

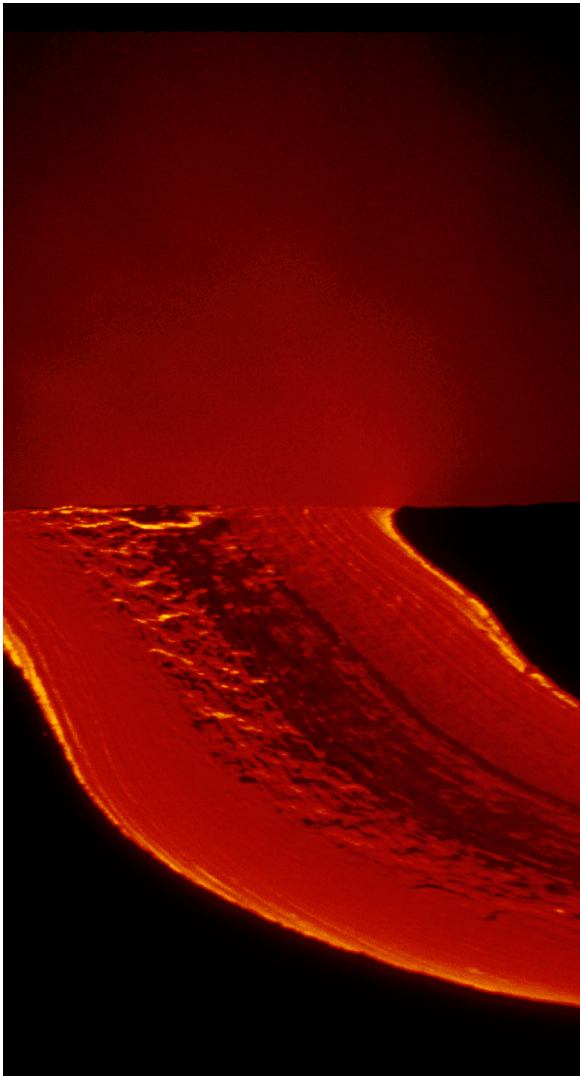
THE ECONOMIC RESEARCH ORGANIZATION  
AT THE UNIVERSITY OF HAWAII

PROJECT ENVIRONMENT

## CHARACTERIZING HAWAII'S NATURAL RESOURCES MANAGEMENT SECTOR: JOBS, EDUCATION, SALARIES, AND EXPENDITURES

Update to the 2015 report titled "Recent Trends in Hawai'i's Green  
Economy: Agriculture, Energy, and Natural Resource Management"

AUGUST 30, 2019





# UHERO

THE ECONOMIC RESEARCH ORGANIZATION  
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## **Characterizing Hawai'i's Natural Resources Management Sector: Jobs, Education, Salaries, and Expenditures**

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## 1. EXECUTIVE SUMMARY

This report provides an update to the 2015 “Recent Trends in Hawai‘i’s Green Economy: Agriculture, Energy, and Natural Resource Management” publication, the second update since our original report in 2012. With financial support from Hau‘oli Mau Loa Foundation and research assistance from The Nature Conservancy, the University of Hawai‘i Economic Research Organization was tasked with analyzing survey data on economic indicators collected from natural resources management agencies across the state. Data on those indicators were also obtained for the agriculture and energy sectors from publicly available data sources, where available, given their importance to future sustainability in Hawai‘i. Major findings across these sectors are as follows:

- Hawai‘i’s NRM jobs were at least 4,697 in 2018, 33% higher than reported for 2014, which is equivalent to an annual growth rate of roughly 7%. This is partly due to the fact that the number of survey respondents was 9% higher in 2018, likely indicative of ongoing expansion of the NRM sector.
- According to survey data, Hawai‘i’s NRM expenditures were at least \$542 million in 2018, roughly equal to expenditures reported for 2014.
- Most NRM agencies in Hawai‘i reported that the average education level across job types within the NRM sector is at least a 4-year bachelor’s degree.
- Starting salaries have been increasing in Hawai‘i’s NRM sector, with 59% of survey respondents reporting that administrative support staff start at \$41,000/year or higher, 49% reporting that field technicians start at \$41,000/year or higher, 77% reporting that professional and managerial employees start at \$51,000/year or higher, and 77% reporting that executives start at \$61,000/year or higher in 2018.
- Agriculture expenditures in Hawai‘i have declined in recent years, but the total number of farms continue to increase. Average farm size appears to have bottomed out, which may be an indication that the transition from large-scale to smaller diversified agriculture is slowing down.
- Despite a recent decline in Hawai‘i’s energy sector expenditures, energy jobs have continued their upward trend.

These findings can help inform decision-makers of the current contribution and future potential of these sectors. In particular, they suggest opportunities to strengthen Hawai‘i’s economy and sustainability at the same time:

- Local training and education programs to match anticipated green job growth, especially in natural resources management. While 83% of survey respondents offered internships, fewer than 30% offered fellowship opportunities.



- Encourage pursuit of the most desirable college majors for NRM careers: natural resources management, biology, environmental studies, botany, ecology, Hawaiian studies, communications, marine biology, geography, environmental law.
- Stimulate interest in post- baccalaureate degrees in NRM-related fields. Higher levels of education are becoming desirable in the NRM sector for all job types.
- Encourage the continued development of public-private partnerships (e.g., The Hawai‘i Association of Watershed Partnerships) to maximize the benefits generated by the effort and resources being invested in the NRM sector by individual organizations.
- Continue to invest in valuation of the state’s natural capital to help policy makers, business leaders, and the public better understand their value and make appropriate investments in maintaining or improving the state’s natural resource assets.

## 2. BACKGROUND

In 2012, The University of Hawai‘i Economic Research Organization (UHERO), in cooperation with The Nature Conservancy and Hau‘oli Mau Loa Foundation, published a report (hereafter referred to as the “2012 NRM report”) characterizing the natural resources management (NRM) sector in Hawai‘i. The analysis was conducted using survey data collected from agencies identified as being part of the NRM sector in 2011. Since then, the survey has been conducted twice, once in 2014 with results published in the “2015 NRM report”, and again in 2018 (this report). Because natural resources are a key component of Hawai‘i’s culture and economy, we hope that identifying trends in the NRM sector will help to fill a current information gap and facilitate an integrated policymaking approach.

## 3. METHODS

This report describes various trends in Hawai‘i’s NRM, agriculture and energy sectors, including four key indicators: total expenditures, employment, salaries, and education levels.<sup>1</sup> Trends in agriculture and energy were constructed from publicly available federal and state data sources (Table 3-1),<sup>2</sup> so not all metrics were available for each sector. In 2018, a survey (see the Appendix) was disseminated for the third time to 255 organizations engaged in one

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<sup>1</sup> GDP—the net value of production for a given sector, i.e., the total sales after subtracting purchases from all other sectors—is often viewed as one of the most comprehensive measures of a particular sector in the economy. However, such a metric, which requires dollar values of produced goods or services, is not particularly amenable to characterizing the NRM sector because the ecosystem services and goods generated or protected by NRM efforts are typically not traded in conventional markets.

<sup>2</sup> Data on expenditures and salaries were adjusted to 2019 dollars using an inflation calculator available online at: <http://www.bls.gov/cpi/cpicalc.htm>.

or more aspects of natural resources management in Hawai'i. Approximately 42 percent or 106 out of the contacted organizations responded to 11 questions related to NRM expenditures, employment, employee characteristics, and salaries.<sup>3</sup> No major changes were made to the survey questions since the 2015 NRM report. While the 2018 results are emphasized in this report, some of the 2011 and 2014 survey results are included for comparison.

**Table 3-1. Data sources for economic metrics by sector**

Sector	Expenditures	Employment	Salary	Education
Agriculture	USDA (2019)	No update	BLS (2019a)	No update
Energy	EIA (2019)	BLS (2019b)	N.A.	N.A.
NRM	This report	This report	This report	This report

N.A. = not available

USDA = U.S. Department of Agriculture

EIA = U.S. Energy Information Administration

BLS = U.S. Bureau of Labor Statistics

The trends highlighted in this report complement several recent publications that similarly aim to characterize Hawai'i's green workforce to various degrees (CREC, 2008; DLIR, 2010; DLIR, 2015). These studies, while valuable in their own right, use broad definitions for their job counts and thus include many jobs that would not necessarily be classified as part of the NRM sector. The objective of the current report is to analyze trends in the NRM sector in particular, which may be viewed as a subset of the state's green economy.

## 4. NATURAL RESOURCES MANAGEMENT SECTOR OVERVIEW

In this report, *natural resources management* (NRM) refers to the activities and employees that support and care for natural lands, air, freshwater and marine systems in Hawai'i. This includes fieldwork, science, research, regulation, planning, protection, management, hazard mitigation, climate change mitigation and adaptation, communications, outreach, decision-making, policy, education, training, and administrative support.

### 4.1. Employment in the NRM sector

In 2018, NRM jobs totaled 4,697 or 44 jobs on average per organization, with a standard deviation of 156. Total FTE employees ranged from a low of 18 for county agencies to a high of 1,452 for state agencies, while average FTE ranged from a low of 3 per county agency to a high of 290 per state agency. Number of jobs for each subcategory are detailed in Table 4-1 and illustrated in Figure 4-1. For the entire NRM sector, 1,154 FTE positions were gained since 2014, equivalent to a 7.3% annual growth rate (see Fig. 4-1). This is an order of magnitude higher than the 0.27%

<sup>3</sup> While this is not necessarily a representative sample, we feel that 42% is an acceptable response-rate.

growth rate predicted by survey respondents in 2014. Looking forward, survey respondents expect a modest growth rate of 0.54% over the next five years, equivalent to 127 FTE positions.

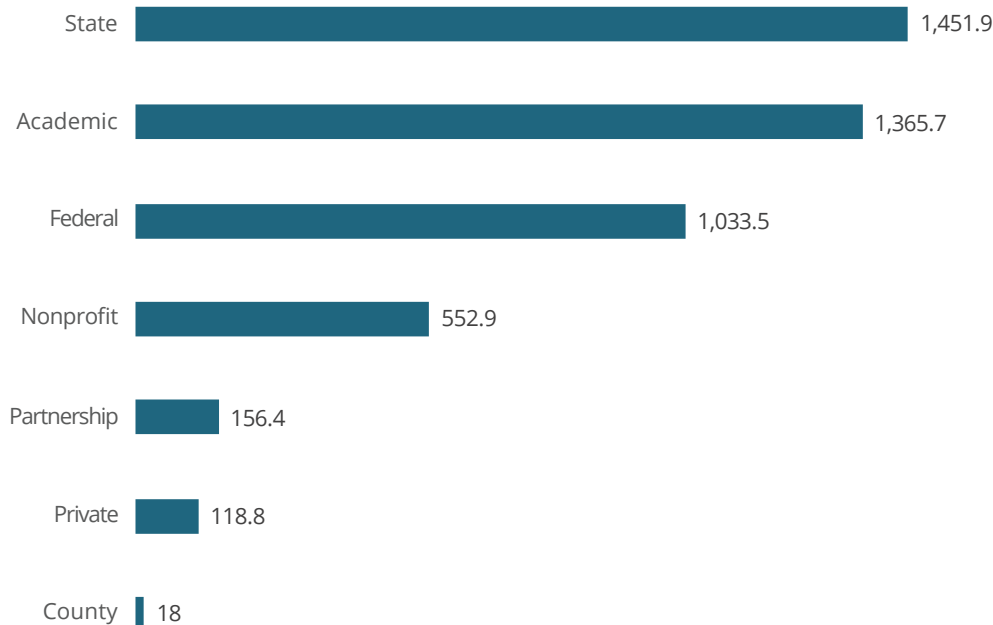
**Table 4-1. Employment (FTE) in the NRM sector, 2018**

Category	Respondents	Total	Mean	St. Dev.
Entire NRM sector	106	4,697.1	45.6	155.7
State <sup>a</sup>	5	1,451.9	290.4	422.9
Academic	18	1,365.7	80.3	277.5
Federal <sup>b</sup>	18	1,033.5	60.8	70.8
Nonprofit	30	552.9	18.4	41.2
Partnership	13	156.4	12.0	8.9
Private	16	118.8	7.9	9.0
County	6	18.0	3.0	3.1

a The FTE estimate for the State Department of Health was obtained from the State Executive Biennium Budget ([https://budget.hawaii.gov/wp-content/uploads/2018/12/18.-Department-of-Health-FB19-21-PFP.ef3\\_.pdf](https://budget.hawaii.gov/wp-content/uploads/2018/12/18.-Department-of-Health-FB19-21-PFP.ef3_.pdf)).

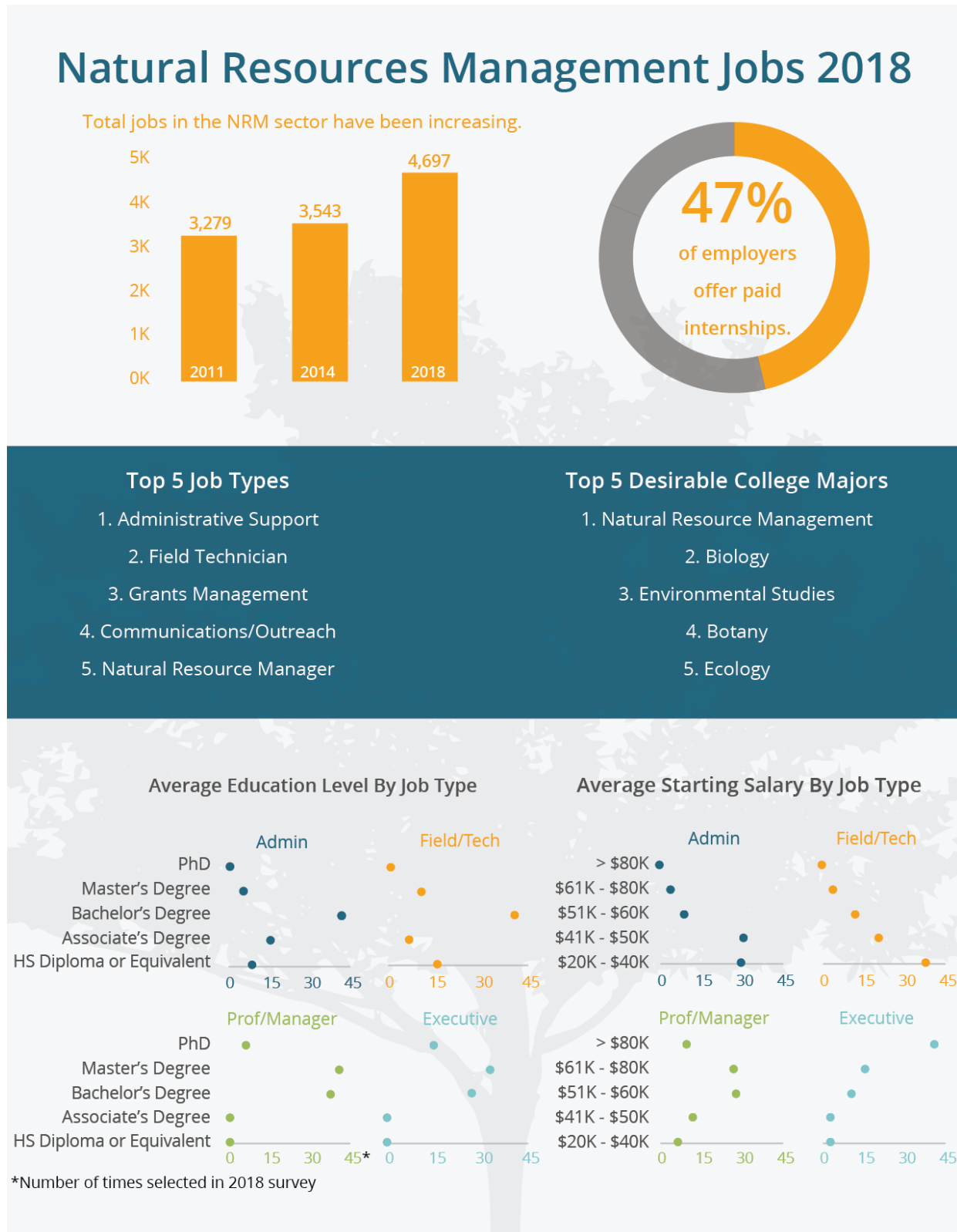
b The FTE estimate for the National Park Service was obtained from the FY2019 NPS Budget Justification Document (<https://www.nps.gov/aboutus/upload/FY2019-NPS-Budget-Justification.pdf>).

**Figure 4-1. Employment (FTE) in the NRM sector, 2018**



Respondents were also asked which of 20 NRM job categories were included within their respective employee groups. The most selected categories included administrative support (64), field technicians (63), grant managers (61), communications/outreach (57), and natural resource managers (53), nearly identical to the results in the 2012 and

**Figure 4-2. Trends in NRM jobs: numbers, job types, college majors, education, and salaries**





2015 NRM reports (see Fig. 4-1). Survey participants were also allowed to submit “other” job types not captured by the suggested categories. Responses to this question included the following: educational program manager, field program manager, educator, plant and animal quarantine specialist, liaison, graphic designer/ animator, instructional design specialist, hazard/resilience specialist, information manager, collections manager, collections technician, wildlife rehabilitation professional, director of conservation, land stewardship manager, farmer, community coordinator, public relations specialist, mediator, human resources manager, recruiting coordinator, facility manager, employment coordinator, director of finance, director of strategy, director of impact, groundskeeper, tour guide, teacher, horticulturalist, agriculture specialist/extension agent, transportation maintenance supervisors and workers, legislator, graduate research assistant, plant propagation specialist, field team leader and assistants, multiagency coordinator, forester, herbicide applicator, equipment operator, and nursery worker. Forty-seven percent of employers offered paid internships (see Fig. 4-1), compared to 49% in 2014, while 17% offered longer-term paid fellowships, compared to 22% in 2014. The complete data set on job types, internships, and fellowships is summarized in Table 4-2.

**Table 4-2. Job types, internships, and fellowships in the NRM sector, 2018**

<b>Job Types (Number of times job categories indicated by respondents)*</b>					
Administrative Support	64	Bookkeeper	38	Technology/Info Systems	23
Field Technician	63	Research/Analyst	36	Hunter	22
Grants Manager	61	Fundraising	35	Training	17
Communications/Outreach	57	Accountant	35	Lawyer	15
Natural Resource Manager	53	Cultural Practitioner	33	Lab Technician	14
Scientist	50	Planner	33	Construction	14
GIS/data manager	43	Government Policy	30		
<b>Internships†</b>					
Paid	50	Unpaid	38	None	20
<b>Fellowships‡</b>					
Paid	18	Unpaid	13	None	62

\*These are self-reported descriptions of the types of NRM positions currently filled in the respondent’s organization. In some cases, a single FTE position falls into multiple categories.

†Internships are defined as short term (1-6 mos.) educational opportunities.

‡Fellowships are defined as medium term (>6 mos.) professional development opportunities.

## 4.2 Education in the NRM sector

Survey participants were asked about the average education level for each of the following job categories: administrative, field or technical, professional or managerial, and executive. Sixty-six percent of employees who provide administrative support and 70% of field technicians completed at least four years of postsecondary education, while 55% of managers and 64% of executives hold a master’s degree or higher. The overall distribution, summarized in Fig. 4-1 and Table 4-3, is similar to what was reported in 2015.

**Table 4-3. Education by job type in the NRM sector, 2018**

Average Education Level	Number of times education level indicated by respondents			
	Administrative	Field/Tech	Prof/Manager	Executive
< HS diploma or equivalent	0	0	0	0
HS diploma or equivalent	9	16	1	0
2-year associate's degree	16	7	1	0
4-year bachelor's degree	42	41	38	27
Master's degree	6	11	41	33
PhD	1	1	7	15

Survey participants were also asked about the types of college majors they look for when considering potential employees. The top five spots remained unchanged and continue to be dominated by natural sciences: natural resources management, biology, environmental studies, botany, and ecology (see Fig. 4-1). Hawaiian studies again just missed the top five, reinforcing the idea that NRM agencies prioritize the importance of cultural values and practices tied to natural resources in Hawai'i. Results for the full list of college majors are included in Table 4-4.

**Table 4-4. Desirable college majors in the NRM sector, 2018**

Major (Number of times major indicated by respondents)					
Natural Resources Mgmt	74	Marine Biology	39	Accounting	21
Biology	71	Environmental Law	33	Economics	19
Environmental Studies	65	Soil Science	31	Computer Science	18
Botany	61	Urban and Regional Planning	31	Political Science	14
Ecology	61	Business	30	Anthropology	13
Hawaiian Studies	45	Hydrology	28	Chemistry	7
Communications	41	Oceanography	25	Physics	3
Geography	39	Geology	23		

### 4.3 Salaries in the NRM sector

Average starting salaries in the NRM sector have risen across the board since our last report in 2015. In 2018, 59% of agencies reported having administrative support employee salaries starting at \$41,000 or higher (compared to 33% in 2014), 49% reported having field technician salaries starting at \$41,000 or higher (compared to 47% in 2014), 77% reported having professional and managerial salaries starting at \$51,000 or higher (compared to 56% in 2014), and 77% reported having executive salaries starting at \$61,000 or higher (compared to 63% in 2014). Fig 4-1 and Table 4-5 includes survey results for all ranges of average starting salaries by job type.

**Table 4-5. Average starting salary by job type in the NRM sector, 2018**

Average Starting Salary	Number of times salary level indicated by respondents			
	Administrative	Field/Tech	Prof/Manager	Executive
\$20,000-\$40,000	30	38	7	3
\$41,000-\$50,000	31	21	12	3
\$51,000-\$60,000	9	12	28	11
\$61,000-\$80,000	4	4	27	16
>\$80,000	0	0	10	41

#### 4.4 Expenditures in the NRM sector

In total, NRM expenditures in 2018 amounted to \$542.5 million or \$5.1 million per organization on average. The \$18.1 million standard deviation suggests, however, that the average is being inflated by large government agencies. When organizations are separated into sub-categories, average expenditures range from a low of \$0.3 million for county government agencies to a high of \$54.4 million for state government agencies. Total and average expenditures for each sub-category are detailed in Table 4-6.

**Table 4-6. Expenditures\* in the NRM sector (millions of dollars), 2018**

Category	Respondents	Total	Mean	St. Dev.
Entire NRM sector	106	542.5	5.3	18.2
State <sup>a</sup>	5	272.0	54.4	66.5
Federal <sup>b</sup>	18	125.1	7.8	6.0
Academic	18	61.4	3.4	9.2
Nonprofit	30	59.1	2.0	3.5
Partnership	13	12.7	1.0	0.6
Private	16	10.7	0.7	0.7
County	6	1.6	0.3	0.3

\*Expenditures included any expenses falling into the following categories: salaries and wages; fringe benefits; grants, contracts and “pass-through” to other entities; capital improvement projects; and other. To avoid double counting, expenditures on grants, contracts and “pass-through” were subtracted from the total to derive final expenditure values.

a The expenditures estimate for the State Department of Health was obtained from the State Executive Biennium Budget ([https://budget.hawaii.gov/wp-content/uploads/2018/12/18.-Department-of-Health-FB19-21-PFP.cf3\\_.pdf](https://budget.hawaii.gov/wp-content/uploads/2018/12/18.-Department-of-Health-FB19-21-PFP.cf3_.pdf)). Pass-through for 2018 is extrapolated based on the 2011 NRM survey response.

b The expenditures estimate for the National Park Service was obtained from the FY2019 NPS Budget Justification Document (<https://www.nps.gov/aboutus/upload/FY2019-NPS-Budget-Justification.pdf>). The total is not adjusted for pass-through.

#### 4.5 Discussion of the NRM sector analysis

The overall numbers suggest that both expenditures and FTE increased in the NRM sector over the period 2011-2018. However, this is partly due to the fact that the number of survey respondents increased (Table 4-7).

**Table 4-7. Change in expenditures and FTE in the NRM sector (2011-2018)**

Year	Respondents	Expenditures (millions of dollars)	FTE
2011	84	465.6	3,279
2014	97	540.5	3,543
2018	106	542.5	4,697
Total Change	22	76.9	1,418
Percent Change	26%	17%	43%

If we only include organizations that responded in all three years, the resulting subset of survey participants is a panel that can be tracked over time. In that case, aggregate changes would not be confounded by a higher or lower response rate in a given year. However, this approach is not without drawbacks. If we focus only on the agencies that responded in all years, the number of observations falls by more than half, from 106 to 50 (Table 4-7). Moreover, by definition, the panel requires that all included agencies were respondents to the first survey, thus precluding the possibility of adding new agencies as the sector expands. Thus, rather than focusing our analysis on a subset of the survey data, we emphasize that our results should continue to be interpreted as lower bound estimates for the growing NRM sector.

## 5. AGRICULTURE SECTOR OVERVIEW

This section includes updates, where available, to agriculture sector data and figures previously published in the 2012 and 2015 NRM reports. Data in this section were not collected from the NRM survey and are therefore contingent on availability from publicly accessible secondary sources (BLS, 2019a; USDA, 2019).

### 5.1 Employment in agriculture

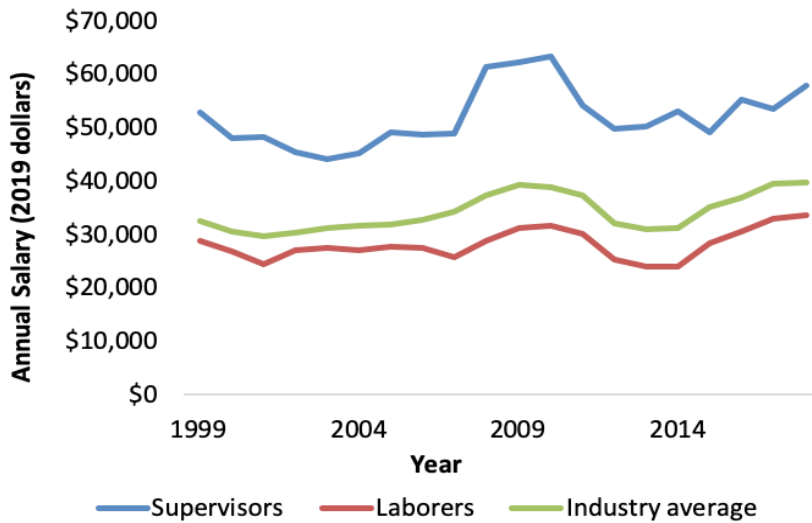
As noted in the 2012 and 2015 NRM reports, the number of agricultural workers in Hawai'i fell from 56,000 or 62% of the workforce to 6,300 or 1% of the workforce over the period 1900-2010, reflecting a shift in the economy from resource-based to service-based. The proportion of agricultural workers relative to the rest of the state's economy declined most significantly between 1940 and 1960, due mainly to the end of the plantation era. Although the general trend is downward, the total number of agricultural jobs in Hawai'i has been slowly rising since 2008, which is consistent with the increasing number of farms across the state. Because farm job counts for Hawai'i have not been published by BLS since 2011, updated values were not available for this report.

### 5.2 Salaries in agriculture

The BLS publishes Occupational Employment Statistics annually for all occupations in the state (BLS, 2019a). We document salary trends for the following representative farming occupations over the period 1999-2018: first-line supervisors of farming, fishery, and forestry workers (managerial); farmworkers and laborers, crop, nursery, and greenhouse (labor); and average for farming, fishing, and forestry occupations (industry average). As Figure 5-1

illustrates, salaries for all occupation types have increased between 1999 and 2018 in real terms (2019 dollars), driven to some extent by a notable upward trend since 2013, the last year for which salary data was published in the 2015 NRM report.

**Figure 5-1. Average salaries for farming occupations, 1999-2018**

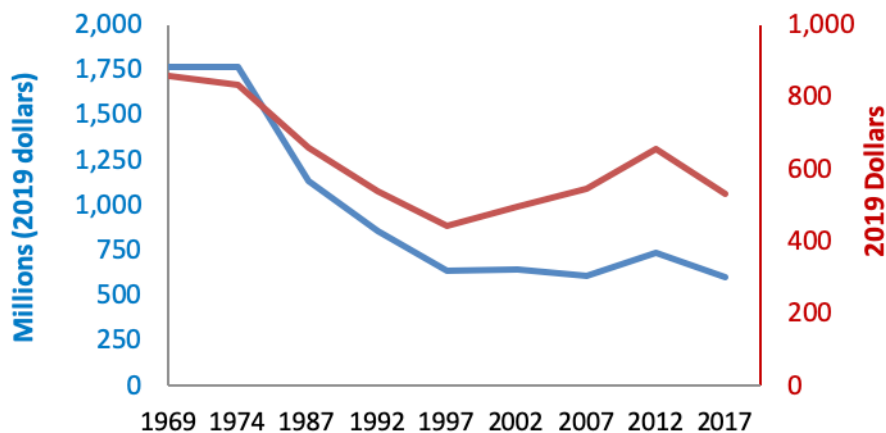


Source: BLS (2019a)

**5.3 Expenditures in agriculture**

Data on farm production expenses have been published in the USDA state agriculture census every three to five years since 1969. Total farm production expenses declined since 2012 (the last data point published in the 2015 NRM report) in real terms but remain above the lowest recorded point in 2007. Expenditures per acre have similarly declined in recent years but remain above the lowest level observed in 1997 (Fig 5-2).

**Figure 5-2. Farm total production expenses and expenses per acre, 1969-2017**



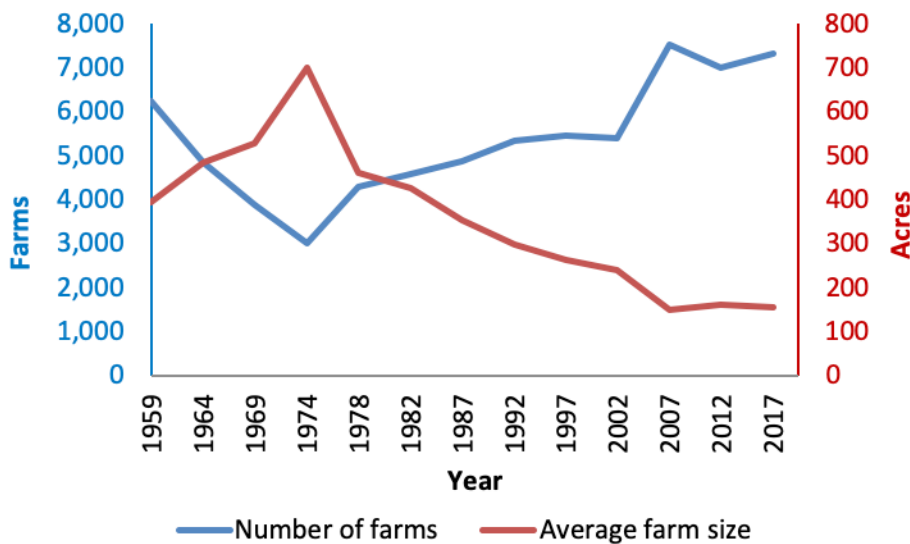
Source: USDA (2019)



## 5.4 Agricultural acreage and total number of farms

Since 1959, statewide acreage in farms has declined by nearly 50 percent, while the total number of farms has continued to rise after 1974 (Figure 5-3), resulting in a downward trend in average farm size over the past four decades. The decline appears to have leveled off recently, however, as the average farm size in 2017 (155 acres) was nearly identical to the average farm size in 2012 (161 acres), the last year for which farm data was available in the 2015 NRM report. Together with the farm expenditure trends, changes in farm size over time suggest that the sector has been steadily shifting from large-scale plantation-style agriculture to smaller farms with diversified products.

**Figure 5-3. Number of farms and average farm size, 1959-2017**



Source: USDA (2019)

## 6. ENERGY SECTOR OVERVIEW

This section includes updates, where available, to energy sector data and figures previously published in the 2012 and 2015 NRM reports. Data in this section were not collected from the NRM survey and are therefore contingent on availability from publicly accessible secondary sources (BLS 2019b; EIA 2019).

### 6.1 Employment in energy

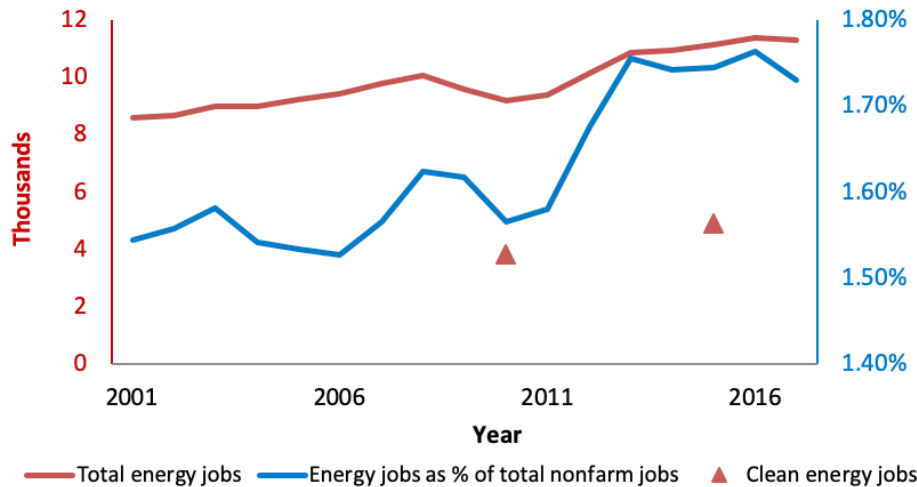
Job counts for Hawai'i's energy sector were compiled from the following industries (NAICS codes<sup>4</sup> in parentheses): power generation and supply (2211), oil and gas pipeline construction (23712), power and communication system construction (23713), electrical contractors (23821), petroleum (4247), and gasoline stations (447).<sup>5</sup> By this measure,

<sup>4</sup> The North American Industry Classification System (NAICS) is the standard used by federal statistical agencies in classifying businesses for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. economy.

<sup>5</sup> Following DBEDT (2011), roughly 75% of jobs in the power and communication system construction industry were attributed to the energy sector. Jobs for some relevant industries (e.g. natural gas distribution) were deemed "not disclosable" by the BLS because they did not meet BLS or state agency disclosure standards.

the energy sector provided over 11,000 jobs in 2017, up over 400 jobs since 2013, the most recent year for which energy job data was published in the 2015 NRM report (Figure 6-1). The electrical contractor (4,768 jobs) and power generation and supply (3,172 jobs) industries continue to provide the majority of energy sector jobs.

**Figure 6-1. Energy sector employment, 2001-2017**



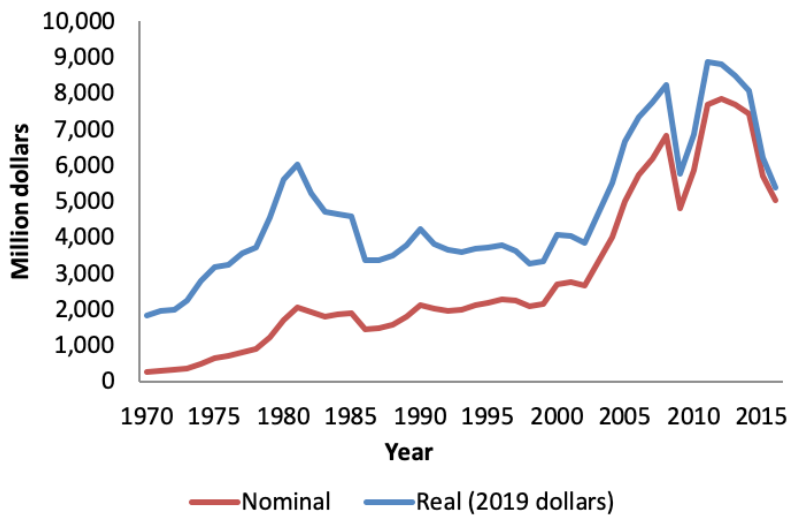
Source: BLS (2019b), DLIR (2015)

Although some of the industries included in our definition of the energy sector capture renewable energy jobs, further disaggregating the publicly available data into nonrenewable and renewable energy subsectors is challenging and beyond the scope of this report. However, using survey-based methods, the Hawai'i Department of Labor and Industrial Relations (2015) estimated that the clean energy sector, including both renewable energy generation and energy efficiency measures, supported 3,816 jobs in 2010 and 4,900 jobs in 2015. Comparing these totals to the entire energy sector (Figure 6-1), it appears that clean energy jobs have been keeping pace with the upward trend in total energy jobs through at least 2015.

## 6.2 Expenditures in energy

Hawai'i's primary energy expenditures<sup>6</sup> have been on the decline since 2012 (Figure 6-2), the last year data was available in the 2015 NRM report. Nevertheless, energy sector expenditures were nearly three times agriculture sector expenditures in 2016 and almost ten times NRM expenditures estimated in the current report. Renewable energy expenditures are likely closer in magnitude to those of the agriculture sector, but we do not have enough information to extrapolate that subtotal from the EIA (2019) total expenditure estimates.

<sup>6</sup> EIA calculates expenditures by multiplying price estimates by consumption estimates, after adjusting for process fuel, intermediate petroleum products, electricity exports, and other consumption that has no direct fuel costs, i.e. hydroelectric, geothermal, wind, solar, and photovoltaic energy sources, and some wood and waste.

**Figure 6-2. Energy expenditures, 1970-2016**

Source: EIA (2019)

## 7. RECOMMENDATIONS

Based on results from the NRM survey and analysis of publicly available energy and agriculture sector data, we have several recommendations moving forward. First, the survey data suggest that many promising future NRM job opportunities exist for Hawai'i's youth. Respondents indicated a number of different job types covering a wide variety of skillsets within their organizations. College majors reported as being desirable for NRM careers were also quite diverse, spanning the physical sciences, social sciences, business fields, and law, among others. Together with evidence that the NRM sector is continuing to expand (5% annual job growth over the past decade) and an upward trend in NRM starting salaries, these results suggest that Hawai'i's students could benefit from outreach efforts to encourage the pursuit of education in fields related to natural resources management.

Second, we want to reiterate the need for further development of public-private partnerships in the NRM sector, given the success of existing partnerships. For example, The Hawai'i Association of Watershed Partnerships works collaboratively with more than 74 public and private partners on five islands to protect over 2.2 million acres of important forested watershed lands. While major government agencies have remained relatively stable over time, the number of nonprofit organizations in the NRM sector has experienced rapid growth in recent years. Individual efforts by these organizations are certainly valuable to the state's natural resource assets, but collaborative efforts have the potential to further augment those contributions. The benefits realized by collaborative management include, but are not limited to, the ability to address large landscapes and threats affecting multiple habitats and species, leveraging limited dollars for maximum benefits, allowing the pooling of resources and expertise to reduce redundancy, and providing education and jobs.

Third, we encourage investment in further research on the valuation of the ecosystem services being protected by natural resources management. Quantifying the benefits generated from NRM activities in monetary terms will

help policy makers, business leaders, and the public better understand the value of efforts to protect the state's natural resources. While most of the general public would agree that ecosystem services are important for a variety of reasons, some of which are difficult or impossible to monetize, making the case for allocating budget resources to the protection of natural resources is challenging without a dollar value that can be compared directly to other projects competing for the same pool of limited funds.

Finally, we recommend continued efforts to collect data on Hawai'i's green economy, including the great work being done by The Center for Regional Economic Competitiveness (2008) and the Department of Labor and Industrial Relations (2010, 2015). Although each approach, including our own, employs different methods and focuses on different aspects of the green economy, the results, when viewed in aggregate, continue to paint a clearer picture of both the current state of Hawai'i's green economy and the direction we are headed.

## **8. ACKNOWLEDGEMENTS**

Funding for this report was generously provided by Hau'oli Mau Loa Foundation. We appreciate all of the efforts made by Mark Fox (The Nature Conservancy), Brant Chillingworth (Hau'oli Mau Loa Foundation), and Keahi Makaimoku (Hau'oli Mau Loa Foundation) to encourage survey participation by various NRM organizations. However, any errors in the report are our own.

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## 9. REFERENCES

- The Center for Regional Economic Competitiveness (CREC). 2008. Innovation and Technology in Hawai'i: An Economic and Workforce Profile. Prepared for: The Hawai'i Science and Technology Institute.
- Hawai'i Department of Business, Economic Development and Tourism (DBEDT). 2011. The Size of Hawai'i's Energy Sector.
- Hawai'i Department of Labor and Industrial Relations (DLIR). 2010. Hawai'i's Green Workforce: A Baseline Assessment.
- Hawai'i Department of Labor and Industrial Relations (DLIR). 2015. Updating the Baseline: Hawai'i's Clean Energy Jobs. Commissioned by the Hawai'i Energy Policy Forum.
- U.S. Bureau of Labor Statistics (BLS). 2019a. Occupational Employment Statistics – State Level Data. Accessible online: <http://www.bls.gov/oes/tables.htm>.
- U.S. Bureau of Labor Statistics (BLS). 2019b. State and Metro Area Employment, Hours, & Earnings – State and Metro Area Databases. Accessible online: <https://www.bls.gov/sae/data.htm>.
- U.S. Department of Agriculture, National Agricultural Statistics Service (USDA). 2019. 2017 Census of Agriculture – Hawaii State and County Data, Volume 1, Geographic Area Series, Part 11, AC-17-A-11.
- U.S. Energy Information Administration (EIA). 2019. State Profile and Energy Estimates - Hawaii. Accessible online: <https://www.eia.gov/state/?sid=HI>.



## 10. APPENDIX: NATURAL RESOURCES MANAGEMENT SECTOR SURVEY

The Nature Conservancy (TNC), Hau‘oli Mau Loa Foundation, and the University of Hawai‘i Economic Research Organization (UHERO) are again conducting this survey of organizations in Hawai‘i engaged in one or more aspects of natural resources management. This is the third time this survey has been conducted in Hawai‘i, in order to quantify the size and economic importance of the state’s natural resources management sector. This survey is an important part of documenting the significance of the natural resources management sector in Hawai‘i’s economy.

Report findings will be shared with policy makers and decision makers so that they can better understand the depth and breadth of Hawai‘i’s sustainability sector (energy, agriculture, and natural resources management). The information collected also helps the next generation of “green job” seekers to better understand the sustainability sector, trends, and the job market.

Please answer questions 1 through 3 to provide critical data for assessing the size of Hawai‘i’s natural resources management sector. Though questions 4 through 11 are optional, we would greatly appreciate your responses that will provide greater depth to this research. Please complete this survey by November 30, 2018.

All individual responses will be kept strictly confidential. Summarized findings that do not identify individual organizations will be available to all survey participants and may be shared with policy makers, others in natural resources management, the media, and the general public. While types or names of organizations may be identified as survey participants, no individual responses or data will be released.

### **FOR THE PURPOSES OF THIS SURVEY, NATURAL RESOURCES MANAGEMENT IS DEFINED AS:**

Activities and employees that support and care for natural lands, air, freshwater and marine systems in Hawai‘i. This includes fieldwork, science, research, regulation, planning, protection, management, hazard mitigation, climate change mitigation and adaptation, communications, outreach, decision-making, policy, education, training, and administrative support.

Whether you are part of a large federal regulatory agency or a community-based effort to protect the environment (mālama ‘āina organization), we hope to document your important contributions in this study.

If you have any questions please feel free to contact Kimberly Burnett at UHERO at (808) 956-8068 or [kburnett@hawaii.edu](mailto:kburnett@hawaii.edu).

1. Please provide your contact information so that we can reach you with any questions about your responses. Your individual responses will be kept confidential.

Name: \_\_\_\_\_

Company/Organization: \_\_\_\_\_

Email Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

2. Please complete the following chart with information on your organization's approximate annual expenditures for natural resources management in Hawai'i. You may use the most recent year/fiscal year for which you have data.

\*Note: Individual responses will be kept strictly confidential.

Category of Expense	Amount
Salaries and wages	
Fringe benefits ( <i>may be expressed in dollars or as a percentage of salaries and wages</i> )	
Grants, contracts, and "pass through" to other entities	
Capital improvement projects ( <i>e.g., buildings, roads, fences, etc.</i> )	
All other expenditures	
<b>TOTAL</b>	

3. How many full-time (FT) or full-time equivalent (FTE) natural resources management employees currently work in your organization in Hawai'i?

\_\_\_\_\_

4. Please identify the kinds of jobs in your organization that support your natural resources management work in Hawai'i. (Check all that apply)

- Scientist
- Field Technician
- Hunter
- Natural resource manager
- Cultural Practitioner
- Construction personnel
- GIS/data manager
- Technical information systems
- Bookkeeper
- Accountant
- Grants management
- Fundraiser
- Government policy
- Administrative support
- Communications and outreach
- Lawyer

- Planner
- Research/Analyst
- Training
- Lab technician
- Other (please describe)

5. Please identify the kinds of undergraduate college majors that your organization looks for in their employees to support your natural resources management work in Hawai'i. (Check all that apply)

- Accounting
- Anthropology
- Biology
- Botany
- Business
- Chemistry
- Communications
- Computer science
- Ecology
- Economics
- Environmental law
- Environmental studies
- Geography
- Geology
- Hawaiian studies
- Hydrology
- Marine biology
- Natural resources management
- Oceanography
- Political science
- Physics
- Soil science/agronomy
- Urban and regional planning
- Other (please describe)

6. What is the approximate average education level for the following categories of natural resources management employees in your organization in Hawai'i? (check only one box in each row)

	Less than HS Diploma or equivalent	HS Diploma	2-year Associates	4-year Bachelors	Masters	PhD
Administrative						
Field/Technical						
Professional/Managerial						
Executive						

7. What is the approximate average starting salary for the following categories of natural resources management full time employees in your organization in Hawai'i? (check only one box in each row)

	\$20-40K	\$41-50K	\$51-60K	\$61-80K	>\$80K
Administrative					
Field/Technical					
Professional/Managerial					
Executive					

8. Does your organization currently offer natural resources management internships in Hawai'i, i.e., paid or unpaid short term (1-6 mos.) educational opportunities? (check all that apply)

- Yes, we offer paid internships
- Yes, we offer unpaid internships
- No, we don't offer internships
- Other (text box)

9. Does your organization currently offer natural resources management fellowships in Hawai'i, i.e., paid or unpaid medium term (>6 mos.) professional development opportunities? (check all that apply)

- Yes, we offer paid fellowships
- Yes, we offer unpaid fellowships
- No, we don't offer fellowships
- Other (text box)

10. Approximately how many full-time (FT) or full-time equivalent (FTE) natural resources management positions has your organization lost or gained in Hawai'i in the last 3-5 years? You may express your answer as a percentage or a number of positions, e.g., 15% loss or lost 3 jobs. Please specify loss or gain (+ or -) in your response.

\_\_\_\_\_

11. Approximately how many full-time (FT) or full-time equivalent (FTE) natural resources management positions does your organization expect to lose or gain in Hawai'i in the next 3-5 years? You may express your answer as a percentage or a number of positions, e.g., 5% gain or gain 1 job. Please specify loss or gain (+ or -) in your response.

\_\_\_\_\_

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