area were also more intensely investigated in the dry season than the wet (Figure 12).

## Fisheries Investigations

Within the fisheries Violation Class, the most commonly investigated Violation Classifications were lay nets (including abandoned nets and unregistered nets; 31% of total fisheries investigations), undersized fish and take (25%), prohibited activities in marine protected areas (16%), and throw nets (15%), Figure 13).

Within the undersized fish and take classification, around 95% of reports identified the species by name. The most identified species were Kala (blue spine unicornfish, *Naso unicornis*, 17%), Samoan Crab, *Scylla serrata*, (15%), Ulua (giant trevally, *Caranx ignobilis*, 13%), and Papiro (young giant trevally, *Caranx ignobilis*, 11%, Figure 14).

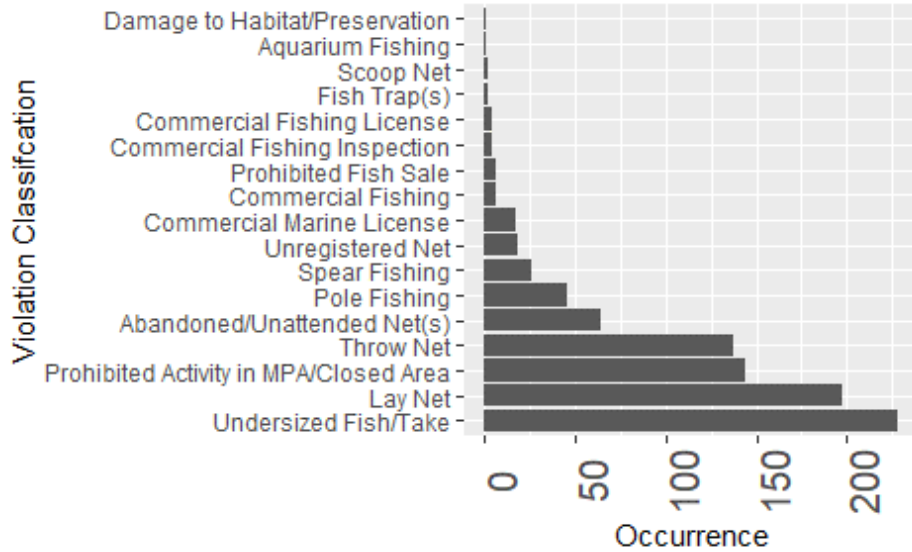


Figure 13. DOCARE fisheries Violation Classification from 2014-2018 across the island of O'ahu

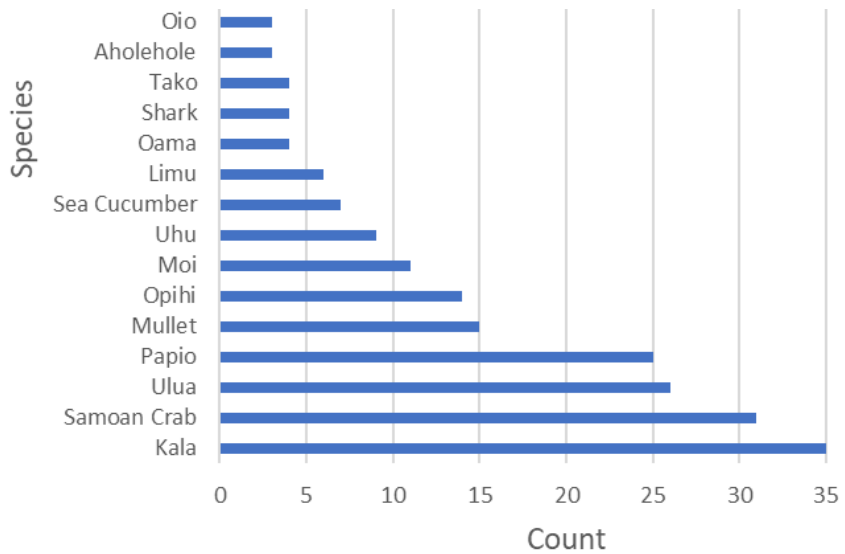


Figure 14. Fish species targeted during DOCARE investigations from 2014-2018 across the island of O'ahu

## DOCARE Observations and Investigations

Per Activity Code, the time spent monitoring for illegal activities (observations) and the number of investigations were positively correlated (Pearson's Correlation;  $R=0.55$ ;  $p < 0.01$ ; Figure 15).

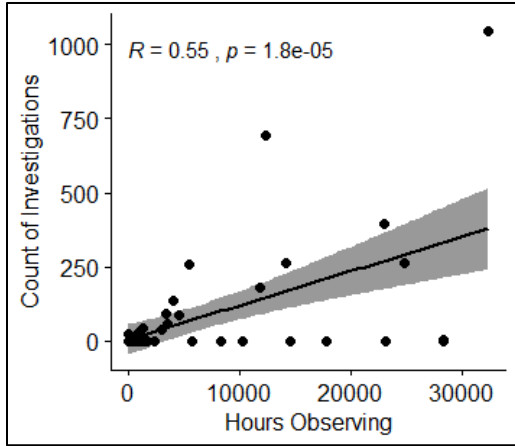


Figure 15. Correlation between DOCARE officer observations and investigations by Activity Code from 2015-2018 across O'ahu. Dots represent distinct Activity Codes. The Line represents the correlation coefficient, and the shaded area represents the 95% confidence interval

An analysis of trends in observations and investigations by month indicates that while March and December were high observation hours from 2015-2018, total investigations during these months were relatively low (Figure 16). In contrast, investigation counts were relatively greater in February and January, when observation hours were lower.

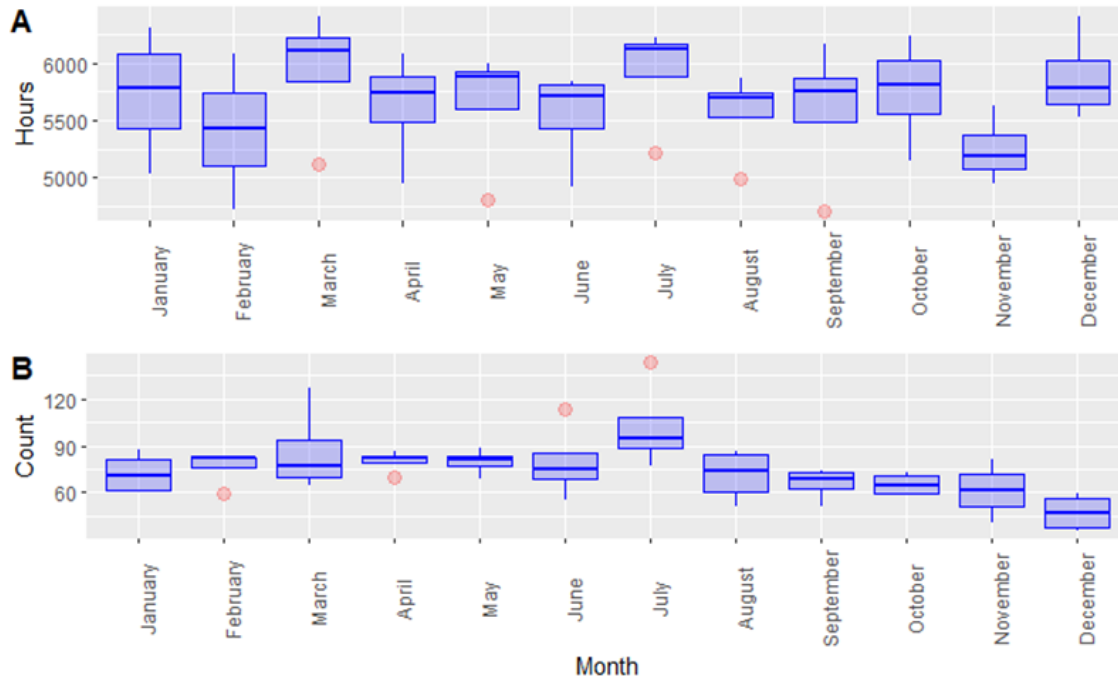


Figure 16. Occurrences of DOCARE observation hours (A) and investigation counts (B) by month from 2015-2018 across the island of O'ahu

A comparison of total 2015-2018 monthly observation hours and investigation counts suggests no correlation between observations and investigations in time ( $R=0.2$ ;  $p>0.05$ ; Figure 17).

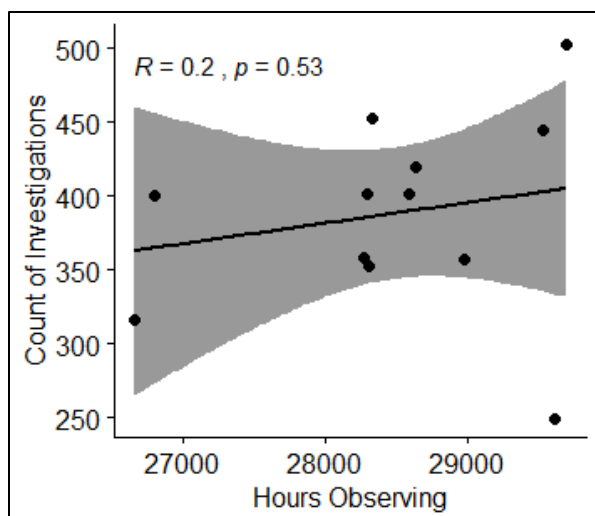


Figure 17. Correlation between officer observations and investigations by month from 2015-2018. Dots represent distinct Activity Codes. The Line represents the correlation coefficient, and shaded area represents the 95% confidence interval

### **DOCARE Enforcement Districts and Top Observation and Investigation Locations**

Through my spatial analysis, I identified the top investigation and observation locations in each District and found differences between these top locations. In District 1, the two most observed locations were the Maunaloa Bay Beach Park and the Maunaloa Bay Launch Ramp. In contrast, the most investigated locations were Ke‘ehi Small Boat Harbor and Ala Wai Small Boat Harbor. In District 2, the two most observed locations were Laniakea Beach and Aweoweo Beach Park, and the two most investigated locations were Ka‘ena Point State Park and Hale‘iwa Small Boat Harbor. In District 3, the two most observed locations were Barber’s Point Beach Park and Barber’s Point Beach Park Shoreline, while the most investigated locations were Pok‘ai Bay and Wai‘anae Boat Harbor. In District 4, the two most observed locations were Ahupua‘a ‘O Kahana State Park and Kahana Bay Launch Ramp Facility. However, the two most investigated locations were Kāne‘ohe Bay and He‘eia Kea Small Boat Harbor.

### **DOCARE Officer Demographics**

Of the officers surveyed (n=15 officers of 88% of all O‘ahu officers), 93% were born and raised in Hawai‘i, and 85% were born and raised on O‘ahu. Officers had lived on O‘ahu for a mean of 37±5.5 years (range 3 to 70 years), and those who were new to O‘ahu moved here from neighboring islands to pursue a job with DOCARE.

### **DOCARE Challenges and Opportunities to Improve Effectiveness from Interviews**

My interview respondents suggested that, since DOCARE formed in 1979, the division has always been underfunded and understaffed (n=9 respondents mentioned underfunding and/or understaffing). Additionally, DOCARE is hindered by several other challenges that inhibit them from being effective on the island of O‘ahu. Of the interview respondents, 50% thought that

DOCARE was not effective, and the other 50% believed that DOCARE was effective given their current resources. Still, these individuals believed there is room for improvement. Of the challenges brought up during interviews, I identified resources (n=9 respondents), courts (n=6), manpower (n=6), and duties (n=5) as the main limitations to effectiveness. Below, I summarize these challenges.

### Resources – Challenges

Resources related to issues with funding, infrastructure, or gear. These issues correlated directly to a lack of a sufficient budget for DOCARE (n=9).

From 2010 to 2019, despite a 3.85% increase in O‘ahu population and 50% increase in visitors, DOCARE’s annual operating budget only increased by 8% (“Hawaii Population” 2019; “DBEDT Quarterly Tourism Forecast” 2020; Tanaka, Miyashiro, and Kaulukukui 2012; DLNR 2018). DOCARE currently lacks the resources needed to add support positions and maintain facilities and vehicles to increase officer coverage and observations (Tanaka, Miyashiro, and Kaulukukui 2012). Interviews with DOCARE officers and affiliates indicated that this lack of funding (n=9) limits DOCARE’s ability to provide their officers with equipment that is necessary to perform their duties, balance emergencies with day to day activities, and hire and retain personnel. DOCARE officers also indicated that they operate with out-of-date technology (n=5), which makes it more difficult to log their operations, lookup license plates, track violators at night, and transition between the ocean and the mountain.

*“We need more funding to purchase equipment: radios in all trucks, Bluetooth for computers and phones, computer mounts, toolboxes, basic equipment for efficiency and safety.”*

*“We [are] coming up on 2020, and we are stuck in the 1990s as far as technology, trucks, [and gear].”*

For instance, instead of submitting reports from the field via smartphones or wireless-enabled laptops, officers must return to the baseyard to write and upload reports. Moreover, officers often used personal resources to maintain or upgrade equipment (e.g., paying to make modifications to vehicles, n=2) due to DOCARE’s inability to approve maintenance funds and slow pace when handling such requests (n=5).

*“If guys need special things like gear or improvements to trucks, it can take forever to approve the budget, and oftentimes, they dig into their own pockets to do what they need to.”*

Illegal and illicit activities related to natural resources occur at all hours of the day and night. Yet, DOCARE officers were, at the time of this study, only allowed to work from 7:30 am to 4:30 pm, seven days a week, leading to a lack of enforcement most hours of the day (n=5). Due

to this lack of 24-hour coverage, officers believed that offenders could predict their movements and time their illegal activities to occur outside of DOCARE monitoring hours.

*“Officers must work from 7:45 (leave the house) to 4:30 (back home); otherwise, they will have to be paid overtime – the Division can’t afford it.”*

*“Violators know our schedules. We have our overtime frozen right now. We cannot go out at night.”*

DOCARE distributes its operating budget of ~\$8 million across all islands. Yet, it must cover the costs of responding to unexpected natural disasters and other emergencies unless Federal or State agencies (e.g., NOAA or the Hawai‘i Tourism Authority) provide additional funds. Unforeseen emergencies or disasters can deplete the DOCARE operating budget by causing the division to pay for overtime hours, which compromises the ability to make necessary gear purchases or performing required maintenance (n=3).

*“Its things like [natural disasters] that divert us, and god forbid a hurricane hits us because that’s going to take a huge hit out of our budget. Often times, we seek federal reimbursement for those things, and that is a clunky, complicated process. And sometimes it is not worth it to go through that process because the fiscal year has ended and any reimbursement that comes in can’t be used by [DOCARE] and gets diverted to the general fund – and basically you did all that work for nothing.”*

For instance, in 2019, DOCARE was dispatched to respond to protests at the Mauna Kea Access Road on the island of Hawai‘i. These protests began in objection to the construction of the Thirty Meter Telescope at the summit of Mauna Kea due to the sacred nature of the mountain to native Hawaiians. Moving DOCARE officers to this site stripped DOCARE of operational personnel and reduced their ability to patrol for illegal activities.

*“For example, the ongoing TMT protests, I have officers up there 24 hours a day, seven days a week. This is diverting from our natural resources mission on the Big Island and is also costing us a huge chunk of overtime and equipment purchases.”*

DOCARE officers receive low salaries relative to other law enforcement opportunities in Hawai‘i, making recruitment a critical challenge (n=4). For instance, in 2020, a new officer’s starting salary with the Honolulu Police Department was \$66,900, while a recruit at DOCARE received \$44,544 (HPD 2020). It would take an officer roughly 20 years with DOCARE to begin making what a starting HPD officer makes (HPD 2020).

*“Our pay is low; if someone comes to us, it is to get their foot in the door with law enforcement. He is hoping that he is that much more attractive later on to shift to another law enforcement agency.”*

This difference in pay may cause qualified candidates to join county enforcement departments rather than DOCARE or use DOCARE as a steppingstone to a County job (n=3). As a result, DOCARE has had a hard time attracting and keeping talented individuals.

Many of the division’s trucks were past their service life and required frequent, costly outsourced maintenance (n=5). Maintenance activities took time away from patrols and reduced officer field activity time.

DOCARE is the only Hawai‘i State-level law enforcement agency. Thus, they are the primary source of enforcement for State lands and activities. When the State of Hawai‘i requests that DOCARE perform special duties (e.g., respond to natural disasters or prepare for and monitor protests), this reduces the ability of the agency to enforce rules and regulations related to natural resources proactively.

#### Resources – Opportunities

To address these challenges related to limited resources, DOCARE could focus on securing more funding from the State of Hawai‘i. DOCARE’s ability to obtain funds depends in part on the success of its lobbying activities at annual Hawai‘i State legislative sessions. Other Hawai‘i state agencies appoint individuals to attend these sessions and argue on behalf of their agency for more funding to carry out their operations. At the time of interviews, DOCARE did not have the resources to send such an advocate to the legislative session. Respondents felt that the State of Hawai‘i needs to hear the argument for increased funding of natural resource protection and preservation, given Hawai‘i’s precious natural resources and dependence on tourism. However, at this time, DOCARE has been allocated funds to fill their vacant officer and administrator positions. It is unlikely that the legislature will further invest in DOCARE until they utilize these funds by filling their vacancies.

Respondents also suggested that DOCARE might consider breaking its budget down into island-specific budgets to better allocate and understand use by island. Splitting up the budget could eliminate the need of each branch to request equipment or over-time and may allow each branch to attribute funds to their gear and projects as they see fit. This distribution practice can help with the overall allocation of funds within DOCARE and lead to more proactive budget planning.

#### Courts – Challenges

This section relates to issues with the sanctions for violations, prosecutors, defense attorneys, judges, or the court system overall (n=6 respondents mentioned these themes during interviews).

DOCARE officers prepare and submit evidence reports of their investigations along with their citations to the Hawai‘i State court system. These reports are also provided to the DOCARE legal representative (legal fellow) and the public prosecutors for use as evidence in court. When the environmental court schedules a DOCARE case, a public prosecutor, legal fellow, and DOCARE officer may all be present. Although Hawai‘i established an environmental court in 2014 to handle cases involving natural resources, all DOCARE cases are still handled poorly in the environmental court (State of Hawaii 2014). Bringing a violation to court is time-consuming, officers must create and revise photo reports, evidence reports, and tag and store evidence (n=8).

*“You would take a case, and a good case, where you caught the violator red-handed in complete violation, you’ve given the citation, and appeared in court, sometimes multiple times, and when the moment of truth comes to have a decision on the case - all the time and work results in a \$50 or \$100 fine. There is no great deterrence on that.”*

Officers communicated that defense attorneys are often successful in convincing judges to dismiss cases or provide lenient rulings for violators, such as simple trespass violation with a \$25 fine (Garrod 2019). Defense attorneys are also perceived as opponents of DOCARE’s efforts in the courts (n=2) because they point out perceived uncertainties in the officers’ actions, reducing the power of the evidence used against the violator.

*“The best defense attorneys will always ask what an officer did to educate that individual or the community prior to the violation, it is almost always impossible to prove, and people get off/cases get tossed.”*

*“If I don’t witness something going on with a resource case, the whole case is shot, so when I am called to other cases, I can potentially miss that offender, and that case goes without resolve.”*

Respondents also felt that natural resource cases are not priorities for judges and state prosecutors (n=5). In comparison to cases such as theft, arson, or assault, respondents explained that judges perceived environmental cases as less grave and are thus less valuable to assign the appropriate conviction. This lack of punishment then disables the deterring factor for repeat offenders.

As evidence to support this perception, officers mentioned that judges scheduled environmental affairs at the end of the day, which often results in dismissed cases because of the lack of time the court has to hear all cases.

*“Judges save the environmental violations until the end and have officers wait until the end of the calendar in that day – wasting time. Cases are dismissed on the diminished rule when the court doesn’t have time for them.”*

Respondents indicated that public prosecutors in Hawai‘i’s district courts are often new graduates and must scramble to fully understand all Hawai‘i Revised Statutes and Administrative Rules (n=3).

*“The prosecutors are fresh out of law school, they are only there for a short time, and aren’t very invested.”*

Prosecutors move out of their roles as public prosecutors with relatively quick turnover. Their inexperience, lack of time, and limited knowledge can lead to lessened sentences and dismissed cases because they do not understand what the ruling should be or do not have time to research the offense thoroughly. Moreover, the lack of time investment and research in these cases by prosecutors may lead to the misidentification of repeat offenders in the court system, allowing repetition of violations over time. DOCARE’s data entry system (EMIS) did not identify repeat offenders in their database. This system shortcoming meant that repeat offenders were not issued sanctions for the crimes committed on a scale that is appropriate to deter them from pursuing natural resource violations in the future (n=3).

*“It’s due to a lack of understanding and awareness from prosecutors.”*

### Courts – Opportunities

Some measures are already underway to address the challenges outlined above. In 2017, the Richardson School of Law at the University of Hawai‘i partnered with DLNR to position legal fellows in several of their divisions, including DOCARE (Creamer 2018). These legal fellows can fully invest their time and effort in understanding the Hawai‘i Administrative Rules as they relate to natural resource management and help to train prosecutors on natural resource violations (Creamer 2018). The University of Hawai‘i William S. Richardson School of Law (UH Law School) has designed trainings to educate judges on the importance of natural resources and the appropriate sanctions for these violations. This eight-hour course may deepen judges’ stake in environmental and resource violations cases by increasing their understanding of the importance of enforcement of environmental laws.

The DOCARE legal fellow (2018-current) has training in the biological sciences and understood the importance of these cases through his education and law degree. The DOCARE legal fellow works to promote buy-in from the prosecutors and judges and is almost always present in the courtroom when DOCARE brings citations to court. In the courtroom, this individual collaborates with prosecutors by encouraging them not to drop or amend cases. Additionally, the UH Law School can continue to offer trainings on an annual cycle to keep judges current with the seasonality of citations, updates to rules and regulations, as well as the importance of deterrence through proper court rulings.

*“[He] goes to court with the prosecutors to push them harder and push for prosecution and not amended convictions. \$50 is not a good enough fine. He is pushing for the conviction to be equivalent to the violations.”*

My interview data suggested that since the hiring of the legal fellow, there has been a shift in the way Hawai‘i district court prosecutors handle natural resource citation cases (n=5). Respondents noted that prosecutors are asking for the maximum penalty on natural resource cases, and judges are issuing more stringent punishments in terms of sentencing or a monetary fine. A new feature in DOCARE’s updated data entry system (CODY) is the identification of repeat offenders. Graduated sanctions for violations following repeat offenses is another direction the environmental court might take (n=2, Ostrom 2015) to increase violator deterrence. As individuals continue to commit offenses against natural resources, their punishments need to keep intensifying. Deterrence might not occur until offenders are issued a significant penalty (Ostrom 2015). Additionally, respondents suggested that if violators are issued community service on top of their fine, they may be less likely to repeat their offenses (n=2). Offenders who get off with simple fees can pay them off (e.g., with the sale of their fish catch). Taking time away from these offenders' livelihoods through the issuance of community service may increase compliance as a result (n=2).

#### Duties – Challenges

DOCARE officers often find themselves dealing with duties unrelated to their mission, which pulls their focus away from natural, cultural, and historic resources.

Through analysis of the observation and investigation data, non-natural resource issues consumed a large portion of DOCARE’s time from 2014 to 2018. About 50% of investigations were related to non-natural resource-related problems, and natural resource monitoring activities consume 46% of their time. Respondents confirmed this finding and emphasized that they spend many of their working hours investigating or monitoring for illegal activities such as thefts, infractions by the homeless population, moving violations, or commercial permit operations (n=9).

*“We get called out about 80% of the time to non-resource related issues. It takes away our ability to enforce resource cases.”*

Many respondents indicated that these activities are not reflective of traditional natural resource enforcer responsibilities and exact time and effort from the enforcement of natural resource violations, an especially critical problem given DOCARE’s limitations of funding and manpower (n=4).

*“We live in a dual role world right now. We are expected to be police officers, and we are expected to be resource officers. If we could go back to our mission statement, which is to enforce the safe use of all our State’s resources [and] go back to our roots, it would be much easier for us to be able to operate.”*

Specific duties also serve as time sinks for DOCARE. For example, Hawai‘i State Parks pressures DOCARE to enforce trespassing violations at Sacred Falls, an illegal yet frequently accessed hike on the west side of O‘ahu.

### Duties – Opportunities

To address issues with non-conservation related duties, DOCARE could establish formal agreements with other enforcement agencies on O‘ahu such as the County Sheriffs or Honolulu Police Department to draw some of these responsibilities away from DOCARE officers (n=2). DOBOR and State Parks can support DOCARE by locking gates and implementing monitoring systems (e.g., cameras). Transferring responsibilities to other agencies may help to free up time for DOCARE officers to focus on essential natural resource issues. The addition of gates and fences at closed hike entrances could deter more potential offenders and reduce DOCARE enforcement effort at these locations.

If divisions of DLNR can engage DOCARE in the enforceability of their rules and regulations before finalizing, there may be better overall enforcement and effort attributed to these new rules and regulations. Consulting DOCARE officers on rule development and changes at monthly branch meetings is a time-and-place appropriate setting for these meetings. Having a representative present at these meetings to discuss challenges and feasibility can aid in the understanding of rule enforceability as well as possibly contribute to enhanced collaboration.

### Manpower – Challenges

Manpower relates to the number of officers actively patrolling natural resources and enforcing conservation-related rules and regulations.

Respondents indicated that DOCARE was severely understaffed. In 2019 DOCARE O‘ahu employed 12 officers, four supervisors, and one branch chief. These officer numbers equated to one officer responsible for patrolling 173.5 km<sup>2</sup> and serving a population of about 61,255 residents. However, the number of active officers was dependent on the day of the week, time of day, and external factors such as sick days or vacation. The maximum capacity of DOCARE O‘ahu includes 40 officers, four supervisors (one per district), and one branch chief.

DLNR handles all of DOCARE’s hiring through their Personnel Office. The Personnel Office maintains staff positions, announces career opportunities, and keeps financial records. Respondents noted that at DLNR, the hiring process for civil service positions often takes

months, indicating that this procedure may require more time than other law enforcement agencies (n=2). The personnel office does not effectively communicate these vacancies and commits job board advertising errors that inhibit the division, such as posting a job at midnight (n=2). Mistakes like these contribute to difficulty recruiting potential officers, because the Honolulu Police Department may hire them before DLNR has handled their applicant paperwork.

*“With our most current recruitment, we had to put a cap on the number of applicants. And personnel released the position at 12:00 am at night, so a lot of people missed it. We got a lot of guys that applied that did not show up too. They messed it up for other people that wanted to apply.”*

*“The other portion is vacancies. There needs to be an easier way to fill our positions and get them posted faster and get ahead of recruitment rather than behind.”*

Funds allotted for these positions are only available to fund the jobs themselves, not the operating budget that accompanies an officer such as uniform, vehicle, cell phone, and laptop (n=1).

Officer respondents noted that due to their low numbers, they struggled to be proactive in their work. They reported that they spent most of their time responding to calls or complaints rather than actively monitoring locations around the island for resource violations, potentially leading to missed resource violations, reduced compliance, and increased degradation of natural resources (n=2). Findings from my 2020 survey indicated that many officers reported they spend 1-2 hours a day on paperwork and reporting. However, 42% indicated that they spend more than two hours on paperwork. This paperwork takes away from an officer's ability to monitor and enforce natural resource-related rules and regulations in the field.

*“We are in survival mode, waiting for relief. Actually, we are more like on life support right now - we are getting close to flatlining.”*

Interviews also suggested that DOCARE lacks many support positions. One secretary supports all DOCARE officers and administrators.

Results from the branch survey also demonstrated that officers spend, at times, more than 50% of their day responding to calls from the dispatcher. Officers in District 1 reported, on average, contributing 31% of their time responding to calls, officers in District 2 reported 37.5%, officers in District 3 reported 17.5%, and officers in District 4 reported >50%. This amount of time spent responding to calls can inhibit the time DOCARE spends actively monitoring for natural resource violations.

### Manpower – Opportunities

To fill DOCARE vacancies and increase interest in working for DOCARE, the State of Hawai‘i could raise the starting salary for DOCARE officers to assist in the recruitment and retention of officers. To find recruits and fill vacancies more rapidly, DLNR could create an expedited system for DOCARE recruits. If this is not possible, then DOCARE may consider hiring their own Internal Affairs or Human Resources personnel to perform hiring. However, DOCARE can only hire new officers as fast as they can get them into the academy, which runs roughly eight months. The academy was developed in 2018 to train recruited officers on the means of enforcement of natural, cultural, and historic resources. Beginning in 2020, this academy began training officers with no prior enforcement background, allowing DOCARE to recruit and train individuals based on their division standards and protocols. If DOCARE can add more recruits to this academy or run multiple classes at one time, they may be able to fill their vacancies more quickly. CODY, the new data entry system, was introduced to officers just a few weeks before the survey. Officers may have reported these long paperwork times because they were still learning how to use the CODY system. As experience and expertise with the CODY reporting system increase, I believe there may be a decrease in reporting time.

Respondents felt that DOCARE could add support positions to assist officers and administrators in operating quickly and efficiently (n=6). By adding such personnel, officers and the division can better focus on enforcement duties and work more effectively and efficiently. After filling all vacant officer positions, the division may also consider other support positions. These positions include Community liaison, IT Forensics, Outreach/Communications Coordinator, Department Assistant, Branch Secretaries, Dispatcher, Mechanic/Maintenance, Evidence Technician, Legislation Representative, and a Captain to Supervise Supervisors.

### Arrests – Challenges

Several respondents reported that DOCARE’s reliance on outside enforcement agencies such as the County Sherriff Office or HPD to transport and detain arrested individuals is a challenge to effective enforcement. DOCARE lacks vehicles with equipment to transport, no facility to house, and personnel and procedures to detain arrested individuals. Thus, if an officer feels that there is a situation in the field that warrants an arrest, they must first contact HPD or the Sheriffs to ensure that an officer can transport the individual in violation. However, DOCARE and these agencies are members of different unions and do not maintain the same radio channels. To contact these agencies, a DOCARE officer must first dial 911 (n=4). Then, the officer responding to assist DOCARE decides whether DOCARE can perform an arrest, a decision that DOCARE officers stated was dependent on the availability of outside enforcement officers or good relations with the responding officer or agency (n=4). One officer noted that there seems to be a lack of communication between law enforcement agencies on O‘ahu. Thus, DOCARE officers sometimes refrain from calling 911 to request assistance for arrests because they are unsure if an officer from HPD or Sheriffs may show up (n=3).

*“There is no mechanism in place to perform an arrest – you cannot tell someone they are under arrest if we physically cannot arrest them – because that is a violation of their civil rights. Thus, officers shy away from making arrests because they do not want to be turned down by HPD or the Sheriffs. The trucks aren’t equipped to transport bodies; there are no transport cages.*

### Arrests – Opportunities

To address this issue, DOCARE could pursue a Memorandum of Agreement (MOA) with HPD and County Sheriffs to establish a protocol for officers to assist with DOCARE arrests more directly when appropriate, other than calling 911 (n=5). Sharing radio frequencies between agencies may aid this relationship (n=1). Strong collaboration between enforcement groups can help in promoting effective enforcement for all groups (Walker, Foote, and Sullivan 2007; Hauck and Kroese 2006; Akella and Cannon 2004). Thus, building cohesiveness between agencies might strengthen communication. Further, this communication can assist DOCARE in enforcing its rules and regulations by increasing the perception of penalization for illegal activities and operations.

*“We need to figure out how to talk with HPD directly. If I need help from HPD – like with an arrest – I am essentially calling 911.”*

Alternatively, DOCARE can purchase and install transportation cages in their vehicles. However, this would still require some contract or communication between DOCARE officers and the HPD or Sheriff’s booking facility because DOCARE lacks a jail and holding facilities.

### Conflicts of Modern-day Law and Traditional Practices – Challenges

DOCARE officers reported that they often interact with individuals who claim to be practicing their “historic resource rights,” which may not align with present-day rules and regulations in Hawai‘i.

Many resource users of Hawaiian descent preserve their cultural practices, including fishing and gathering (Jokiel et al. 2011). In the past, Native Hawaiians used the Konohiki system to manage resources and created rules based on centuries of advanced knowledge and intimate relationships with these resources (Jokiel et al. 2011). This system has been primarily replaced by natural resource governance by the State of Hawai‘i. DOCARE, a State agency, upholds modern-day law and thus expects resource users to extract resources under the circumstances of modern law (n=3). Yet, some individuals of Hawaiian descent wish to practice their gathering rights in a way that conflicts with the State’s rules and regulations. Officers find it frustrating when individuals dismiss warnings or attempts at education because they are practicing their cultural rights.

*“We have resource users that are insistent on returning to the old system but do not recognize the old laws. No matter what guys are saying, ‘I am Hawaiian, I can do that’ - I have a problem with that. The hardest part is having them flat out refuse and say I am going to do it anyway.”*

*“You get a guy fishing with his kid, and the dad says that the kid is going to keep the fish because he caught it even if it is undersized to teach him that you got to eat what you catch. But the fish is undersized, and he is teaching the kid bad ways to fish.”*

#### Conflicts of Modern-day Law and Traditional Practices – Opportunities

To address this issue, DOCARE could focus on educating individuals who access Hawai‘i’s resources. Education might emphasize the rationale for rules and regulations (e.g., the connection between fish size limits and fish biology) and the function of these rules in protecting valuable natural resources. Education may lead to greater compliance because education promotes an understanding of rules and regulations, as well as the reasons for their implementation (Hauck and Kroese 2006). Performing these public education sessions in conjunction between DOCARE and other divisions of DLNR can bring forth greater collaboration and potentially more compliance through enhanced understanding of rules and regulations and their means of construction. Additionally, individuals who practice their traditional gathering rights under the modern laws of DLNR can serve as educators alongside DOCARE on the importance of safe and sustainable management practices.

#### Public Image and Recognition – Challenges

DOCARE struggles with their public image and recognition of officers in the field. Several respondents indicated that DOCARE is relatively unknown across the island (n=6).

*“One percent of people I talk to know what DOCARE is, maybe 50% of people I talk to even know what DLNR is.”*

This lack of recognition may discourage compliance with rules and regulations enforced by officers because individuals do not associate authority over natural resources and their regulations with DOCARE. Without public recognition, DOCARE may be challenged by offenders, leading to decreased morale and compliance. This decreased morale may discourage officers from performing their job to the best of their abilities, inhibiting their effectiveness.

*“We have a small number of officers, which makes it hard for the public to recognize us. We need more recognition.”*

*“We have an identity problem; people call us agents, officers, just all kinds of stuff. People look at us and think we are HPD with the police blue that we wear. I have gone into places, and people say, ‘since when does the fire department carry guns,’ ... people don’t know who we are.”*

As a result of low officer numbers, DOCARE's overall response time to violations observed by the public is slow (n=4). Responding too late, or not at all, may cause the officer to miss the violator. Additionally, this can lead to a lack of trust of DOCARE officers by community members because they feel that their concerns are not valued.

*"People are mad because officers don't respond on time."*

*"[DOCARE is] ten steps behind or 48 hours later."*

During this study, two major negative news articles came out against DOCARE. Officers have used GPS jammers to cover their locations from administrators (Daysog 2019a), and one officer lost their police powers when the County discovered this individual did not have an operational driver's license (Daysog 2019b). This kind of media coverage can skew the public's perception of DOCARE.

#### Public Image and Recognition – Opportunities

There are several strategies DOCARE might pursue to remedy the issue of low public recognition. First, by filling vacancies, DOCARE would put more officers in the field and likely respond to public complaints faster. Further, hiring more dispatchers who can focus specifically on phone calls and Tip-App complaints could help to address community complaints and place officers at the scene more rapidly. DOCARE might also consider pursuing more public events to introduce DOCARE to communities, which could assist in creating trust between officers and the communities in which they operate. DOCARE could also develop press releases to generate positive media coverage on the number and types of investigations and citations. Next, more public service announcements by the division on area closures and reminders of rules and regulations may bring the name DOCARE into more homes and associate them with conservation enforcement. Ultimately, the public can be a considerable resource for DOCARE as they may help to report illegal activities and assist in policing their resources through programs such as Makai Watch. For example, in 2020, DOCARE adopted new uniforms using the traditional game warden colors of tan and olive. These changes may help DOCARE become more visible to resource users while actively in the field. DOCARE is on the cusp of recreating their image. Utilizing new ways to spread awareness and understanding of this division is critical in their movements forward, especially when aiming for effective enforcement.

#### Morale

While challenges impede DOCARE's ability to perform their duties as conservation officers, officers still reported positive feelings about the job. In addition to the questions asked about effectiveness and challenges, I also asked officers what they loved about their jobs (n=7). Even while talking through the hardest points of being a conservation officer, these individuals still

came to work every day – something had to be driving them to be there. Knowing that these officers love what they do despite challenging circumstances inspires hope for the future of DOCARE. Below are some of the reasons officers have joined, and stayed with, DOCARE:

*“I get to be someone that stands up for the resources and preserves them for future generations.”*

*“I love the freedom that this job provides, my playground is huge, I can operate anywhere in the district, and design my own workday.”*

*“I love the diverse broad range of duties. I always tell people that a DOCARE officer is a combination of a game warden, forest ranger, park ranger, marine patrol officer, police officer, teacher, paramedic, counselor all rolled into one. When you look at our diverse responsibilities, in an 8-hour shift, you could be up in Honolulu Forest Reserve chasing poachers and in the same shift down in Chinatown doing fish dealer inspections and then go jump on our boat and do off-shore boating safety right off Waikīkī.”*

*“If you truly love what you do, then you're never going to work. And that is what I feel like at DOCARE. 4:30 comes way too quickly sometimes.”*

### **Measuring and Achieving Effectiveness**

The following section outlines criteria (C1-C7), indicators (I1, I2, I3...X), and metrics to quantify those indicators (M1, M2) that I developed to evaluate DOCARE’s effectiveness based on the results from spatio-temporal analyses, interviews, and my literature review.

C1 DOCARE identifies and addresses problem locations and major recurring violations

I1 Each district maintains a list of problem areas (developed from investigation database)

M1 Percentage of districts with a list (0-100%)

I2 Each district has an action plan to address problem areas

M1 Percentage of districts with an action plan (0-100%)

I3 Each district maintains a list of primary violations (developed from investigation database)

M1 Percentage of districts with a list (0-100%)

I4 Each district has an action plan to address primary violations

M1 Percentage of districts with an action plan (0-100%)

C2 The public is educated about DOCARE’s role and the proper use and importance of natural, cultural, and historic resources

I1 Officers use education first as a tool when addressing potential violations

M1 Percentage of times an officer used education per year (number of individuals educated /number of contacts = %)

- I2 DOCARE partners with other divisions of DLNR to participate in education sessions
  - M1 Number of sessions attended per year (summed count)
- I3 DOCARE is invited to speak about enforcement, proper use of, and importance of resources
  - M1 Number of invitations received per year (summed count)
- I4 DOCARE periodically engages with traditional and social media to positively publicize DOCARE activities
  - M1 Percentage of media in favor of DOCARE per year (Number of posts referencing DOCARE in a positive light / total number of posts referencing DOCARE = %)
  
- C3 Reactive monitoring (i.e., investigations) is rapid
  - I1 DOCARE officers respond to calls or tip app submissions as soon as they are received or at least within the same working day
    - M1 Number of calls or tip-apps received and responded to in the same day per year (percentage – from investigation database)
  
- C4 DOCARE has the resources needed to fulfill its mission
  - I1 Officers do not use personal funds for DOCARE needs
    - M1 (YES or NO)
  - I2 DOCARE receives additional funds from DLNR or divisions of DLNR each year
    - M1 (YES or NO)
  - I3 DOCARE receives additional funds from Federal or State Agencies outside of DLNR each year (e.g., NOAA or Hawai‘i Tourism Authority)
    - M1 YES or NO
  
- C5 Serious natural resource offenders are targeted and penalized appropriately
  - I1 Offenders receive graduated punishments
    - M1 Repeat offenders are identified (YES or NO)
    - M2 Repeat offenders receive more stringent punishment each time they are cited (YES or NO)
  
- C6 Officers spend most of their time proactively addressing natural resource issues via monitoring and education
  - I1 Officers spend their time monitoring for violations
    - M1 >50% of officer hours are spent monitoring for violations and not responding to calls (YES or NO)
  - I2 Investigations and citations are more focused on natural resources
    - M1 Investigations are natural resource-based >50% of the time – from investigation database (YES or NO)
    - M2 Citations are natural resource-based >50% of the time – from Legal Fellow (YES or NO)

C7 DOCARE hires and retains qualified officers and other personnel that support the agency's mission

I1 DOCARE fills officer vacancies

M1 Allotted officer positions for the division are filled (% filled)

I2 The academy continues training of recruited officers with no background experience

M1 (YES or NO)

I3 Most new hires/recruits continue their contracts with the division

M1 Percentage of recruits/new hires that continue their contract after a year (0-100%)

Utilizing these criteria and indicators on an annual basis can assist in reminding the division of opportunities for improving DOCARE's effectiveness.

## *Discussion*

As a result of this research, I found that coastal areas are the focus of most DOCARE observations and investigations and that DOCARE's monitoring activity misses many locations across O'ahu. DOCARE developed a mission statement focused on the protection of natural, cultural, and historic resources. However, DOCARE only spends about 50% of their time protecting these resources. Interview results indicated that DOCARE faces many challenges to their effectiveness, including a lack of resources, difficult recruitment and hiring processes, courts, and prosecution, and a fragmented public image. However, several opportunities exist to overcome these challenges, even if additional funds are not available.

### **Spatial and Temporal Patterns of Enforcement Observations and Investigations**

Understanding how temporal factors affect resource user behavior can support enforcement agencies, including DOCARE, in allocating their effort accordingly. For example, in the Cocos Marine Protected Area, officers patrolled based on lunar cycles, which optimized the number of contacts with illegal fishers (Arias et al. 2016). In interviews, several DOCARE officers noted that they investigated more fisheries violations in the dry season because improved ocean conditions attract higher concentrations of fishers. They also noted that more hunting violations occur in the wet season because hunters can more easily track game based on feeding habits.

However, fisheries investigations did not increase in the dry season relative to other months during odd years (i.e., 2015 and 2017; Figure 10). A coral bleaching event from June 2015 to January 2016 may have driven this pattern in 2015 (Rodgers et al. 2017). One study in Hanauma Bay, O'ahu, suggested that bleaching affected 47% of corals and led to a mortality of 10% of corals (Rodgers et al. 2017). Bleaching reduces overall habitat for coral reef fish, which can lead to fishers experiencing decreased fish catch (Pratchett et al. 2008). If fishers experience decreased fish catch, they might be uninclined to fish, thus leading to decreased fisheries investigations.

The Waikīkī-Diamond Head Shoreline Fisheries Managed Area (FMA) is closed to fishing in odd-numbered years (DAR 2020). I hypothesized that these closures may have reduced the overall counts of fisheries investigations in odd years. However, 82% of all FMA investigations from 2015 to 2018 occurred in 2015 and 2017, which suggests an increase in crime during FMA closure years, and that extra enforcement is required during these times. Potentially, DOCARE should plan for additional officer effort (observations) in this area during odd-numbered years. Yet, of all years at the FMA, 2015 and 2017 only make up 9% of the total officer observation hours at the FMA. Adding more officer observation hours to this area could increase enforcer presence, which may increase potential offenders' perception of detection likelihood and thus increase compliance (Arias et al. 2016; Guidetti et al. 2008). Allocating effort in this way may lead to more education opportunities and faster responses to illegal activities in the form of investigations.

### DOCARE Effort Allocation

Officers indicated that they spend significant time enforcing rules that do not align with the DOCARE mission. Roughly 50% of DOCARE investigations focused on issues not related to natural resources, a common challenge among conservation law enforcement agencies (Eliason 2011; Wellsmith 2011; Akella and Cannon 2004). Importantly, this means that DOCARE is utilizing funding earmarked by the Hawaii State Legislature for resource conservation to enforce parking, traffic, and human safety regulations and laws.

Monitoring or observing for illegal activity is critical to effective enforcement (Hilborn et al. 2006; Critchlow et al. 2017; Arias et al. 2016). Understanding the relationships between investigations (suspected illegal activity) and observations (routine monitoring) may ultimately assist DOCARE in improved allocation of their effort to locations with many illegal activities. Locations with a high intensity of investigations are likely to have a high intensity of illegal activities. Given that the presence of enforcement personnel may act as a crime deterrent (Ehrlich 1972), DOCARE could prevent crime by adding observation hours at these high investigation intensity sites.

My results indicate that both the most observed and investigated locations from 2015 to 2018 were Ka'ena Point State Park – Mokulē'ia, Ke'ehi Small Boat Harbor, and Ala Wai Small Boat Harbor (

Table 4; Table 5). These locations do not often display natural resource violations, such as parking issues. However, many locations of investigations are not present in the observation effort maps (**Error! Reference source not found.**; Figure 7), suggesting that DOCARE officers visit more locations in response to tips than when they freely choose to patrol for observation time. Locations of highest investigation intensity may attract officers during observations because they know that violations are likely in these areas. Yet, some locations may remain un- or under-monitored (i.e., have no or low observation intensity) because officers are unfamiliar with crime and resource use in these other areas. Field testing patrol posts by asking officers to conduct observations in areas with investigations but few or no observations (Critchlow et al. 2017) may be one way for DOCARE to assess whether officers are spending time in locations with the most illegal activity.

Another way to assess whether DOCARE is effective in their allocation of officer time is to compare natural resource use to officer effort. For instance, the Pacific Islands Ocean Observing System (PacIOOS) Ocean Tipping Points Case Study in Hawai'i (PacIOOS 2020) provides annual, spatially explicit estimated fish catch maps for near-shore O'ahu waters (Figure 18).

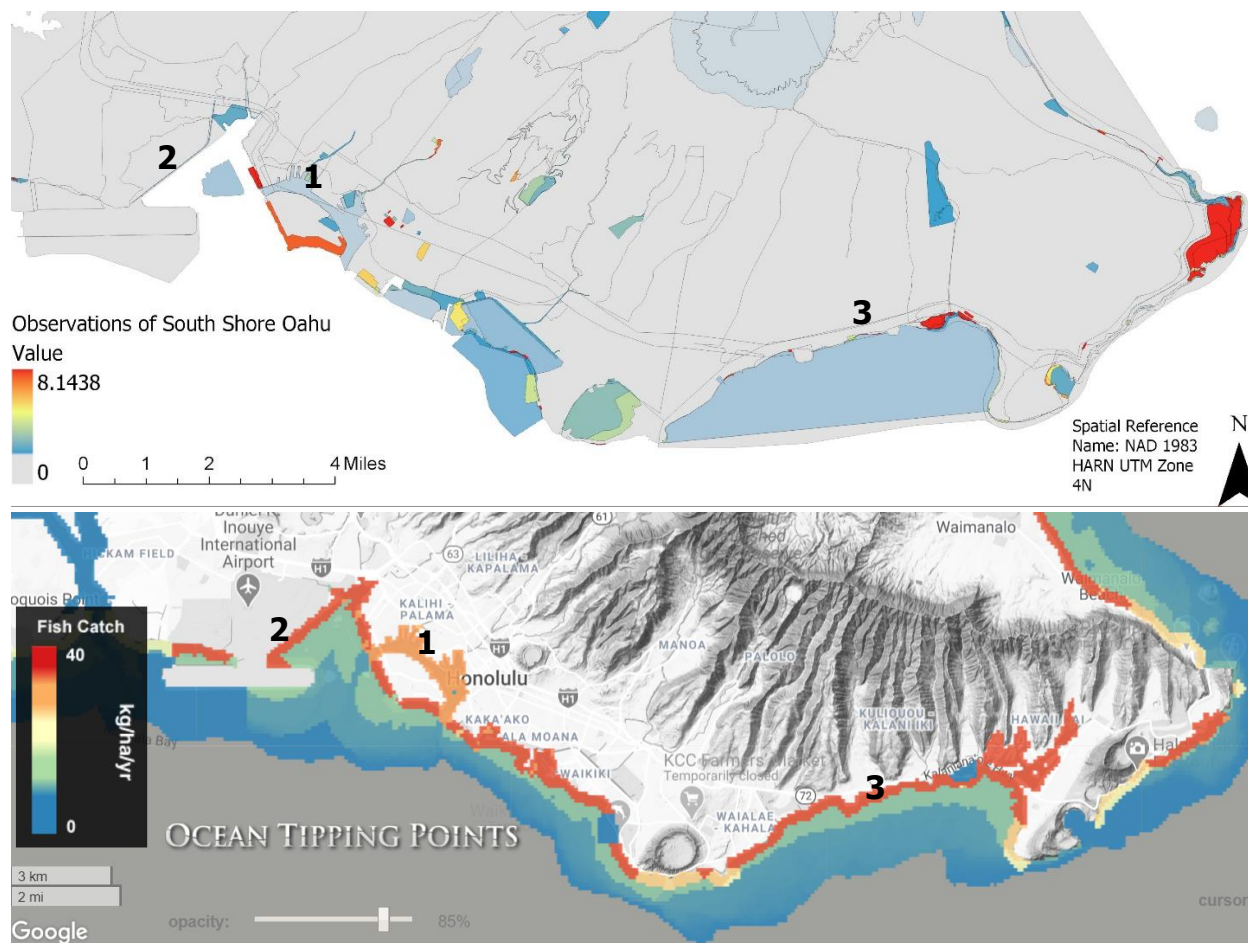


Figure 18. Comparison of DOCARE officer effort (observations 2014-2018, top) to fisher effort (bottom) across the island of O'ahu

A visual comparison of fish catch and observation intensity indicates that DOCARE effort covers some but not all of the high fisher effort locations. For instance, despite the high fishing effort in Honolulu Harbor (Figure 18, #1), along the coastal areas of the Honolulu Airport (2), and a majority of Maunaloa Bay (3), observation intensity is low or absent in these areas. Adding fishing patrols as a part of organizing DOCARE O'ahu by patrol type rather than district may lead to better alignment between officer and fisher effort (Hauck and Kroese 2006). Formalizing such analyses for fisheries and other mapped natural resource uses (e.g., hunting, recreation, reserves, or state park areas) may help DOCARE in identifying areas where they may currently be over- or under-allocating their efforts.

Optimizing officer patrol effort can assist in increasing the detectability of natural resource violations (Critchlow et al. 2017). Thus, looking forward, DOCARE may find value in further analyzing the relationship between officer effort and the demands of a particular location (e.g., geography, activities, time of year). For instance, a very steep location may be less observed than a flat one, even if the steep location is subject to more rule violations. The use of this data could help better allocate limited officer time to improve violation detectability.

### Major Challenges DOCARE Faces in Achieving Effectiveness

To address compliance issues, a conservation law enforcement agency requires resources, infrastructure, and information (Eliason 2011; Gaveau et al. 2009; Moreto and Lemieux 2015; Keane et al. 2008). My work provided a set of analyses on the type, location, and timing of DOCARE activities that can support DOCARE in addressing gaps in information. My interviews with DOCARE officers further indicated several barriers to operating effectively, including resources and infrastructure. Remediating these challenges through mechanisms such as better processes of recruitment and more substantial funding may assist in improving effectiveness by increasing compliance with natural resource laws and regulations in the State of Hawai‘i, ultimately protecting natural resources for future generations of residents and visitors.

These challenges are not unique to DOCARE and Hawai‘i. Other US conservation law enforcement agencies also struggle with substantial time dedicated to non-conservation related duties, difficulty recruiting and retaining personnel, conflict between state laws, lack of funding, and unsupportive courts (Eliason 2011; Wellsmith 2011; Akella and Cannon 2004). For instance, in Hawai‘i, staff who enforce natural resource regulations are unable to examine bags, containers, or vehicles of any recreational fisher unless voluntarily allowed access, or if probable cause warrants their inspection (HRS Title 12, Subtitle 5). This lack of inspection authority then makes it difficult for DOCARE officers to enforce bag and size limits for certain fish species that may be over-fished and illegally targeted, despite the State’s best efforts to create rules and regulations to protect and conserve these populations. Although interviews with DOCARE officers did not identify corruption as a major reported issue, Akella and Cannon (2004) identified corruption as an issue in other conservation law enforcement contexts, DOCARE does suffer from issues related to their reputation. While these adverse media events may not prove that there is corruption in the division, the media coverage on these events may lead the public to assume corruption within DOCARE (Doyle 2018; Lee 1982). A poor reputation may relate to reduced compliance of resources users when approached by DOCARE officers in the field, reduced reporting of illegal activities through the dispatcher or tip-app, and/or decreased morale for officers leading to less dedication in their activities, which may all affect DOCARE’s effectiveness.

### Effectiveness Measurement and Achievement

While the literature provides metrics by which to measure effectiveness - such as compliance or detectability – these metrics are not applicable in all contexts (Hilborn et al. 2006; Arias et al. 2016; Critchlow et al. 2017). I used concepts offered by DOCARE officers and affiliates to design criteria and indicators for the measurement of effectiveness specifically for DOCARE, and also compiled opportunities that may support meeting these criteria. DOCARE can now carefully develop approaches and interventions based on these suggested opportunities and measure their progress using the criteria that I developed. Some criteria may be achievable in the short term, while others may require long-term planning to make progress. To my knowledge, no

research has developed criteria for measuring conservation enforcement effectiveness. Thus, the criteria and indicators presented here can be adapted for use by other similar agencies to track and understand their effectiveness over time, as many of the challenges DOCARE faces are similar to those of other agencies.

Even if funds allocated to DOCARE remain limited, there are still several opportunities for the organization to work toward greater effectiveness. Creating more effective partnerships with communities can remediate the lack of enforcement manpower for DOCARE (Walker, Foote, and Sullivan 2007; Vaughan and Caldwell 2015; Berkes 2009; Hauck and Kroese 2006). By identifying high-intensity areas from the maps developed in my research and cross-referencing them with communities interested in enforcing their own resource use norms and rules, DOCARE can identify opportunities for an expansion of Makai Watch locations. Additionally, creating public service announcements, attending education sessions with other divisions, and promoting the DLNR Tip-App can increase public awareness and the eyes and ears of DOCARE without substantial additional funds.

### **Managing for Diverse Natural Resources**

The results from my study provide a more holistic approach to understanding enforcement movements in space and time, information that provides insight into the effectiveness of natural resource enforcement organizations. Previous studies have evaluated spatial and temporal trends of officer effort (Arias et al. 2016; Critchlow et al. 2017; Hilborn et al. 2006) or defined and quantified enforcement effectiveness (Wellsmith 2011; Critchlow et al. 2017; Arias et al. 2016; Hilborn et al. 2006). However, these studies focused on particular management targets such as marine protected areas (MPAs) or game management areas (GMAs, Walker, Foote, and Sullivan 2007; Arias et al. 2016; Critchlow et al. 2017; Hilborn et al. 2006; Hauck and Kroese 2006). In contrast, my research examined natural resource enforcement across diverse resource management areas with different rules and biophysical conditions. Understanding how enforcement moves across all of these resource systems is critical to understanding enforcement effectiveness of natural, cultural, and historic resources in a tourist-dependent, island setting. Further, the conservation and management of our world's finite resources is a key goal of natural resource governance. Conservation law enforcement agencies are often the last line of defense for these resources. Utilizing data and developing standards for achievement to reduce present challenges can help these agencies operate effectively with the hopes of preserving resources for future generations to come.

## *Limitations*

### **Spatial and Temporal Data and Analysis**

Here I consider some of the uncertainties throughout my analysis when interpreting the results of this study.

DOCARE location entry was not standardized, which may have limited the spatial accuracy of locations, observations, and investigations. DOCARE provided a 2014-2018 dataset observations and investigations. Officers entered this data in EMIS, often at the DOCARE office, after completing daily field operations. Officers were provided ‘fill-in-the-blank’ options for entering Classifications, but other data options, such as Activity Code and location, were selected from drop-down menus. If a location was not present, or an officer monitored across multiple locations, they either did not enter a location (because it was not in the drop-down) or put that location in an alternative ‘fill-in-the-blank’ column. I had to make subjective decisions regarding the meaning of these manually entered locations.

Additionally, officers may have selected different names for a location (e.g., “Hamakua Marsh” vs. “Hamakua Marsh Wildlife Sanctuary”), or a nearby location, rather than their actual location. An officer could have chosen a nearby location because of a lack of that location in EMIS. Thus, I may have identified incorrect locations when I tagged activity data with locations. Moreover, data entry differed between districts, which likely resulted in non-standard intensities that varied by district. In particular, one district (District 4) commonly entered locations in swaths (location A to location B) rather than a single location. Swath entry may have resulted in more apparent area subject to DOCARE activity in that district than actually occurred, but lower activity intensity at the locations of actual activity. Further, nearshore high-intensity areas likely reflect activity at off-shore locations because officers could not enter GPS points as locations to describe off-shore areas. The lack of GPS utilization likely increased the apparent activity intensity at harbors and boat ramps, and reduced the intensity in near-shore waters, a form of spatial bias.

My categorization choices were dependent on my perceptions. I used the DOCARE mission statement to define what is or is not a natural resource-related investigation. However, I could have better understood these relationships by performing this categorization with DOCARE officers and administrators. While I report that roughly only 50% of investigations related to natural resource violations, had I made these classifications alongside DOCARE, there may have been a higher concentration of natural resource-related investigations.

## **Interviews**

While I performed ten interviews in this study, more resource user interviews could have captured a more robust opinion about DOCARE and their enforcement effectiveness. Of the ten interviews, seven were officers or DOCARE administrators. At the time of this study, those respondents made up roughly 40% of the total DOCARE personnel for the O‘ahu DOCARE Branch. I would have liked to interact with and interview resource users on their perceptions of DOCARE, especially individuals or groups that lack an intimate relation with DOCARE. It is especially important to develop an understanding of how the public views DOCARE’s effectiveness is, especially when only 50% of DOCARE-affiliated respondents believed that DOCARE is effective.

### ***Recommendations for DOCARE***

I will provide this document to DOCARE so that they may use this information to increase their understanding of their movements across time and space, their effectiveness, and opportunities to improve their effectiveness. Below are specific recommendations for DOCARE that have emerged from my work.

#### **Critical Transition Period for DOCARE**

As DOCARE settles into their new uniforms and the division continues through its third round of the academy, DOCARE could consider measuring their current performance based on the criteria and indicators that I developed to understand their ability to enforce natural, cultural, and historic resources as defined by their mission. Using the findings from this exercise, they could then develop strategies to improve the degree to which they meet these criteria.

DOCARE may also wish to focus on improving how the public perceives them. Public awareness of officers in the field may increase through the addition of markings to DOCARE trucks. Adding decals to their trucks reading “Conservation Police” may help the public recognize DOCARE officers. However, marked vehicles in law enforcement tend to reduce an officer's ability to apprehend violators (DNR 2008). Thus, DOCARE should consider whether they would like to increase their ability to apprehend violators or increase their public recognition.

Another way to increase public recognition and create a positive image of DOCARE is through promotion via traditional and social media. News media is one of the significant sources of the perception of police legitimacy by the public (Marsh 1991; Surette 1998). However, news media can also quickly destroy this public buy-in. When news media covers incidents of police misconduct, these events can negatively affect public perception of those police divisions (Doyle 2018; Lee 1982). DOCARE can continue the presentation of positive media to increase not only public exposure to the division but a continued positive perception of DOCARE’s legitimacy.

Quickly responding to a call promotes more trust than the treatment of individuals by police (Van Craen and Skogan 2015). Thus, DOCARE may have a decreased level of trust not just because of their media incidents but because of their response time. If officers can increase their response time, the positive public perception of these officers may also increase. Officers mentioned that individuals did not trust DOCARE because they perceive officers as lazy and not being from the islands. Through my survey, I found that 93% of officers were born in Hawai‘i (85% born on O‘ahu). Having been born and raised in Hawai‘i, officers will most likely have a highly developed understanding of Hawai‘i resources and culture. Promoting this information (i.e., most officers are from Hawai‘i) as well as response time may attribute to a more positive perception of DOCARE by the public.

## **Spatial and Temporal Results to Assist Effectiveness**

Results from the analysis of DOCARE observation and investigation data have the potential to inform trends in violations and officer effort over both space and time.

Reviewing the major Violation Classes from the DOCARE investigation data indicates that the division primarily investigates cases falling under the jurisdiction of DAR and DOBOR. Encouraging collaboration between DOCARE and these two divisions might lead to active conversations on rule changes, rule construction, and enforcement effort and feasibility (Hauck and Kroese 2006). These conversations could begin to increase collaboration between divisions of DLNR and DOCARE.

Sharing these results with the divisions of DLNR, specifically DAR, DOBOR, DOFAW, and State Parks, is important for policymaking and may encourage additional funding to be shared by these divisions with DOCARE. For instance, DOCARE spends 27% of their time monitoring for DAR violations. Additionally, DOCARE initiates 19% of investigations under DAR rules and regulations. Understanding gear types (lay nets = 31% of investigations) and fish species targeted illegally (blue spine unicorn fish = 17% of investigations) can assist DAR in creating new rules to reduce the occurrences of violations. I believe that DOCARE needs to share these data with other divisions of DLNR to help conceptualize these violation types for groups responsible for the construction of rules and regulations.

In Florida, research shows that enforcers primarily dedicate time to specific tasks such as fisheries or wildlife enforcement (O'Connor Shelley and Crow 2009). However, DOCARE responsibilities require diverse time allocation rather than specific duties related to enforcement types. Other divisions of DLNR often have better access and personnel to apply for and manage grants (e.g., funding positions through the Hawaii Coral Reef Initiative, NOAA 2020). These divisions could consider providing additional funds to DOCARE to enforce their rules and regulations and monitor lands and waters under their management. This added funding is especially important when monitoring these locations (e.g., state parks and boat harbors) requires DOCARE to spend resources observing for and investigating non-conservation related crimes. If DOCARE, like Florida enforcers, can move from district enforcement to activity enforcement groups (e.g., fisheries, wildlife, forestry, boating) they may be able to cover more ground, collaborate more effectively amongst themselves and other enforcement agencies and divisions, and carry a better understanding of rules and regulations of these violation types.

Ensuring consistent effort over the island may help with overall DOCARE visibility and compliance with rules (Walker, Foote, and Sullivan 2007). Visibility and recognition are a challenge for DOCARE, as highlighted by respondents; this is a challenge in part because DOCARE is under-staffed. Utilizing officer effort to expand observations into locations with no

observation activity from 2015-2018 (Figure 5) may assist in changing communities' perception of officer effort and increasing DOCARE's visibility to a broader range of communities.

Sharing of the spatial and temporal findings presented in this thesis during the DOCARE academy may help recruits understand what types of investigations occur on O'ahu. Sharing high importance areas based on their intensity of observation hours or investigation counts at those locations is essential and can help recruits understand patterns of violator movement and district violation trends. If DOCARE utilizes the spatial results of where potential illegal activities are occurring and the types of these violations, they can create appropriate action plans for their districts on O'ahu.

To provide DOCARE with a spatial understanding of where investigations occur and where DOCARE Oahumonitors for potentially illegal activities, I will print and share maps generated from by research with DOCARE using research grant money from my Kulana Noi'i Award (Biocultural Initiative of the Pacific 2020). Providing these location-specific data can show DOCARE where potential crimes and observation activities are occurring and present more spatially explicit information than available from analysis of officer perceptions.

### **Opportunities for Implementing Recommendations**

Many factors influence DOCARE's achievement of effectiveness. Meeting all criteria defined during my research has the probability of being very expensive (Nøstbakken 2008). While DOCARE has not indicated how much additional funding they require to purchase equipment, add infrastructure, maintain vehicles, and pay overtime, nine respondents indicated that a lack of resources is a crucial challenge for DOCARE. However, merely providing increased funding to a conservation enforcement agency may not improve effectiveness if other significant challenges are not addressed (Akella and Cannon 2004).

DOCARE's funding is limited, but the actions needed to make progress toward achieving effectiveness do not always have any associated costs. For instance, promoting education about the importance of DOCARE and natural resources. Attending community meetings alongside divisions of DLNR such as DAR can help promote knowledge of fisheries, the rules and regulations in place to protect them, and DOCARE's intentions of protecting them (criterion 2).

If DOCARE ultimately wishes to receive more funding and resources, they first must utilize the funding and resources DLNR has provided to them. This utilization entails moving forward with the academy and filling position vacancies, which may show DLNR administrators that DOCARE needs additional funds, thus supporting major concerns by officers that DOCARE is under-resourced. Doing so quickly while also choosing qualified candidates can also assist DOCARE in meeting criteria related to manpower.

## *Conclusion*

Circa 2020, DOCARE officers, administrators, and affiliates believed that DOCARE faces significant challenges that impede the division's achievement of its mission statement, but also thought that there were several available opportunities to overcome these issues. This research, for the first time, set forth to understand DOCARE's effectiveness and generate a set of criteria and indicators that can track DOCARE's progress toward increased effectiveness in enforcing natural, cultural, and historic resource laws in Hawai'i. DOCARE can utilize the results of this study to develop actions that will move them toward greater effectiveness. For instance, it may be critical for DOCARE to change their operating procedures and public image. Developing strategies to achieve less costly criteria is feasible over the short term while securing additional funding should be a longer-term goal.

The results of this research contribute to a broader understanding of natural resource enforcement effectiveness in resource-limited tourist-dependent islands as well as provide a methodology for utilizing enforcement data to understand enforcement effectiveness more thoroughly. Promoting enforcement effectiveness and understanding barriers to this effectiveness may help to achieve enhanced natural resource governance in Hawai'i and other similar systems. Utilizing spatial and temporal patterns can provide insights to officer movements and increase the potential for taking action to shape improved operations and effort.

By conducting these types of analyses, other conservation law enforcement agencies can further understand personnel movements, effectiveness, and their own similar and unique challenges. Without the ability to understand effectiveness, let alone track it over time, there may be no improvement in conservation, and challenges may continue to plague natural resource conservation enforcement agencies. Using the definition of enforcement and the means to measure enforcement effectiveness potential, as outlined in this study, can serve as examples or baselines for other agencies worldwide.

## Appendices

### Appendix 1. Coding dictionary for interviews

Coding Theme	Sub Theme	Definition
Background		Background on individual officers, how they became part of DOCARE, why they are DOCARE officers, and where they are assigned.
	Demographics of Officers	Information on the Officer's background
	Recruitment	How the officer was recruited to work at DOCARE
	Love About Job	What the officer loves about their jobs
	District Assignment(s)	Where the officer has been or is assigned
Operations and Effort		Operations and effort of DOCARE in their monitoring, investigating, citing, and court rulings
	District Trends/Background	Patterns specific to districts
	Sanctions/Courts	How Officers interact with the court system
	Information Exchange	How officers exchange information between shifts
	Operations/Duties	Officers operations, duties, or assignments
	Gear	Officer gear specific to the job
	Patrolling Effort	Accounts of the effort allocated to patrolling, and observations
	Enforcing Rules	How officers enforce specific rules or regulations
Challenges		Challenges that impede DOCARE from being effective
	Dislike about Job	What the officers dislike about the job
	Sanctions/Courts	Issues with the sanctions for violations or the court system
	Administration/Morale	Concerns about administrative backlash and declines in overall officer morale
	Manpower	Issues of lack of manpower and the manpower that exists today
	Public Image and Recognition	Issues of DOCARE identity and not being recognized as natural resource law enforcement
	Duties	Issues of irrelevant duties
	Conflicts of Modern-day Law and Traditional Practices	A clash between the cultural rights of local and native Hawaiians and present-day law and historic resource rights
	Resources	Issues with funding, infrastructure or gear directly related to a lack of a sufficient budget
	Communication	Problems with communication between officers, other divisions of DLNR, administration, etc.
	Arrests	Issues with Arrests and Jailing
Illegal Activities		Illegal Activities cited and observed by DOCARE
	Common Violations	Most cited or observed violations
	Violators	Demographics of violators
	Worst Offenses	Offenses that are misdemeanors or other
	Locations	Locations where illegal activities typically occur
Opportunities		Opportunities to improve DOCARE

	Makai Watch	Opportunities for Makai Watch integration
	Community Support/Outreach	Opportunities to increase community support and outreach
	Resources	Things that should be funded or implemented to relieve officers' stresses
	Sanctions/Courts	Opportunities to either increase sanctions or improve court dispositions
	Transition	The concept of the transition has to do with a rebranding of DOCARE
	Manpower	Increase Manpower to increase compliance
	Trainings	Additional trainings to improve officer effectiveness in the field and officer knowledge, including academy
	Collaboration	Collaboration with other offices or police forces
	Rule Making	Change the way rules are made or communicated to improve enforcement
Effectiveness		How DOCARE and associated individuals view DOCARE effectiveness
	Definition	What is the officer's definition of enforcement?
	Effective?	How good of a job does the officer feel that DOCARE is doing towards this definition?
Makai Watch		Information relevant to Makai Watch programs and respondents
	Locations	Locations for consideration for Makai Watch Program integration
	Challenges	Challenges in Makai Watch Communities
	Recruitment	Recruitment of Makai Watch Communities and Volunteers in those Communities
	Enforcing Rules	How Makai Watch enforces rules in their communities
	Collaboration	How Makai Watch collaborates with Community and DOCARE and other organizations
	Opportunities	Opportunities for improving enforcement in communities, or proper Makai Watch integration
Legal		Information relevant to the legal fellow and legal practices
	Background	Background on the DOCARE legal services and the fellow
	Cultural Shift	A cultural shift from not supporting DOCARE enforcement to now supporting DOCARE citations
	Challenges	Problems with the legal system and carrying out rulings for NR violations
	Sanctions	The ruling for violations of NR and challenges
	Operations	How the legal side handles DOCARE violations in the courts



**University of Hawai'i Mānoa**  
Cole Hendrickson, MS Student  
Officer Survey 2020  
O'ahu Branch of DOCARE

*Project title: Regulation and Enforcement Effectiveness of Natural Resources on O'ahu, Hawai'i*

1. **Where did you grow up, where were you raised?**  
\_\_\_\_\_
2. **How long have you lived on O'ahu?**  
\_\_\_\_\_
3. **When did you start with DOCARE (year or approximate date)?**  
\_\_\_\_\_
4. **Did you transition to DOCARE through the academy or outside law enforcement agency? (circle one)**  
ACADEMY or OUTSIDE LAW ENFORCEMENT AGENCY
5. **If you answered OUTSIDE LAW ENFORCEMENT AGENCY for Question 3, please state the agency below:**  
\_\_\_\_\_
6. **What district are you currently assigned?**  
\_\_\_\_\_
7. **What districts have you been assigned previously?**  
\_\_\_\_\_
8. **How many hours a day (on average) do you spend on general paperwork and/or CODY (circle)?**  
0    1-2    2-3    3-4
9. **What percentage of your day is devoted to responding to dispatcher phone calls, tip-app complaints, or complaints from your district (circle)?**  
0-5    5-10    10-15    15-20    20-30    30-50    >50%
10. **What is/are the biggest challenge(s) you face as a DOCARE officer?**  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
11. **How would YOU solve this/these problem(s)?**  
\_\_\_\_\_  
\_\_\_\_\_



**University of Hawai'i Mānoa**  
**Consent to Participate in a Research Project**  
Cole Hendrickson, MS Student

*Project title: Regulation and Enforcement Effectiveness of Natural Resources on O'ahu, Hawai'i*

**Interview Questions**

**Subjects:** DOCARE Officers

*Interview questions will follow a semi-structured format with questions designed to direct conversation rather than be followed chronologically and exclusively.*

1. Where did you grow up/ were raised?
2. When and why did you become a DOCARE officer?
3. Did you become a DOCARE agent through the training academy or outside police department?
  - a. If yes to police department, which police department did you transfer from?
4. What district are you currently assigned?
  - a. Have you been assigned other districts previously?
5. What do you love most about your job, and what do you dislike most about your job as a DOCARE officer?
6. Please describe your typical day on the job.
7. How do you spend your time at work, daily?
8. When you see someone in violation of regulations, what do you do?
9. How do you decide whether to issue a citation? If you choose not to issue a citation, are there other ways to improve compliance of that individual (e.g., through discussion)?
10. What violations have been most common over the last five years? Has the number or type of violations changed over time? Why?
11. Do you think that the sanctions for violations are appropriate for the violations? Why or why not? Does this change your strategy with respect to your decision to issue a citation?
12. How do you choose where to patrol, how long to spend in each location, and what to do there?
13. What parts of the island tend to experience the highest amount of violations, and why? What kind of violations occur there?
14. What parts of the island tend to experience the least amount of violations, and why? What kind of violations occur there?
15. Has the location of violations changed over time? If so, why?

16. According to your observations, are certain ethnicities, ages, economic classes, or residents/tourists more likely to violation rules? Who is most likely to receive a citation of they are in violation of these rules?
17. Do you think that certain parts of the island are over- or under-patrolled by DOCARE? Which ones? Why or why not?
18. What violations are hardest to detect?
19. How do you hand off information to other officers between shifts?
20. What are the most effective strategies to increase compliance with rules and regulations?
21. How would you define effectiveness for DOCARE? How would you measure this effectiveness?
22. Do you think that DOCARE is effective at meeting its mission statement? Why or why not?
23. What can DOCARE do, and what can individual agents do, to become more effective?
24. What are the biggest limitations to effectiveness for DOCARE and individual agents?

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