

Education and Training Gap Analysis for the Fisheries, Seafood, Maritime Workforce

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Study Purpose and Methodology

Study Purpose

This gap analysis was developed to help identify training and education needs and opportunities related to industries in the Fisheries, Seafood, Maritime (FSM) sector. It reflects the ideas and experience of participants from private, public and nonprofit organizations working in FSM subsectors across Alaska, as well as data collected by the Alaska Department of Labor and Workforce Development (DOLWD). This research is intended to provide a factual and theoretical foundation for further training and education design efforts by the University of Alaska (UA), other workforce training and education entities, and the businesses and agencies of the sector itself.

Assessment Methodology

The gap analysis included the following major tasks:

- An overview of the Fisheries Seafood Maritime sectors and summary of discussions held at the Alaska Joint Fisheries Seafood Maritime Workforce Forum held at UAA on March 5, 2012
- Telephone interviews with 25 representatives of the FSM sector and selected training providers
- Design and fielding of an online Workforce Needs Survey distributed by email to 250 FSM businesses and organizations and promoted through sector membership organizations
- Identification and analysis of specialized employment and training data in cooperation with the Alaska Department of Labor and Workforce Development Research and Analysis Unit
- Briefing and discussion with the UA Allied Fisheries Working Group
- Production of this report and associated data files for public use

Conclusions presented below draw on all these sources of information to identify common themes. It is important to remember, however, that the information provided at the Forum, through interviews, and in the online survey are anecdotal and may not be representative of the sector as a whole. Data and analysis provided by the Alaska Department of Labor also has limitations, primarily because it is based on industry and occupation codes that are not always aligned with the structure and activities of the FSM sector.

Overview

Like the visitor Industry, the FSM sector has not been formally defined by agencies that track workforce participation. Yet the sector is profoundly important to the Alaskan economy. Alaska has one mile of coastline for every 20 residents and more than 12,000 rivers. There is hardly an economic entity in the state that is unaffected by FSM activities.

Broadly defined, the FSM sector includes any firm or occupation connected in some way with oceans or waterways. Positions range from seasonal fish-census workers to experts in maritime law. McDowell Group identified firms associated with FSM activities and found that their employees represent more than 800 different Standard Occupational Codes (SOCs). Many firms, and even individual occupations, are only partly associated with FSM activities, however. For example, many professionals and technicians, from economists to diesel mechanics to construction managers, perform a portion of their work in the FSM sector.

This analysis focuses on firms and occupations that are typically or mainly associated with fishing, seafood processing, vessel operation, and the businesses that provide direct technical and professional support to those industries. Even by that abbreviated definition, the FSM sector in Alaska includes more than 500 firms (not counting the many sole proprietorships and smaller fishing operations that do not file unemployment reports). With proprietorships and fishing operations included, McDowell Group estimates the FSM workforce at more than 68,000 workers.

Sector Employment

This analysis, together with more detailed employment data in the appendices, is based on two sets of federal codes, the North American Industry Classification System (NAICS) codes, and the Standard Occupational Codes (SOCs). The analysis is useful mainly as a general indicator of the overall potential market for various types of education and training. Data should be considered an approximation. Neither code-set specifically identifies FSM businesses or workers, and reporting by employers of both kinds of data is of variable accuracy.

The NAICS and SOC data, provided by DOLWD, indicates that Alaska's FSM sector consists of roughly 68,000 workers not counting scientists, educators and other professionals whose association with the sector is not evident from DOLWD employment records. Alaska residents make up 47 percent of the private-sector FSM workforce. The seafood industry dominates employment in the sector. Commercial fishing, seafood processing, and non-profit hatcheries employ 92 percent of the private FSM workforce. With the exception of AMHS, most FSM-related government positions support the commercial seafood and sport-fish seafood industries in some manner.

Based on interviews with industry and the array of applicable NAICS codes, McDowell Group segregated Alaska's FSM sector into the following subsectors:

- Commercial Fishing
- Seafood Processing and Marketing
- Sport-fish Guides
- Salmon Hatcheries
- Boat Building, Repair, and Dealers
- Selected Marine Engineering and Surveying
- Water Transportation (Freight and Sightseeing)
- State and Federal Government

The table that follows breaks down selected employment indicators by these sub-sectors to the extent possible with available data. It gives a sense of the overall potential market for education and training within each of the subsectors. The table highlights the large component of resident FSM employment represented by commercial fishing. Government workers shown are limited to those for whom data was readily available. Those are employees of the Alaska Department of Fish and Game, USCG, and the National Marine Fisheries Service (NMFS).

Employment in Alaska Maritime Industries

Maritime Sub-Sector	# Workers	Pct. Resident	# of Resident Workers	Wages and/or Earnings (\$MM)	Average Age
Commercial Fishing ¹	30,980	56%	17,349	\$1,742.0	N/A
Seafood Processing/Marketing	22,412	27	6,051	\$323.2	40
Water Transportation	4,056	62	2,515	134.2	39
Sport-fish Guiding ²	3,034	72	2,184	N/A	N/A
Boat Building/Repair	693	76	527	21.5	38
Salmon Hatcheries	456	64	292	10.7	37
Marine Engineering/Surveying	183	85	156	12.1	40
ADF&G, USCG, NMFS	5,641	N/A	5,077 ⁴	N/A	N/A
Total³	68,042	N/A	34,150	N/A	N/A

¹ Workers represent total count of fishermen fishing commercial permits and adult crewmembers. Earnings are estimated gross ex-vessel earnings for the industry and are not directly comparable to wages in other industries.

² Guiding employment is estimated based on 2010 license and logbook data. Figures cover saltwater and freshwater guides. Residency is based on address data provided by guides.

³ Data provided on residency and age apply to private sector only; data was not available for government employees.

⁴ For purposes of estimating potential training demand, McDowell Group assumes that 90 percent of these state and federal workers are residents of Alaska. Adding these workers to the private sector data brings the proportion of resident workers from 47 percent to approximately half.

Note: Data on age applies to Alaska residents only, as data is not available for nonresident workers.

Source: DOLWD, CFEC, ADFG, ASMI, NOAA, US Office of Personnel Management and American Forces News Service.

The remaining tables in this section show only workers who are covered under Alaska's unemployment insurance program. These include private-sector wage and salary workers, but not sole proprietorships. The latter encompass, for example, most of the sport-fish guides shown in the previous table. In addition, thousands of fishing and government jobs are not covered by the data. Nevertheless, the table may help identify the approximate overall market for certain types of education and training, this time by occupational area. The next table segments the FSM workforce by occupation using Standard Occupational Codes.

**Private Sector Wage and Salary Employment in Alaska's Maritime Sector – 2010
by Type of Occupation
(not including government or most guiding and commercial fishing)**

All Private Sector Wage/Salary Maritime Industries	Number of Workers
Production Occupations	18,697
Transportation and Material Moving Occupations	3,121
Office and Administrative Support Occupations	1,163
Installation, Maintenance, Cleaning, and Repair Occupations	1,065
Management and Financial/Business Operations	456
Sales and Related Occupations	325
Architecture and Engineering Occupations	189
Life, Physical, and Social Science Occupations	177
Business and Financial Operations Occupations	115
All Other	2,607

Source: DOLWD.

The next table shows the same employment data grouped by type of FSM business (Boat Building, Hatcheries, Seafood Processing, Selected Marine Engineering and Surveying, and Water Transportation).

**Private Sector Wage and Salary Employment in Alaska's Maritime Sector – 2010
by Type of Business
(not including government or most guiding and commercial fishing)**

	Number of Workers
Boat Building	
Construction and Extraction Occupations	222
Production Occupations	188
Installation, Maintenance, and Repair Occupations	104
Office and Administrative Support Occupations	72
Sales and Related Occupations	65
Management Occupations	14
All Others	28
Total	693
Hatcheries	
Farming, Fishing, and Forestry Occupations	293
Management Occupations	38
Installation, Maintenance, and Repair Occupations	30
Life, Physical, and Social Science Occupations	21
Office and Administrative Support Occupations	20
All Others	54
Total	456

(continued on next page)

Seafood Processing	
Production Occupations	19,931
Installation, Maintenance, and Repair Occupations	685
Office and Administrative Support Occupations	568
Management and Financial/Business Operations	221
Architecture and Engineering Occupations	99
Life, Physical, and Social Science Occupations	93
All Others	815
Total	22,412
Selected Marine Engineering & Surveying	
Architecture and Engineering Occupations	84
Life, Physical, and Social Science Occupations	49
Office and Administrative Support Occupations	37
All Others	13
Total	183
Water Transportation	
General Labor/Operations	1,887
Sailors/Oilers/Navigation	1,120
Management	272
Maintenance	248
Operating Engineers and Truck Drivers	235
Cooking	172
Administrative	81
Specific Pipeline Operations	27
Other	14
Total	4,056

Source: DOLWD.

For purposes of estimating FSM training and education needs, it would be helpful to know how long specific positions typically remain vacant and how often hires are made out of state for that reason. Unfortunately, there is no public source for that information. DOLWD has data on occupation and duration of employment by individual social security number. However, the data does not show why individuals leave particular positions (for example, whether there was simply not enough work). Neither does the data show how long positions remain open.

Major Findings and Recommendations

Goals for FSM Workforce Development

Interest in UA's FSM education and training initiative has been high. In spite of the sector's social and economic importance, the initiative represents the first comprehensive effort to understand and address its workforce development needs. The research suggests FSM-sector participants have somewhat different overarching goals for workforce development. Primary concerns include the following:

- **Fishing** – counteract the aging of the fleet and, especially, the aging of those providing the fishing fleet with shore-based marine support services of many kinds.
- **Seafood processing and marketing** – Help attract and hold motivated workers who have potential to advance into more highly skilled technical, supervisory, and management positions.
- **Maritime** – 1) Training to meet USCG requirements for safety training and licensed and experienced mariners as well as trained unlicensed deckhands and engineers (for organizations involved in vessel operations); and 2) workers with enhanced technical skills similar to those sought by the Fishing participants, above (for organizations involved in vessel construction, repair and support).

Within these broad concerns are a host of workforce needs specific to different components of this varied sector. Those most often identified during the research are discussed below.

Training and Education Needs Reported by FSM Businesses and Organizations

This study concludes that additional training and education opportunities would be especially welcome in six main areas:

1. Technical support services for shore-side and at-sea fishing, processing and maritime operations.
2. Seafood processing and mariculture technologies
3. Business management relevant to the FSM sector
4. Resource management for sustainable ocean resources
5. Mariner licensure and certification for career ladders
6. Safety and risk management

These areas are described further below.

TECHNICAL SUPPORT SERVICES FOR SHORE-SIDE AND AT-SEA FISHING, PROCESSING AND MARITIME OPERATIONS.

This often-referenced need includes vessel support services, construction, and repair. Technical skills identified as in short supply include welding, electronics, fabrication, electrical generation and other plant and vessel support. Refrigeration engineers and technicians are especially in demand, in part because of an ongoing shift from canned to fresh and frozen seafood products. All refrigeration work must be performed by certified technicians, and commercial anhydrous ammonia systems are potentially dangerous if mishandled.

SEAFOOD PROCESSING AND MARICULTURE TECHNOLOGIES

The skilled positions most often identified as in short supply are plant managers, plant engineers, mechanics, and quality-assurance technicians and managers. Training needs for specific employers depend on the equipment and technologies actually employed. Mariculture and hatchery personnel need training in fish biology and also in maintaining mechanical systems in remote locations. Another need is for environmental monitoring and compliance officers.

BUSINESS MANAGEMENT RELEVANT TO THE FSM SECTOR

Currently, UA management programs do not directly address the business activities of the FSM sector. Companies need managers with a combination of traditional management skills and industry-specific knowledge and experience. This is especially true for seafood processing and marketing firms and for fish hatcheries. Fishermen who want to self-market their catch also need training in marketing and product quality.

RESOURCE MANAGEMENT FOR SUSTAINABLE OCEAN RESOURCES

Regulatory managers, and sometimes technicians, need a combination of technical, managerial, and communications skills. Related training needs include applied fisheries science such as by-catch reduction, gear design, and marine mammal avoidance.

Documentation of training needs for the Alaska Department of Fish and Game (ADF&G), with 1,700 employees, is not readily available and will require further research and analysis in cooperation with the department. Training needs were not assessed for the Department of Environmental Conservation, the Department of Natural Resources, the Department of Public Safety, or other State departments with responsibilities that include marine and maritime activities. The same is true for the Alaska-based staff of the U.S. Fish and Wildlife Service and Region 10 of the U.S. Forest Service. All these agencies might benefit from training as varied as biological sciences and boat handling, but specific needs are not yet identified.

MARINER LICENSURE AND CERTIFICATION FOR CAREER LADDERS

This category includes masters, deckhands, and vessel and marine engineers. These highly specific technical certifications should be developed in consultation with prospective employers, existing training providers (for example, AVTEC and UA's Ketchikan campus), and the United States Coast Guard (USCG). Vessel engineers

manage systems such as diesel engines, gas turbines, boilers, steam turbines, heat exchangers, and pumps and compressors, electrical machinery; hydraulic machinery, refrigeration machinery, steam, water, fuel oil, lubricating oil, compressed gas, equipment for automation and control, equipment for fire fighting and other forms of damage control, and systems for cargo handling. Marine engineers are responsible for design, outfitting, inspection and surveying, corrosion protection, and repair of ships.

SAFETY AND RISK MANAGEMENT

Requirements for vessel and food-safety training, as well as environmental safety, are both increasing. The Alaska Marine Highway System (AMHS) has a specific need for USCG-approved emergency-trauma technicians. More broadly, small-boat fishermen need training, likely through short courses or winter classes, in vessel operation and systems of all sorts. One interviewee referred to this material as an “Alaska mariner basic skill set.”

Other Training Needs

In addition to the six areas above, representatives of various segments of the FSM sector cited the following education and training needs:

- Education in the implications of climate change for subsistence and commercial harvesting and other arctic commerce
- An AA or similar degree in maritime transportation
- Training for new fishermen in sophisticated modern electronics, fish handling techniques and equipment, diesel engines, etc.
- Commercial diver training
- Additional emphasis on coastal engineering disciplines within existing UA engineering programs
- Culinary training, especially with a seagoing component
- Customer service and other training for interpretive naturalists
- Training in various disciplines for marine surveyors
- Commercial truck-driver training

Additional Findings

- **Workforce development efforts for the FSM sector statewide currently consist of localized efforts with no overall plan, priorities or coordination.** Some close working relationships exist, however, between regional UA campuses, regional training providers, and sometimes CDQ groups and Alaska Native organizations. These relationships may be fertile starting points for developing an FSM strategy.
- **The FSM sector is different from healthcare and warrants very different approaches to training.** Healthcare employment is highly structured and concentrated in large employers or in clinics and offices that are similar in structure and services. Credentials are well established and widely known.

FSM, with the exception of the Coast Guard and AMHS, has a heterogeneous employment pool with little formal structure spread across disparate businesses and organizations.

- **Except for the Coast Guard and agencies such as ADF&G and AMHS, the concept of career ladders seems almost unknown in the FSM sector.** Similarly, professional development experiences, as distinguished from technical training needed or required for particular positions, typically is provided on an ad hoc basis rather than as part of a workforce strategy.
- **CDQ groups could be important partners in the workforce initiative.** The groups have long relationships with 65 FSM-dependent communities. They already engage in workforce development and have dedicated staff in that area. Finally, CDQ groups are engaged in a variety of FSM businesses and occupations. Of particular importance to CDQ groups, in addition to training for plant personnel, is knowledge of the regulatory process, including the North Pacific Fisheries Management Council and the Alaska Board of Fisheries.

Structuring Training

Different employers have different needs with respect to the content and scheduling of employee education and training. Among the considerations that will require ongoing discussion between employers and educators are the following:

- **A hands-on training component is important to meet most of the existing needs.** This is particularly true of positions on vessels. Shore-based processors and other manufacturers also need technical workers who are trained on particular kinds of equipment. Apprenticeships and internships are examples of how some employers have combined classroom and workplace learning. It has been suggested that UA could support apprenticeship programs by providing specific classroom components. Apprenticeships and internships in areas such as quality control and mechanical/industrial repair are especially useful because they tend to be:
 - Career-oriented
 - Flexible to meet industry needs
 - A combination of classroom and practical experience
 - Eligible for grant subsidies
- **Scheduling and duration of classes is important and must adapt to seasonal businesses and geographic location of workers.** Short (3 weeks or less), off-season, and online courses are necessary to meet many industry needs, assuming that adequate hands-on experience can be incorporated where necessary. Timing and duration of classes should be developed in consultation with target employers and trainees. This might lead, for example, to a series of short courses that feed into a certification.
- **Existing providers of technical training can help UA identify potential links between academic and vocational programs.** AVTEC, with its ship and fire-response simulators, is the most

comprehensive FSM training organization in the state outside the UA system. UA Ketchikan already offers more than 20 different maritime certifications.

- **In addition to new training courses, training materials might be useful to the sector in other forms.** For example, video and other online content could be developed to help fishermen and others perform repairs and other tasks, even in real time, that formerly required trained technicians.

Training Needs versus Workforce Needs

Finally, it is important to differentiate between unmet training needs and a real or perceived lack of skilled workers in particular positions. The former represents potential immediate demand for new training programs. The latter may be a result of lack of training availability, but may also reflect other factors that retard new entries into certain professions. Those factors may include lack of real or perceived job or future advancement opportunities, the nature of the work, wages associated with the work, demanding training requirements, or other considerations that discourage new entrants.

For example, the research suggests there is a growing shortage of qualified, shore-based marine services, such as refrigeration, welding, diesel maintenance, fabrication, etc. Training in these areas is indeed limited in most parts of Alaska. Economics, however, is also a factor in whether a new generation of owners develops to take over the small businesses that often provide these services. Finally, those entrepreneurs will need the necessary management and financial as well as technical skills.

Recommended Further Steps

McDowell Group suggests that the university consider where training will create the most benefit for Alaska's employers and its economy as measured by the health of its communities. This suggests the workforce initiative should:

- **Take a long-term view.** Properly managed, the FSM sector will be a mainstay of Alaska employment indefinitely. The big challenge is to capture more and more of the value created in the sector here in Alaska, and one way is to generate career opportunities for Alaskans. For example, 85 percent of the first-wholesale value of Alaska commercial fisheries goes to companies whose headquarters are outside the state. Goals and strategies in this area must be chosen carefully, however. For example, Alaska is unlikely to capture significant management infrastructure associated with large catcher/processors that are logistically best suited to be based in more southern ports.
- **Establish strong relationships with industry and other training providers, such as AVTEC, not just to design courses, but to work in a continuing three-way partnership.** Focus on flexibility to adapt approaches to the needs of both employers and workers. Work toward production of a statewide workforce development plan for the FSM sector.
- **Look to the CDQ groups and other innovative companies such as Copper River Seafoods that are already exploring training, internships, and apprenticeships in a variety of areas.** CDQ

groups already engage in community workforce development, and their workforce needs likely will continue to increase. Consider bringing together the workforce development staff from these companies for more targeted discussions about education and training.

- **Package and promote FSM-oriented offerings to the sector.** Make it easy for prospective students to find and evaluate relevant classes across the entire university system, and link individual classes to potential careers. As part of that effort, develop business, regulatory, and other management classes that incorporate FSM-specific skills and content.
- **Work individually with ADF&G, AMHS, and USCG to evaluate potential for specific training and certification support.** AMHS and USCG training needs are well documented because most address legal and regulatory requirements. (See the accompanying electronic file, “AMHS Crew Training Requirements”). ADF&G represents a large workforce (1,700 employees) with diverse training needs that are not fully documented. The best way to pinpoint opportunities with ADF&G may be to work directly with department leadership to conduct a department-wide survey designed to identify recent past trainings and future needs for each division.
- **Look for ways to combine classroom and field experience.** For many FSM positions and careers, employers stressed the need for training to include significant hands-on, as well as classroom time. This is particularly true of positions on vessels.
- **In addition to new training courses, consider provision of training materials in other forms.** For example, video and other online content could be developed to help fishermen and others perform repairs and other tasks, even in real time, that formerly required trained technicians.

Appendix 1: Summary of FSM Workforce Forum Discussions

Two broad areas of discussion at the March 5 UA FSM Workforce Forum concerned the level of training most appropriate for UA attention and the challenges of training versus recruiting. Other themes from the discussion groups are described briefly following.

Entry-level versus skilled training needs

There was much discussion at the Forum of training needs for both skilled and entry-level positions. Other research for this report continued to identify needs for both types of training. Most entry-level positions that involve basic production activities (production line, laborer, driver, etc.) benefit from training that is reasonably well known and understood. These so-called “soft” or job-readiness skills include basic reading, math, organization, interpersonal dynamics, safety and other skills and practices, sometimes extending to customer service. This type of training often serves the related function of screening prospective workers for attitude, drug and alcohol use, and other personal attributes that may affect job performance. Job readiness skills are important and in great demand and are provided by a variety of training organizations, some of which are FSM-related and some not.

Training versus recruiting

Many Forum participants said there is a need to address a broad set of recruiting factors that include perceptions of and information about various types of FSM jobs. This need exists among school-age youth as well as the workforce in general. Expanded training efforts will, to some extent, raise the profile of the FSM sector, however training and recruiting are different functions. Recruiting—and also retention—includes management strategies, public relations, pay and benefits, working conditions, career opportunities, and other considerations that go far beyond training or even development of career ladders. Effectively addressing the public awareness/public-relations aspects of recruiting would take additional planning and resources beyond training provision.

Following are themes or comments that represent some of the views voiced at the FSM Forum.

Fishing Group Themes

CURRENT PRACTICES

- *Many employers depend on personal references, word of mouth, and relationships with tribal and regional organizations for recruiting.*
- *Small boat owners are in a difficult spot. They don't have resources for formal recruiting and depend mainly on on-the-job training.*
- *CDQ groups invest in a variety of education programs.*

CHALLENGES

- *The private sector competes with ADF&G for employees, and ADF&G competes with NOAA and other federal employers.*
- *It's hard to find qualified people in rural regions.*
- *Refrigeration and other technical skills are in short supply. In general, shoreside support for small boats is aging and declining.*
- *High school graduates have a very limited skill set.*
- *Students need to be exposed to industry skills and opportunities at a much earlier age (high school or younger). This needs to be a major effort/partnership.*
- *ADF&G is facing a shortage of biologists and people with educational skills.*
- *Young people have to see opportunity before they will get excited about skills. Need to sell the range of careers available in the whole industry and career paths need to be clear.*
- *Look at educational models in other states and countries.*
- *Overly specific training will saturate individual positions, but there is a great need for broad-based training, including business skills.*
- *It's difficult for employers and workers to find out what training is available, where, and when. We need easier access to information, maybe through a central clearinghouse, but one that is clearly identified as FSM.*

OTHER CONSIDERATIONS

- *Breadth of training is extremely wide. There needs to be an ongoing, working interface between the University and industry to evaluate and address. What kind of structure could do this with fish/maritime as the focus?*
- *Looked at sectors and the items that weave through all.*
- *Build interest at a younger age and make the industry more visible to those students. Sell the career opportunities.*
- *Scholarships are an important tool to consider.*
- *Need to coordinate approaches across the University. Credits must be transferable.*
- *Distance delivery will be important, but how to do it and coordinate across the state?*

Seafood Group Themes

CURRENT PRACTICES

- *Employers being flexible to create year round opportunities*
- *Outreach working well in some areas, word of mouth*
- *Replicating successful programs – EX: Coastal Villages Regional Fund. Some programs working well, but small in scale*
- *Promoting from within, investing in current workers*

- *Skilled and entry-levels cannot be differentiated by number of hours or seasons. Season length can differ by region, and positions adapt.*

CHALLENGES

- *Entry level jobs hard to fill and have high turnover.*
- *Processors would like to attract more people to entry-level work who have interest in and potential for advancement.*
- *Seasonal nature of industry*
- *Remote nature of industry*
- *Current online and urban recruiting methods are not effective in rural Alaska.*
- *Both companies and workers need a better understanding of what kinds of training and recruiting tools are available.*
- *Most employers are not familiar with training providers. Need a statewide inventory of what's available.*

FUTURE NEEDS

- *Better placement information -- a centralized job bank*
- *Connect with existing academies/programs, i.e. STEM Academy*
- *Site based training – bring education to people*
- *Contact students younger – K-12 to get them interested in the industry.*

Maritime Group Themes

CURRENT PRACTICES

- *AK is a good place to build careers – good lifestyle and good opportunities*
- *AVTEC and UAS MT program offer good training used by AMHS*
- *AVTEC has an on-line maritime class for high school seniors – get to hear from folks in industry about opportunities and what it takes to get there*
- *Bristol Bay region has a CTE maritime model*
- *ASD gives HS tours, introduces students to workers, get to see facility – also hire high school kids in summer – get them into work force*
- *Teacher Externship opportunities (such as APICC's TIE program, which places teachers in companies to help them learn first-hand about an important industry) would be good for this sector*

CHALLENGES

- *Lack of central source of information*
 - *On training*
 - *Work standards*
 - *Credentials required*
 - *Opportunities*
 - *Pathways*

- *AK has lack of industry recognition*
- *Need for screening and employability skills among entry level workers*
- *AK maritime operations must be viewed in a global context.*
- *Young people not aware of opportunities*

FUTURE NEEDS

- *Look at transferability of training to other positions, including seasonal shifts in location for some positions.*
- *Need strong industry support and input for this to work*
- *Look at on-the-job career paths as well as formal/academic paths.*
- *Need to start young – middle school and high school.*
- *Guidance counseling (secondary and post-secondary) is important.*

Key steps include:

- *Employability and basic skills*
- *Basic analytical skills*
- *Career paths*
- *Centralized career/job/training information*
- *Understand the structure of the Maritime sector better*
- *Look at gaps and what others are doing. Design complementary and cooperative training*
- *Don't lose track of demand. Look at what the workforce really needs.*

Appendix 2: Online Survey Responses

McDowell Group developed an online survey based on discussion topics from the FSM Forum and the UA Working Group. Survey questions were designed to identify training and education needs based on general information from the divers participants in the FSM sector. Final design of effective training courses will require additional information about, and discussions with, the industry segments to be targeted by the training.

The survey link was emailed to 250 organizations and businesses that represent a cross-section of the FSM Sector. Business associations were invited to circulate the link to their member. This appendix summarizes the results of the 52 complete survey responses.

Please note that the survey results represent a small, nonscientific (nonrandom) sample. The responses are a useful source of insight but are not necessarily representative of the whole FSM sector either in content or in number.

Respondents

WHERE IS YOUR ORGANIZATION'S HEADQUARTERS LOCATED?

Headquarters Location	# Respondents
Anchorage	7
Kodiak	4
Dutch Harbor/Unalaska	2
Dillingham	0
Sitka	5
Juneau	8
Ketchikan	7
Seattle	5
Cordova	3
Petersburg	2
Homer	1
Wrangell	2
Kenai/Soldotna	2
Other outside Alaska	4

WHICH PART OF THE FISHERIES SEAFOOD MARITIME SECTOR BEST DESCRIBES YOUR BUSINESS/ORGANIZATION?

Primary Business Activity	# Respondents
Fish harvesting	7
Shellfish mariculture	0
Fish hatcheries	4
Seafood processing/marketing	11
Resource management	4
Professional/technical services	3
Manufacturing	0
Industrial or logistical support for marine vessels	3
Public safety or enforcement	1
Equipment installation and maintenance	0
Construction/mechanical services	0
Transportation/shipping	6
Tourism/hospitality	3
Resource exploration/development	0
Scientific/academic research or education	0
Trade or advocacy organization	8
Economic Development	1

WHAT WAS THE AVERAGE MONTHLY NUMBER OF EMPLOYEES WORKING IN ALASKA FOR THE BUSINESS/ORGANIZATION YOU REPRESENTED DURING 2011?

Average Monthly Employment	# Respondents
1-10	12
11-50	11
51-200	11
201-500	4
501-1,000	7
1,001-2,000	3
>2,000	4

Current Education and Training Priorities

NEEDED POSITIONS AND SKILLS

WHAT ARE THE HARDEST ALASKA-BASED POSITIONS FOR YOUR BUSINESS/ORGANIZATION TO FILL?

Scientific/Professional

- *Biometric positions*
- *Entry level labor/technicians AND experienced upper level Fishery Biologist positions (upper level management and research)*
- *Fisheries economist*
- *Fisheries managerial positions*
- *Middle management*
- *Upper management for processing and for trade groups*
- *Project managers, supervisors, top level subject matter experts (journey level)*
- *Science based - from the field technicians to biologists who want to work in rural Alaska.*
- *Senior Level Managers*

Vessel or Plant Operations

- *Chef, mate*
- *Class A - CDL Truck Drivers. Most applicants cannot pass a drug test*
- *Class A - CDL, Master 100 ton with towing*
- *Competent divers*
- *Deckhands (2 responses)*
- *Engineers*
- *Filleters, Shipper, HACCP trained personnel*
- *Fish culturists and hatchery managers*
- *Fish culturists at entry through 5 year experience levels*
- *Plant Managers, QA, Chief Engineers with Ammonia Certification*
- *Individuals trained in seamanship; vessel operation, handling & navigation; general vessel maintenance*
- *Licensed mariners*
- *Marine engineers (2 responses)*
- *Processor engineer*
- *Processor positions. Other technical positions such as engineers and refrigeration technicians*
- *Processor workers (2 responses)*
- *Vessel captains, mates, engineers*
- *Seafood Processors*

Customer Service

- *Customer service positions on board vessels: Naturalist, Deckhand, Passenger Service*
- *Naturalist/guides for day tours and Expedition Leaders for multi-day cruises.*

Trades/Technical

- *Highly skilled people to work on/repair of fishing vessel (e.g. diesel mechanic, electrician, fiberglass, welder)*
- *General ship mechanics (electrical work, plumbing, engine mechanics, refrigeration, fabrication, etc.)*
- *Instructors*
- *Marine surveyor*
- *Millwrights, Tech professionals*
- *Refrigeration Engineers, Millwrights, Port Engineers (skilled in both vehicle and vessel repair)*
- *Refrigeration Technicians, Quality Control Specialist and Environmental Compliance personnel*
- *Refrigeration technicians, Machinists (can line), Electricians, QA managers, Production Managers, Maintenance workers*
- *Refrigeration*
- *Safety officer, Welding Foreman, Ship fitters, Machinists, Mechanics, Electricians, and Bookkeepers*
- *Chief Engineers, Refrigeration Techs, Electricians*
- *Technical positions, such as Quality Assurance and process related production positions*
- *Trained Quality Control Technicians (seafood safety & seafood quality issues, including biological/chemical/other contamination, general quality, etc.), trade persons (Electricians, Plumbers, Mechanics, Refrigeration specialists, Welders, etc.), individuals with other skills (Personnel managerial, Manufacturing management, Human Resources, Accounting, etc.)*
- *Unlicensed deck and engineering*

Other

- *Community organizers*
- *Seasonal employees that will stay throughout the whole summer season*
- *Security*
- *Cooks*

REGARDLESS OF WHAT POSITIONS THEY MIGHT APPLY TO, WHAT SPECIFIC WORKFORCE KNOWLEDGE, SKILLS AND ABILITIES ARE HARDEST FOR YOUR BUSINESS/ORGANIZATION TO FIND FOR YOUR ALASKA-BASED OPERATIONS?

Business and Industry Experience

- *Alaska based experience and knowledge of enhancement program, and understanding of commercial fishing industry*
- *Basic business skills, problem-solving skills, and specialized training in their field*
- *Project/program management skills including written communications, budget management and supervision*
- *Understanding of on the grounds reality of the fishing industry*
- *Experience*

- *Knowledge of the industry*
- *Experience in fisheries management/economics*
- *Historical knowledge of resource management issues, current knowledge of resource management issues*

Interpersonal skills/Guiding

- *Customer Service*
- *Customer service, interpretive guide*
- *Experienced naturalists/guides*
- *Mainly the service related positions*

Specific Technical

- *Commercial divers that have experience with boat husbandry*
- *Engineers, refrigeration technicians, plant managers (in-region). Hard to retain processors (high turnover)*
- *Fish picking skills*
- *Food sciences and up-to-date, sophisticated process skills*
- *Common sense*
- *Unique repairs skills related to canning machinery; ability to cope with 7 days per week min 11 hour per day schedule for up to 90 days straight*
- *Engineering*
- *Qualified people to repair onboard freezers, weld, fabricate, repair fiberglass, perform shipwright; above all- finding shipyards that support work on commercial fishing vessels is increasingly a problem*
- *Chief engineer*
- *Employees able to work on the fish processing specific equipment we have in our plants*
- *Aquaculture and Fishery Research techniques; scientific or formal report writing/communication*
- *Fisheries managerial positions, Plant Managers, QA, Chief Engineers with Ammonia Certification*
- *Security*
- *Shipwrights*
- *Since the rationalization of the BSAI Crab fisheries we are lucky to have among the highest skilled crewmembers of any fishery in the nation. What concerns me are the lack of mechanics, welders, refrigeration technicians, and other shore-based workers that the crab industry depends upon to keep operating.*
- *Diesel mechanics, electrical, refrigeration*
- *The tradesmen need more background knowledge in the theory of fabricating constructing etc. Bookkeepers need better knowledge of the fundamentals of running a small business office and the type of software programs required to do it efficiently*

Good Workers/Basic Education

- *Drug-free employees*
- *Maintenance, attention to detail. High school education, simple math skills*
- *Information Technology*
- *Safety, ability and drive to work in remote operations at basic line production work*
- *Ability to work only 3 months*
- *For the vessels I represent, its finding people who are willing to work long hard hours*

Mariners

- *USCG Licensed and experienced mariners*
- *Licensed Mariners with a wide range of maritime skills and vessel handling abilities*
- *Experienced, knowledgeable, educated, Mariners*
- *USCG master licensed individuals. Professionally trained cook/chef*
- *Marine engineering*
- *Unlicensed deck and engineering, cooking*
- *Marine vessel knowledge; USCG regulations; ABYC Standards; NFPA Standards*

Combination of Technical and Qualitative Skills

- *Experienced and qualified employees with knowledge of manufacturing processes, project management, supervisory and leadership skills*
- *Large-scale production-oriented salmon rearing skills. Knowledge of small hydropower operations, maintenance and repair. Managing a staff in an isolated, remote, year-around production facility*
- *Biology, policy/regulatory. We generally desire Alaska Native individuals*
- *A combined skill-set of statistics, biology/oceanography, communication, speaking, and writing*

Hiring Graduates of Education and Training Programs

DOES YOUR COMPANY/ORGANIZATION REGULARLY HIRE GRADUATES OF AN EDUCATION OR TRAINING PROGRAM RELATED TO THEIR JOB, EITHER IN ALASKA OR ELSEWHERE?

Name of position hired	Name of program or organization providing the training	Location of program or organization	Degree, credential or certification (if applicable)	Approx. # hires per year of graduates from this program
Diver	Commercial diver training	Various around the country	ADC recognized air diver certification	2
Marine Engineer	Massachusetts Maritime Academy	Buzzards Bay, MA	Marine Engineer	2
Pilot boat operators	UAS Ktn Maritime	Ketchikan	STCW, radar endorse	2
Unlicensed deck and engineering	UAS, AVTEC	KTN and JNU for UAS. Seward for AVTEC	QMed, Able Seaman	25
USCG Licensed and unlicensed Mates	AVTEC, Seattle CC, Astoria CC and others		100 ton masters Navigation and vocational training certificates	6

Internal Training of Existing Workforce

DOES YOUR BUSINESS/ORGANIZATION USE ITS OWN STAFF TO DELIVER INTERNAL, FORMAL TRAINING LASTING ONE FULL DAY OR MORE AND BASED ON A RECOGNIZED CURRICULUM (MORE THAN JUST ON-THE-JOB INSTRUCTION AND COACHING)?

Type	Position	Training	Curriculum
ENV	Biometrician	Escapement Goal Analysis	
ENV	Biometrician	Writing techniques	
ENV	Procurement Specialist	Contracts, Grants, Procurement	NOAA Required
ENV	Supervisors	Supervisory Training using various vendors	Required Training
F	Skiff operator	Extreme skiff training	Internal
H	Our seasonal employees are provided with a week of training before being employed in the fisheries field.	Safety, fish identification and sampling methods	Internal
M	Adjunct Instructor	Mentoring	Internal
M	All positions	Customer Service	Alaska Host

M	Customer Service Crew	Classroom sessions, facility orientation, TAM training and safety/emergency training. CPR & First Aid	AMT - company designed
M	Deckhand/engineers	Classroom sessions, facility orientation and safety/emergency training. CPR & First Aid	AMT - company designed
M	Fork Lift Operator	Instruction and hands on	Vendor
M	HAZ-COM	Instructor-led	Commercially produced
M	In house training consists of Customer Service, Retail, Tour Supply, Inventory, Stocking, Maritime nomenclature and skills (such as line handling etc, safety (at work and with guests)		
M	Job Hazard Awareness	In person	Company provided
M	Lock Out Tag Out Stored Energy	Instructor Led	Company provided
M	Marine surveyor	Fiberglass, aluminum, wood recreational and commercial boats; damage investigations; appraisal training	ABYC standards; Society of Accredited Marine Surveying Recommended Content
M	Naturalist/interpreters	Classroom sessions, facility orientation, area familiarization and safety/emergency training. CPR & First Aid	AMT - company designed
M	New hires	Basic safety training, crowd control	
M	Port Security	Security, first aid, safety, customer service	
M	Respirator fit testing		
M	As needed.	Training of this nature is usually a regulatory requirement; i.e. asbestos, HASWOPER, etc.	
M	Vessel Captains (w/ 100 Ton License)	Classroom sessions, facility orientation, area familiarization and safety/emergency training. CPR & First Aid	AMT - company designed
M/A	Apprentice Pilot Trainee	Hands on training, simulation	
M/A	Deputy Pilot trainee	Hands on training, simulation	

Continued on next page

S	Foreman	Management	
S	In FY 13 we will be begin apprenticeships in IT and Seafood Marketing.		
S	Internal training is conducted on an as needed basis	Forklift driving, Quality Control, etc. Also, the company has been conducting training programs for Electricians and other skilled positions. This works well as those selected for these openings have demonstrated that they enjoy living and working in Dutch Harbor.	The training is in line with a certified apprenticeship, requiring the same hours in order to advance.
S	Line Manager	Management	
S	Mechanical Repair Industrial/Refrigeration	Apprenticeship	NCCER, Liberty Mutual, Garden City Ammonia Program
S	Microbiology Quality Control Technician-Seafood handling and production	Apprenticeship	NCCER, HACCP, Liberty Mutual, State of Alaska FSS, American Society Quality
S	Mobile Heavy Equipment Repair	Apprenticeship	NCCER, MAVCC, Liberty Mutual,
S	Office Manager	Personnel management	
S	Quality Control Manager	Management	
S/A	Electricians		
S/A	Millwrights		
S/A	Specialty Welders		

Type Codes:

CDQ = CDQ Group
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External Training of Existing Workforce

DOES YOUR COMPANY/ORGANIZATION REGULARLY SEND EXISTING EMPLOYEES TO AN EDUCATION OR TRAINING PROGRAM (INCLUDING AN ONLINE PROGRAM) EITHER IN ALASKA OR ELSEWHERE?

Type	Name of position trained	Name of program or organization providing the training	Location of program or organization	Degree, credential or certification (if applicable)	Approx. # employees sent per year
M	Able seamen			Fast rescue boat	10
M	Able seamen		80% KTN	Ratings	10
M	ALL	NOAA/NMFS	Seattle	HACCP	2
M	ALL	NPFVOA	Seattle	Fire training	8
M	ALL	NPFVOA	Seattle	Immersion suit pool training	12
M	ALL	NPFVOA	Seattle	Medical	12
M	All Crew Positions	CPR/FA Tongass Substance Screening	Ketchikan	CPR/FA Card	20
H	All employees	Red Cross or AK EMS	Kodiak	ETT or First Aid/CPR	15
H	All Employees	UA	Kodiak	N/A continuing ed	2
M	All Vessel Crew Positions	Red Cross	Various	CPR & First Aid	100
ENV	Biometrician	American Fisheries Society			2
ENV	Biometrician	American Statistical Association			1
S	Boiler Technician	Cleaver Brooks	Fresno, CA	Boiler fundamentals	1
S	Community Liaisons	BBEDC	Dillingham or Naknek	N/A	17
S	Crane Operator	Overton \?	Aloha, OR\ Yakima, WA	OSHA Crane Operation	1
H	Culturist	UAS	Online or Sitka		2
H	Culturist/ Biologist	UA	Anchorage	N/A	2
M	Customer Service Crew	State Contractor	Various	TAM qualification	100
F	Deckhand	Alaska Marine Safety Education Association	Sitka	First aid, Marine safety	1
M	Fire fighting	NPFVOA	Seattle	Certificate	12

Continued on next page

H	Fish culturist and technician	UAS Fisheries Technology Program	Sitka or online		3
M	Marine surveyor	ABYC STANDARDS	ABYC various	Certificate	1
S	Mechanical Repair/Refrigeration				6
M	Medical emergency	NPFVOA	Seattle	Certificate	12
S	Microbiology Quality Control Technician	NCCER, Liberty Mutual, ASQ, HACCP			5
S	Mobile Heavy Equipment Repair	NCCER, Liberty Mutual, MAVVC, Class A CDL			5
M	Passenger Service	AK Food Handlers	Internet based	Food Worker Card	15
M	Passenger Service	TAP	Ketchikan	TAP Card	10
CDQ	Plant Engineer	Garden City Ammonia	Kansas	Ammonia Cert	1
CDQ	Plant Engineer	American Trainco inc	Anchorage	HVAC Cert	1
CDQ	Plant Manager	MAP Seagrant	Anchorage	ASPLI	2
CDQ	Plant Manager	Two-day seminars	Anchorage		5
S	Salmon Cook	Better Process School	Burien, WA	Container Closure Technician, Low Acid Processing	2
M	Steward	UAS, AVTEC	KTN, Seward	Proficiency	35
ENV	Supervisors	Mandatory safety training	Various	Certification	1
ENV	Supervisors	Supervisory training	Various Vendors	Mandatory NOAA Training	2
M	Survival at sea	NPFVOA	Seattle	Certificate	12
S	Technician	Multi Vac	Kansas City, MO	Basic Machine Operations	1
M	Tugboat / Pilotboat master	Crawford Maritime	Vancouver, WA	License upgrades	2
M	Tugboat mate	Columbia Maritime	Seattle, WA	Towing lic. upgrade	2
M	Unlicensed deck and engineering	UAS, AVTEC	KTN, Seward	Advanced fire	20

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Regional Employment and Training Needs

DOES YOUR BUSINESS/ORGANIZATION HAVE SPECIAL EMPLOYMENT OR TRAINING NEEDS IN PARTICULAR REGIONS OR COMMUNITIES IN ALASKA?

Type	Location	Special Employment Need
CDQ	Aleutian/Pribilof Region	Community development
CDQ	Western Alaska	Biology and general field technician skills
F	Wrangell	Vessel repair, Diesel mechanic, Electrician
F/A	Cook Inlet	Fish picking, net hanging and mending, outboard motor repair, knot tying, welding
F/A	Kodiak Island	Certification programs on trawl gear design and repair. Certification programs on refrigeration operation and maintenance. Certification programs on marine electronics, new generation of communication equipment, hydro-acoustic fish finders, fisheries and oceanographic data collection
F/A	South Central	Continued Education in commercial fishing fields
H	Kodiak	Fisheries Research Techniques; Basic and Advanced Fisheries Biology (salmon), Fish Culture techniques, Worker Safety, first aid/emergency medical training; Welding
H	Nanwalek, Port Graham	Fisheries Technicians and Hatchery Operations
H	Rural Southeast Alaska	Small hydropower operation, maintenance and repair
M	All maritime (including interior) region	Willingness to travel
M	Ketchikan	Customer Service in Seasonal Visitor Industry
M	Sitka, Alaska - Allen marine Shipyard	Qualified aluminum welders, Mechanics and Marine Electricians
M	SE Alaska / Ketchikan	Trained and licensed Mariners

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M	Statewide	Entry-level construction and employability skills (NCCER LEVEL 1 - 2)
M	Unalaska/Dutch Harbor	HAZWOPPER, confined space, shipyard competent person training
M/A	Glacier Bay and Tracy Arm	Ice maneuvering
S	Bristol Bay	Refrigeration engineers, Diesel Mechanics, Welders, fiberglass workers
S	Floating processors	Finding skilled and non-killed workers willing to work in remote areas of Alaska
S	Naknek, Ketchikan	Refrigeration, Electrician, Millwright
S	Southeast	Smokehouse, retort, canning, packaging, shipping, filleting

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Priorities for Future Workforce Development

HOW IMPORTANT ARE EACH OF THE FOLLOWING TRENDS TO YOUR WORKFORCE NEEDS OVER THE NEXT TEN YEARS:

Workforce trend or training need	Very important	Important	Somewhat important	Not at all important
Need for additional skilled machinery operators	21%	29%	23%	23%
Training workers to use new types of technology (other than machinery)	19	38	25	13
Training to meet safety standards	44	37	12	4
Need for additional installation/repair/maintenance technicians	35	25	19	17
Need for more business and financial personnel	6	25	37	29
Cross-training workers (i.e., train workers to fill multiple positions)	31	40	21	4
Training employees for positions in foreign countries	2	2	8	85
Training in writing, public speaking or communication in the workplace	17	33	35	12
Training in quantitative skills	15	37	31	13
Training in the regulatory process	21	44	23	8
Training in environmental science	21	23	31	21
Other	21	29	23	23

“Other” responses, above, include vessel operation; fishing vessel repair and maintenance; seafood quality, safety and product development; advanced manufacturing production processes; USCG maritime requirements; packaging; and motivated workers.

WHAT TYPES OF TRAINING THAT YOU EITHER NEED NOW OR EXPECT TO NEED IN THE NEXT TEN YEARS ARE HARDEST TO FIND OR IN SHORT SUPPLY?

Type	Training Needed
CDQ	Ammonia training (not available in state), Quality Assurance, fisheries management, production management
CDQ	Technical training for skilled trades such as Refrigeration Technicians, Engineers, Welders, electricians, etc.
ENV	Writing and speaking training for employees for whom English is not the first language
ENV	Fish habitat protection
ENV	Most of the training we need at NOAA Fisheries is readily available through academic or private entities or internally through NOAA
F	Mechanics, fiberglass, electrician (all marine related)
F	Qualified deckhand training
F	EPA regulatory compliance training
F/A	Safety training. Fishing skills training
F/A	1. Applied engineering skills, i.e. electrical, mechanical, electronics, hydraulics and refrigeration 2. Vessel operations, management, state and federal regulatory compliance and policy, critical thinking and problem solving 3. Basic seamanship skills, gear repair and construction, fundamental life and social skills
F/A	Support services for commercial vessels; skills with electronics
F/A	Shore-based technical support
H	Hatchery technicians
H	Data management, biometrics, fishery management
H	Middle management
M	USPAP Appraisal Training. ABYC Standards
M	Employees that hold certifications that are recognized by OSHA and DEC, etc.
M	USCG Certified and or Licensed mariners who are good teachers/instructors
M	Class A truck drivers 100 ton master with towing
M	advanced training for tradesmen and engineering types
M	Customer Service/Personnel/Business/Marketing
M	Training seems to be readily available if you know where to look
M	Advanced manufacturing production processes based on knowledge of key tasks in ship production processes (industry standards)
M	Trained and licensed mariners
M	Regulatory training - OSHA and USCG requirements
M	HVAC Training, CDL, Heavy Equipment Operator

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M	Credentialed Mariners
M	Training to meet everyday needs
M	Technical training in specialty areas
M/A	Cost effective simulation
S	HACCP trained workers, high school graduates, people detailed oriented
S	<p><i>Seafood processing sector:</i> quality control technicians (seafood safety & seafood quality issues, including biological/chemical/other contamination and general quality, etc.); regulatory compliance as it applies to domestic and export markets; product development personnel to meet the needs of domestic and export consumer demand in retail and foodservice; food utilization technicians to assist with extracting maximum product and value from the entire raw product; trade persons (Electricians, Plumbers, Mechanics, Refrigeration specialists, Welders, etc.); individuals with other skills (Personnel Managerial, Manufacturing Management, Human Resources, Accounting, etc.).</p> <p><i>Harvesting sector:</i> individuals trained in: seamanship; vessel operation, handling & navigation; general vessel maintenance; general ship mechanics (electrical work, plumbing, engine mechanics, refrigeration, fabrication, etc.); on board quality assurance</p>
S	Technical-maintenance, etc. Regulatory familiarity and compliance production supervision and management for more advanced processes
S	Millwright, Electrical Engineer, Robotics Engineering
S	Refrigeration
S	Business analysts that understand the seafood industry. Environmental scientists that understand how our industry affects the environment around us and can work with government agencies to make sure we are in compliance with environmental laws.

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IF YOUR ORGANIZATION OR BUSINESS HAS RECOGNIZED CAREER PATHWAYS (ESTABLISHED WAYS FOR EMPLOYEES TO ADVANCE FROM JOB TO JOB WITHIN THE ORGANIZATION), PLEASE DESCRIBE THEM BRIEFLY.

Type	Typical Career Pathways
CDQ	Our seafood company recognizes hard working individuals and has promoted them through the years up to the position of plant manager and plant engineer. This is done by time in the positions and training requirements in either management or certifications for HVAC
CDQ	Processors to plant managers, deck hands to skippers, etc.
ENV	Biometrician I, Biometrician II, Biometrician III, Fishery Scientist I, Fishery Scientist II
ENV	NOAA offers an Advanced Studies Program, an Undergraduate Studies Program, a Leadership Competencies Development Program, and Aspiring Leaders Program. We have had from 10-20 employees go through the Advanced Studies or Undergraduate Studies programs at the University of Alaska. NOAA funds these students tuition
F/A	Improving on skills and take command
H	Not clearly defined
H	Pathway is available based on demonstrated abilities, performance, and drive
H	Employees can start in temporary Hatchery Technician positions assisting with fish feeding, cleaning, egg-takes and similar basic tasks. Those who demonstrate interest, dedication, competence and ability to communicate and interact well with other employees are usually offered permanent fish culture positions. The best of these, i.e. those that demonstrate ability to learn and execute a wide variety of specific hatchery skills and, most importantly, the ability to thrive socially in a small, remote work location, will be promoted to positions of increased authority and responsibility
M	Work toward full accreditation in the Society of Accredited Marine Surveyors
M	Vessel experience, USCG certification/licensing, teaching and organization leadership
M	We ask our employees where they want to go with their career and encourage them in that direction within our company as they show their ability and willingness to learn
M	We have a set of skill standards and a model training plan developed for the shipbuilding and repair industry by skilled workers
M	Deckhands with the necessary skills are given the opportunity to become vessel operators. In order to advance they must continue to upgrade their license and USCG requirements as well as show maritime abilities for competent operation of the vessel
M	Seasonal vessel captains are occasionally promoted to full-time operations managers. Seasonal deckhands are occasionally promoted to work full-time in the shipyard (as mechanics and engineers). Customer service crew are occasionally promoted to be naturalists or to shore support.
M	Greenhorn, full-share deckhand, engineer, captain
M	[See DOLWD career lattice] Positions are defined by USCG or AMHS regs.
S	Cross training. Suggesting one continues with their education
S	Yes we emulate the 16 Federal Career Clusters and have adapted them to our Company and the Seafood Industry

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-
- S Many managers started as production line workers. Always room for advancement for employees who are willing to put in the time and who are able to learn new skills
-
- S We internally train our maintenance helpers on the equipment then as people get promoted or leave the company they are promoted into the next job level
-
- S Almost every employee at the plants has been a processor. All of the supervisors, maintenance, auto shop, galley, dock workers, office, security, and all the way up to the production managers and also the plant managers. As positions open up each season, they are posted, and the selection begins.
-

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DO YOU HAVE ANY OTHER SUGGESTIONS FOR NEW OR EXPANDED TYPES OF TRAINING OR EDUCATION TO SUPPORT THE FISHERIES SEAFOOD MARITIME WORKFORCE NOW OR IN THE FUTURE?

Type	Other Suggestions for New or Expanded Training or Education
CDQ	Fisheries-specific management training, including regulatory training, logistics/processing plant management, accounting and human resources
ENV	Marketing Alaska wild salmon and their habitat as unique
ENV	Continue efforts to enhance and support the Undergraduate Fisheries Program (Rasmuson Foundation). Continue to work towards enhancing educational opportunities in Seafood Technology, Marketing, and Business fields
F	Alter the training programs available through the state/federal governments to allow for individuals to receive training for a specialized skill (e.g. diesel mechanic) and then go to work for themselves. In rural Alaska, many times an individual is his own business, yet most training programs won't allow people to enter unless they intend to work for another company after the training
F	There needs to be a highly specialized small-boat-operator course
F	Basic fisheries training - especially net hanging, net repair clinics
F/A	USCG safety regs are going to impose a huge burden on the fishing fleet in the coming years. We could use increased commercial fishing training. We could use more Mechanics, Refrigeration techs, Electricians, Machinists, and Welders
F/A	Certain areas of specialized applied fisheries science (other than classic fisheries and marine science) are becoming more important, but currently are not large enough to support an Alaska-based academic program. Mandated by-catch reduction, marine mammal avoidance, commercial fishing gear selectivity, gear design, etc. are becoming more important to the industry. Currently, vessel captains and crew have to travel to Denmark, Newfoundland, or Maryland to participate in workshops that address these issues. There may be potential for visiting professionals, researchers or professors to present seminars and workshops in these or similar topics. Timing and accessibility are always issues with programs like this
F/A	Training in support services-fiberglass repair; shipyard operation; welding; fabrication; shipwright, machining
H	As much online certificates, degrees, and workshops in the aquaculture, biometrics, data management areas
M	More training on the new USCG F/V regulations; and also the new towing industry regulations.
M	We suggest the University looks into emerging fisheries marketing new kinds of harvestable fish and shell fish that can be flown or moved by marine transport to foreign markets. Including farming of the shellfish. While we are not in the fishing industry directly, we serve the fishing fleet and do charter work for government, public and private industry in the areas of filming and research
M	Curriculum development

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M	A big problem for employers is rapid turnover; long time employees are our biggest asset. The main reason for turnover is character issues and poor attitude. This problem has a root in our countries social ills but I believe training in this area would help a lot of them
M	Adopt a common curriculum for the educational and training providers for construction related work and a strong employability sequence for entry level skill (through the equivalent of a 2 year degree, then support work place learning with supervisory training to include coaching and mentoring for subject matter experts (Training Within Industry)
M	The University of Alaska should support full funding for the Associate of Applied Science degree program in Maritime Transportation for UAS. A proven need
M	Most of our applicants cannot pass a drug test. Some type of drug and alcohol training
M	3-5 day USCG approved medical class (care provider - e.g., emergency trauma technician. An associate degree in deck or engineering duties that is USCG approved and receives credit for seagoing time to meet requirements
S	HACCP certification locally or at least a one-day program in Sanitary procedures. Numerous other Seafood businesses in the area would also be interested in this. Currently to have people certified we have to send out of town for training
S	The Post Secondary system offer RTI/short courses that support and work with the apprenticeship and training programs/systems of companies in the Seafood Industry
S	There is an ongoing need and domestic shortage of processor-level seasonal workers. I recommend targeting skilled trades (refrigeration, electrical, boilers/generators, line maintenance, welding, fabrication, production machinery maintenance
S	I recommend a vocational tech class specializing in refrigeration, but the class would need to be completed in a reasonable amount of time. Classes related to the fishing industry and what legal constraints surround this specific business
S	Training our existing workforce outside of the facilities is difficult as our permanent (non-seasonal) employees are needed at the plant every day with a few exceptions. But what can be promoted away from the plant would be the knowledge that Seafood Processing is not a dead end job. Almost all of our positions are filled with our own employees. Senior employees provide on the job training. We promote from within. Even though these are seasonal jobs, they provide employment from 9 to 10 months a year and the opportunity to earn and save a good amount of money

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Appendix 3: Interviews with FSM Sector Participants

Interviews were conducted with 25 individuals from various segments of the FSM sector. Interviewees represented the following organizations:

- Alaska Department of Fish and Game (ADF&G)
- Alaska Longline Fishermen's Association
- Alaska Marine Highway System (AMHS)
- Alaska Marine Safety Education Association (AMSEA)
- Alaska Vocational and Technical Education Center (AVTEC)
- At-Sea Processors Association
- Bristol Bay Economic Development Corporation (BBEDC)
- UA Bristol Bay Campus
- City of Petersburg Harbors
- Copper River Seafoods
- Kachemak Shellfish Growers
- Lynden Transport and Alaska Marine Lines
- Northwestern Alaska Career & Technical Center (NACTEC)
- Norton Sound Economic Development Corporation (NSEDC)
- Large Engineering Firm
- Port of Anchorage
- Port of Dutch Harbor
- Port of Kodiak
- Southwest Alaska Vocational Education Center (SAVEC)
- United Fishermen of Alaska
- UAS Ketchikan Campus

Because the FSM sector and the above organizations represent heterogeneous activities, it was not feasible to standardize interview questions or easily categorize responses. Interviews were designed to probe subjects' particular area of expertise for insights into training needs and the potential role of the university. Themes that emerged include the following:

WORKFORCE DEVELOPMENT GOALS

- *A UA FSM workforce development program should work, in part, to raise the profile of FSM occupations. Make people aware of opportunities.*
- *Be aware of, and realistic about, the number of positions available for graduates of upper level training programs. Some segments of the FSM sector will never have large management contingents in Alaska.*
- *Trainees in rural areas often need connections with employers outside the region.*

TRAINING NEEDS

- *Work readiness and drug/alcohol screening are important, especially to processors and other seasonal employers.*
- *Skills are needed at the management level, as well. Product development, marketing, QA, etc.*
- *Growing demand for icing/freezing technology.*
- *There may be unmet demand for 6-pack training. Too expensive for smaller training organizations.*
- *Port directors say vessel-support skills are hard to find, especially during the summer season, refrigeration, electronics, fiberglass, etc. A winter training program might provide some of these services to boat/permit owners during the off-season.*
- *Demand for safety-related training is significant and will increase with new USCG drill-instructor regulations.*
- *One reason for shortage of technical vessel support is that everyone needs them at once. Can training be used to extend availability of vessel services in places like Bristol Bay beyond the season?*
- *There is no particular shortage of highly trained technical crew such as licensed engineers and masters for larger transportation and catcher/processor vessels. However, those professionals need ongoing skills and refresher training.*
- *Training is needed in:*
 - *Fish quality and bleeding*
 - *Research on underutilized species*
 - *Marketing, both well known and less known species*
 - *Use of refrigeration, freezing, and slush technology*
 - *Impacts of environmental (climate) change*

IN-HOUSE TRAINING STRATEGIES

- *Most firms do in-house training. Copper River Seafoods developed a federally recognized apprenticeship program that currently has 15 candidates enrolled in 3 different disciplines.*
- *The concept of apprenticeships is receiving growing attention, spurred in part by federal and state funding when available. Keep curriculum flexible and duration of apprenticeships as short as possible. Ability to earn a wage during training is important.*
- *Firms are focusing more on developing technical, supervisory and management capacity from within, in part because complex industries such as seafood harvesting and processing demand local knowledge and experience as well as training.*

OTHER DELIVERY CONSIDERATIONS

- *Distance delivery is necessary to reach many Alaska workers, but it must typically be coupled with hands-on training, which is considered critical for many positions.*
- *AVTEC enjoys strong name recognition and an excellent reputation among high school students and counselors. They have the strongest maritime training program in the state, as well as sophisticated*

equipment such as their ship and fire training simulators, and ongoing partnerships with the Pilots Association, cruise industry and US Coast Guard.

- *A role for UA would be to offer short courses of technical instruction that support other programs, for example apprenticeships.*
- *Training needs to be accessible, affordable and credible, typically with a significant hands-on component.*
- *Young fishermen need training in new technologies partly to make themselves bankable – to get financing.*

Appendix 4: Overview of Education and Training Needs by FSM Subsector

This appendix combines information from the Forum, survey and interview research with DOLWD data to profile education and training needs in major FSM subsectors.

Commercial Fishing

Commercial fishing is one of Alaska's largest sectors, employing more than 30,000 people per year. Businesses range from a family with a few nets and a skiff to factory trawlers worth millions of dollars and employing more than 100 workers. In 2010, commercial fishermen of all kinds grossed an estimated \$1.7 billion. However, these are gross earnings and not wages or profits. Significant deductions must be made for fuel, gear, boat repairs, interest, food, taxes and other expenses.

Investment in upgrades on commercial fishing boats typically follows fish prices. The last four seasons have seen strong prices and concomitant investment in the fleet that, in turn, has increased demand for many marine services.

TYPES OF SKILLS NEEDED

Nearly all commercial fishing jobs are "blue collar" jobs requiring a range of technical skills. Most white-collar jobs associated with the seafood industry in Alaska are in government, sales, or non-profit organizations.

Very little formal training is required to enter the industry, but mastering the techniques needed to succeed can take a lifetime. The Alaska Vocational Technical Center (AVTEC) offers some relevant courses, such as Able Seaman, Basic Safety Training, Masters programs (25/50/100+ tons), Introduction to Nautical Skills, Shipboard Emergency Medicine, and several others. The Marine Transportation Department at UAS Ketchikan offers a range of courses for mariners, including many designed to meet the needs of AMHS staff. Finally, UA Fairbanks is the home of UA's undergraduate and graduate Fisheries programs. Typically, UAF programs are tailored for individuals training to work as biologists, administrators, or researchers.

Although commercial fishing boats range from less than 20 feet to more than 300 feet, the majority of Alaska's commercial fishing vessels are small and employ anywhere from three to 20 people. Larger factory trawlers may employ 100 or more, but most positions are processing rather than fishing jobs.

Ideally, each crew has a range of skills that cover all eventualities on a voyage (in addition to fishing skills such as hauling gear or knowing where/when to set gear). The same applies to other vessels on extended voyages, for example long-haul tugs. Some of these skills could be gained through vocational courses, including:

- Hydraulic Operation and Repair
- Marine Engine Repair

- Basic Navigation
- Marine Electronics Troubleshooting and Repair
- Onboard Refrigeration Repair
- Welding and Metal Fabrication
- Fiberglass Repair/Fabrication
- Gear Repair (Mending Nets or Tying New Lines/Leaders)

Skippers interviewed for this report indicated a need for skilled mechanics, refrigeration technicians, welder, shipwright/fiberglass, and marine electricians. A few respondents said they have trouble finding employees willing to work long, hard hours, but most responses indicated a lack of technical shoreside services.

Detailed occupational data on the commercial fishing industry is not available. Most commercial fishing operations are exempt from unemployment insurance levies. As a result, employment statistics similar to other wage and salary jobs are not available. License data shows how many permit holders (skippers) and crew participated in the industry during a given year. No government data is kept on how many first mates, hydraulic experts, or other specialists the industry requires, however.

New US Coast Guard requirements for safety drill instructors will affect fishermen and other who work outside the 3-mile limit. Unless it becomes a Coast Guard requirement, more general training aimed at qualifying people as “commercial fishermen/women” would likely take time to generate interest because the industry is so diverse, so remote, and has such a history of on-the-job learning. However, greater access to resource materials covering basic skills and how to address common problems might be helpful. Input from skippers in a range of fisheries, as well as from the US Coast Guard, would be important in designing such resources. The Coast Guard keeps incident reports that could provide clues to the type of reference materials that might be most useful.

DIVE FISHERIES

There are approximately 180 divers participating in the sea urchin and geoduck fisheries in Alaska. Southeast Alaska has three sea urchin plants, and the dive fisheries in that region are worth approximately \$9 million annually.

Seafood Processing

Seafood processing is Alaska’s second largest FSM industry, employing more than 22,000 workers. Most seafood processing workers are not year-round residents (in 2010 resident workers made up 27 percent of the industry workforce). This is because many of Alaska’s busiest processing plants are located in remote areas (for example, Akutan, Unalaska, and Excursion Inlet) or are highly seasonal (Petersburg and Bristol Bay). In these areas and situations, the local workforce is too small to fill several hundred jobs on a short-term basis.

TYPES OF SKILLS NEEDED

Every seafood plant in Alaska requires a unique collection of skills to function profitably. Most positions are low wage jobs requiring little training, but each plant contains several positions that require advanced skills/experience and pay substantial wages. Plant managers typically earn more than \$100,000 per year, while fleet managers can earn \$30,000 to \$60,000 for a season. Talented maintenance staff are paid well and required almost year round, even in seasonal plants. In addition, there are sales staff, accounting staff, and other white-collar positions that may be located at the plant or in a separate location.

Seafood processors surveyed for this report reported the following labor challenges:

- Finding enough hard-working employees to staff production lines
- Building greater awareness of opportunity within the Industry
- Finding skilled trade-workers (to maintain equipment/facilities and coordinate plant upgrades)
- Hiring trained quality control technicians and environmental officers
- Developing effective plant managers (who want to live in rural areas)

PRODUCTION LINE WORKERS AND AWARENESS OF OPPORTUNITY IN INDUSTRY

Forum feedback and industry surveys suggest staffing general line positions is the primary labor issue for most seafood processors. Uncertainty about the J-1 visa program has created additional concern about labor for the 2012 season. The J-1 visa program typically supplies several thousand workers for various Alaska industries, particularly the seafood processing industry during the summer months.

Work on the “slime line” can be tedious and exhausting, but it can also be a stepping-stone to more skilled positions within a plant or company. Although many of today’s managers started in entry-level positions, however, there is no clear ladder for advancement in most processing firms.

TRADE WORKERS (REFRIGERATION, ELECTRICAL, PRODUCTION EQUIPMENT)

Another big challenge for processors is finding skilled engineers who can fix refrigeration units, line equipment, and maintain other plant equipment/facilities. A few processors and a marine shipper said finding engineers or general maintenance workers with ammonia certification and the ability to fix onshore or offshore refrigeration units is especially difficult.

Alaska’s seafood industry has seen a great increase in refrigeration/freezing capacity during the past 10 years. In 2003, more than 50 percent of all commercially harvested Alaska salmon was canned. In 2011, only 20 percent of the salmon pack was sold in cans, the rest was delivered to fresh and frozen markets. In addition to plants adding more frozen capacity, a large percentage of the fleet now features Refrigerated Sea Water (RSW) systems that require specialized technical skills.

Maintenance and repair of RSW and refrigeration systems is a big part of most plant engineers’ jobs. Given the increase in refrigeration capacity, these skills are in high demand. The Alaska Marine Advisory Program

has addressed the situation by offering one-day workshops for fishermen so they can troubleshoot simple problems and have the background to communicate with a repair technician in order to fix a problem on the water. However, there are no programs available in Alaska to train people in the complex refrigeration systems being installed in Alaska's seafood plants.

QUALITY CONTROL TECHNICIANS, FOOD REGULATION EXPERTS, AND EFFICIENCY AUDITORS

Quality control (QC) technicians make sure processing plants comply with food safety and other regulations as well as meeting customer specifications. The latter can require knowledge of food science, especially as products become more complex. QC techs also audit production efficiency and many are responsible for monitoring plant discharge and overall worker safety.

The skill set needed to be an effective quality control technician is highly specific to the seafood industry. HACCP (basic food safety) training is common, but not ubiquitous, and no training program covers all the areas a QC technician might encounter.

PLANT MANAGERS

Several survey respondents said they have difficulties finding effective plant managers to live in rural Alaska. Plant managers are difficult to find because the position requires a combination of extensive plant experience and organizational, inter-personal, and business skills. Partly for this reason, some survey respondents expressed interest in the idea of a business-school curriculum tied to the seafood industry.

EMPLOYMENT AND EDUCATION/EXPERIENCE REQUIREMENTS

Occupational data was matched with DOLWD data on job qualifications to produce a profile of processing jobs by education level and experience level. Roughly four percent of seafood processing workers worked in jobs requiring education beyond high school in 2010.

Employment in Alaska Seafood Processing and Marketing Industry, 2010

	Number of Workers	Pct. Resident	Average Quarterly Wage	Average Age
By Education				
High School or Less (or N/A)	21,497	25%	5,896	40
Associates Degree or Post-Secondary Award	527	65	7,921	32
Bachelor's Degree or Higher	388	35	\$20,053	44
By Experience				
Less than 1 year (or N/A)	21,714	25	\$6,035	40
1 to 5 years	661	59	10,100	37
More than 5 years	37	76	27,189	48

Note: Data on age applies to Alaska residents only.
Source: DOLWD.

Water Transportation

Roughly 5,000 workers are employed ferrying goods, raw materials, and people to, from or within Alaska. The majority of these workers are residents and work for companies with significant operations in Alaska. The average private sector water transportation wage was \$11,217 per quarter in 2010. Those employed moving freight tended to earn higher incomes.

Cruise line employees are not included in these data. Cruise lines employ an estimated 21,697 crewmembers. This estimate is based on data from the Juneau Convention and Visitor's Bureau showing crew capacity for ships visiting Juneau in 2010.¹ Cruise line employees are not included in data shown below because they are not covered under Alaska's unemployment insurance program. These crewmembers are composed almost entirely of foreign nationals or US residents from other states and have little connection to the Alaska ports they visit (aside from shopping there along with the tourists they transport).

¹ All major cruise ships coming to Alaska typically make at least one stop in Juneau, which make this total an acceptable proxy for statewide cruise line crew employment.

**Employment in Alaska Water Transportation Industry
by Education and Sub-Sector - 2010**

	Number of Workers	Pct. Resident	Average Quarterly Wage	Average Age
By Education (Private Sector Only)				
High School or Less (or N/A)	3,306	64%	9,621	46
Associates Degree or Higher	750	53	17,821	38
Private Sector Total	4,056	62	11,217	39
By Sub-Sector (includes AMHS)				
Freight	1,895	70	15,156	42
Passenger/Sightseeing	1,816	50	6,042	35
Alaska Marine Highway System	935	N/A	N/A	N/A
Other	347	80	12,893	40
Cruise Lines	21,697	N/A	N/A	N/A
Total	26,688	-	-	-

Note: Data on age applies to Alaska residents only, as data is not available for nonresident workers. Employment by major cruise lines generally not included in these data because they operate primarily in international waters and the bulk of their employees are not covered under Alaska's unemployment insurance system.

Source: DOLWD, JCVB, and OMB.

Slightly less than half of the private sector water transport industry workforce is employed in general operating positions that require relatively little training or education. These positions include a wide range of jobs, such as: clerks, cashiers, material movers, housekeepers/cleaners, labors, and porters.

A large percentage of workers are employed as captains, mates, sailors, or marine oilers. About 1 in 15 workers in private sector water transport is employed as a manager and a similar number are employed as maintenance workers.

Private Sector Employment in Alaska Water Transportation Industry by Occupation

	Number of Workers
General Labor/Operations	1,887
Sailors/Oilers/Navigation	1,120
Management	272
Maintenance	248
Operating Engineers and Truck Drivers	235
Cooking	172
Administrative	81
Specific Pipeline Operations	27
Other	14

Note: Does not include employees of major cruise lines or government employees associated with the Alaska Marine Highway System.

Source: DOLWD.

SURVEY RESPONSES

Several companies working in the freight, salvage, and scenic sightseeing industries were interviewed for this report. They said the hardest positions to fill were for USCG-licensed and experienced mariners, knowledgeable guides/naturalists, and skilled trade workers. Seasonality and ability to pass drug tests were also noted as challenges.

Boat Building and Repair

Companies that build, repair, or sell boats employed nearly 700 people in Alaska during 2010, not including self-employed workers. Workers earned an average of \$9,868 per quarter and slightly more than 75 percent were Alaska residents.

An executive interviewed for this project expressed difficulty finding top-level project managers with knowledge of advanced manufacturing processes and supervisory/leadership skills. Hiring journeyman-level trade workers with substantial experience in key subject matters is also challenging. This executive suggested a common curriculum be adopted for educational and training programs related to vessel construction. He stressed three elements: 1) a strong employability sequence from entry level (through the equivalent of a two year degree), 2) work place learning with supervisory training as employees progress, and 3) mentoring by subject-matter experts to ensure institutional knowledge is passed on.

Similar to other production-oriented segments of the FSM sector, vocational training most needed is for refrigeration, marine construction techniques, DC electrical systems, marine boilers, diesel engines, stainless/fiberglass fabrication, and processing equipment.

Salmon Hatcheries

Most salmon hatcheries in Alaska were established by the Alaska Department of Fish and Game in the 1970s and 1980s. Today, most hatcheries are run by private, non-profit companies or regional aquaculture associations. Operations are generally paid for through cost-recovery harvesting (when hatcheries contract local fishermen to catch and sell their fish) and enhancement taxes paid by fishermen. The State occasionally contributes funding for capital projects.

Alaska's private salmon hatchery industry employed 456 workers in 2010. Including state and federal employees working at salmon hatcheries, the total figure is probably close to 500. These employees collect broodstock, hatch more than 1 billion fry, and release them into the wild according to regional salmon plans.

Four salmon hatchery operators were surveyed for this report. Those surveyed expressed difficulty filling positions from entry level through upper management. Skills noted as scarce include: aquaculture/fishery research techniques, scientific report writing, project management skills, budget management, supervisory skill, and a basic understanding of Alaska and the commercial fishing industry. One hatchery operator suggested online certificates, courses, or workshops covering general aquaculture methods, biometrics, and data management.

Shellfish Mariculture

Shellfish mariculture, primarily oysters and mussels, is a small industry in Alaska, but one with potential for growth. Most farms are in Kachemak Bay or Southeast. Because world markets for these products are very large, and mariculture typically occurs in remote locations, the industry has been identified as having important community development potential if it can develop to a more efficient scale of operations.

Currently there are approximately 75 licensed shellfish farms in Alaska. Half are productive and employ a total of roughly 125 people. Kachemak Shellfish Growers Cooperative is exploring the possibility of an apprenticeship program. There are no regularly scheduled courses in shellfish biology in Alaska. UAS Ketchikan has arranged for visiting lecturers in the past. Other key employee skills include those associated with working in small boats.

Marine Engineering and Surveying

Unlike aquaculture or seafood processing, there is no NAICS code that specifically delineates marine engineering or marine surveying firms. In an effort to quantify Alaska's marine engineering and surveying sector, the study team asked DOLWD to isolate a group of companies known to provide these services.

These firms employed 156 workers in 2010. They typically contract for design and construction management on marine or harbor/port construction projects but may work on other construction projects as well. Some firms also perform marine vessel surveys. As a group, these workers tend to require advanced degrees and earn relatively high wages.

One surveying firm was interviewed for this report. They noted difficulties filling positions for marine surveyors, which require knowledge of USCG regulations, American Boat and Yacht Council (ABYC) standards, and National Fire Protection Association (NFPA) standards.

An executive from an engineering firm known for design and construction of marine facilities urged UA to consider more course content related to coastal engineering, including areas such as harbor utilities design, marine geotechnical engineering, offshore foundation piles, heavy timber design, and hydrographic surveying. The representative also said there is a need for affordable training in certified welding and welding inspections.

State and Federal Government

The State of Alaska (ADF&G and AMHS), USCG, and NOAA employ a total of roughly 6,600 workers in Alaska’s FSM sector. Gathering occupational data on these government workers is challenging because state workers are not identified by agency within DOLWD data, and federal employees are not included in the State’s occupational database (because they are not covered under Alaska’s unemployment insurance system). Instead, the study team used budget reports and communicated with various federal departments to estimate employment in agencies known to support the FSM sector.

Federal and State Employment in Agencies Related to Alaska Maritime Industries

	Number of Workers
US Coast Guard in Alaska	3,010
Alaska Department of Fish and Game	1,743
Alaska Marine Highway System	935
National Oceanic and Atmospheric Administration	888
State and Federal Government Total	6,576

Source: OMB, NOAA, US Office of Personnel Management and American Forces News Service.

NOAA and ADF&G were surveyed for this report. The NOAA representative suggested the University continue efforts to enhance and support the Undergraduate Fisheries Program and work towards enhancing educational opportunities in seafood technology, marketing, and business fields (although the latter programs are not related to NOAA staff). ADF&G responses indicated that finding biometricians can be difficult because many applicants do not possess a strong combination of statistical skills, biological/ocean knowledge, and writing/speaking skills.

ADF&G has a much broader range of training needs, and UA may be well suited to meeting many of them. However, those needs have not been documented recently. The department's most recent comprehensive workforce development plan was published in 2008. It identifies cross-training and supervisory training as high priorities among employees. The report does not recommend specific kinds of technical training, but includes some suggestions offered by staff. These include training for:

- Seasonal field technicians in bear safety, first aid, boat handling etc.
- Programming languages
- Technical writing
- Leadership and management

The best way to pinpoint training needs and opportunities with ADF&G may be to work directly with department leadership to conduct a department-wide survey designed to identify the incidence and focus of past trainings and to estimate future needs for each division within the department.

Potential Training Needs Related to Arctic Marine Research

The Arctic Ocean and Alaska marine environment will be the subject of intensified research in coming years as a result of global warming. Climate change may also create commercial opportunities as receding ice sheets offer more efficient shipping routes or allow access to hydrocarbon deposits.

Alaska already plays a pivotal role in Arctic research/exploration. Endeavors. The University of Alaska-Fairbanks (UAF) International Arctic Research Center has a long history of collaborative Arctic research. In addition, the Arctic Research Consortium of the US (ARCUS) is based in Fairbanks and supports numerous ongoing Arctic research projects. One project is the Study of Environmental Arctic Change (SEARCH), which seeks to understand the nature, extent, and future system-scale developments in the Arctic and interpret those developments in the context of environmental changes occurring in other climates.

In order to carry out this massive research undertaking, a variety of tools and skills will be needed. One tool, the 261-foot research vessel R/V Sikuliaq is currently under construction in Wisconsin and is expected to begin collecting data in 2014. It will be able to break ice up to 2.5 feet thick and will be homeported in Seward at UAF's Seward Marine Center.

Future research missions will require collaboration across physical borders and disciplines. The Arctic environment will require skilled technical staff (to ensure instruments and communication equipment continue to function during a research mission) and academic staff to study data. Expanding or forecasting all

the positions and skills required as Arctic research evolves is beyond the scope of this report, but the University should confer with UAF, ARCUS, SEARCH, and other Arctic research groups to discuss training needs and learn from experiences associated with prior research projects.

Summary of FSM Employment by Size of Employer

FSM employment data was segregated by employer size to determine whether there are significant differences in wages, residency, or quarters worked. These data do not include self-employed individuals, rather only wage and salary workers covered under Alaska's unemployment insurance program.

In general, workers employed by larger companies work more quarters and make more money (except in the seafood processing industry where average wages were higher in smaller firms). Overall, smaller firms employed a higher percentage of residents. Remote processing plants are typically large-scale operations requiring many imported workers. This pushes the total nonresident hire percentage up. In the water-transport sector, smaller companies are likely involved in the visitor sightseeing or guiding industries, which require local knowledge.

Private Sector Employment by Employer Size - 2010

	Number of Workers	Pct. Resident	Avg. Wages/Worker	Avg. Number of Quarters Worked
Employers with more than 25 FTE employees				
Boat Building/Repair/Dealers	413	72%	\$11,019	3.2
Salmon Hatcheries	384	61	8,252	3.0
Seafood Processing/Marketing	20,930	25	6,231	2.3
Selected Marine Engineering and Surveying	161	89	19,757	3.6
Water Transportation	2,735	64	12,116	3.2
Total	24,623	31%	\$7,351	2.5
Employers with fewer than 25 FTE employees				
Boat Building/Repair/Dealers	280	82%	\$8,111	3.1
Salmon Hatcheries	72	79	6,491	2.8
Seafood Processing/Marketing	1,482	44	6,616	1.9
Selected Marine Engineering and Surveying	22	55	10,725	2.9
Water Transportation	1,321	57	8,788	2.4
Total	3,177	54%	\$7,794	2.3

Source: DOLWD.

Appendix 5: FSM Private Sector Workers and Education Requirements by Occupation Code

This table shows the number of workers (in 2010) in private-sector FSM occupations along with education and on-the-job training (OJT) requirements developed by DOLWD for each occupation.

Occ. Code	Occupational Title	Count of Workers	Education Required	OJT Required
111011	Chief Executives	34	Bachelors degree	None or N/A
111021	General and Operations Managers	134	Associate degree	None or N/A
112011	Advertising and Promotions Managers	2	Bachelors degree	None or N/A
112021	Marketing Managers	6	Bachelors degree	None or N/A
112022	Sales Managers	14	Bachelors degree	None or N/A
113011	Administrative Services Managers	21	HS diploma or GED	None or N/A
113021	Computer and Information Systems Managers	3	Bachelors degree	None or N/A
113031	Financial Managers	8	Bachelors degree	None or N/A
113051	Industrial Production Managers	12	Bachelors degree	None or N/A
113061	Purchasing Managers	4	Bachelors degree	None or N/A
113071	Transportation, Storage, and Distribution Managers	7	HS diploma or GED	None or N/A
113121	Human Resources Managers	6	Bachelors degree	None or N/A
119013	Farmers, Ranchers, and Other Agricultural Managers	14	HS diploma or GED	None or N/A
119041	Engineering Managers	21	Bachelors degree	None or N/A
119051	Food Service Managers	4	HS diploma or GED	None or N/A
119081	Lodging Managers	5	HS diploma or GED	None or N/A
119121	Natural Sciences Managers	1	Bachelors degree	None or N/A
119199	Managers, All Other	48	HS diploma or GED	None or N/A
131022	Wholesale and Retail Buyers, Except Farm Products	3	HS diploma or GED	Long-term
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	22	HS diploma or GED	Long-term
131041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	49	Bachelors degree	Moderate-term
131071	Employment, Recruitment, and Placement Specialists	4	Bachelors degree	None or N/A
131075	Labor Relations Specialists	1	Bachelors degree	None or N/A
131081	Logisticians	4	Bachelors degree	None or N/A
131121	Meeting and Convention Planners	1	Bachelors degree	None or N/A
131199	Business Operations Specialists, All Other	9	HS diploma or GED	Long-term

132011	Accountants and Auditors	22	Bachelors degree	None or N/A
132082	Tax Preparers	1	HS diploma or GED	Moderate-term
151121	Computer Systems Analysts	2	Bachelors degree	None or N/A
151131	Computer Programmers	1	Bachelors degree	None or N/A
151142	Network and Computer Systems Administrators	1	Bachelors degree	None or N/A
151151	Computer User Support Specialists	1	Some college, no degree	Moderate-term
171021	Cartographers and Photogrammetrists	1	Bachelors degree	None or N/A
171022	Surveyors	2	Bachelors degree	None or N/A
172051	Civil Engineers	58	Bachelors degree	None or N/A
172071	Electrical Engineers	2	Bachelors degree	None or N/A
172081	Environmental Engineers	1	Bachelors degree	None or N/A
172121	Marine Engineers and Naval Architects	5	Bachelors degree	None or N/A
172141	Mechanical Engineers	83	Bachelors degree	None or N/A
172151	Mining and Geological Engineers, Including Mining Safety Engineers	1	Bachelors degree	None or N/A
172199	Engineers, All Other	14	Bachelors degree	None or N/A
173011	Architectural and Civil Drafters	17	Associate degree	None or N/A
173019	Drafters, All Other	2	Associate degree	None or N/A
173029	Engineering Technicians, Except Drafters, All Other	1	Associate degree	None or N/A
173031	Surveying and Mapping Technicians	2	HS diploma or GED	Moderate-term
191012	Food Scientists and Technologists	1	Bachelors degree	None or N/A
191021	Biochemists and Biophysicists	1	Doctoral or prof. degree	None or N/A
191023	Zoologists and Wildlife Biologists	9	Bachelors degree	None or N/A
191029	Biological Scientists, All Other	12	Doctoral or prof. degree	None or N/A
192031	Chemists	14	Bachelors degree	None or N/A
192041	Environmental Scientists and Specialists, Including Health	12	Bachelors degree	None or N/A
192042	Geoscientists, Except Hydrologists and Geographers	6	Bachelors degree	None or N/A
192043	Hydrologists	1	Master's degree	None or N/A
193051	Urban and Regional Planners	5	Master's degree	None or N/A
193091	Anthropologists and Archeologists	3	Master's degree	None or N/A
194011	Agricultural and Food Science Technicians	20	Associate degree	None or N/A
194021	Biological Technicians	1	Bachelors degree	None or N/A
194041	Geological and Petroleum Technicians	5	Associate degree	Moderate-term
194091	Environmental Science and Protection Technicians, Including Health	11	Associate degree	Moderate-term
194099	Life, Physical, and Social Science Technicians, All Other	76	Associate degree	Moderate-term
211019	Counselors, All Other	1	Master's degree	None or N/A

231011	Lawyers	1	Doctoral or prof. degree	None or N/A
251199	Postsecondary Teachers, All Other	1	Doctoral or prof. degree	None or N/A
252059	Special Education Teachers, All Other	1	Bachelors degree	Internship/Residency
253011	Adult Literacy, Remedial Education, and GED Teachers and Instructors	1	Bachelors degree	Internship/Residency
271012	Craft Artists	1	HS diploma or GED	Long-term
272099	Entertainers and Performers, Sports and Related Workers, All Other	6	HS diploma or GED	None or N/A
273012	Public Address System and Other Announcers	3	HS diploma or GED	Short-term
273042	Technical Writers	1	Bachelors degree	Short-term
274013	Radio Operators	1	HS diploma or GED	Short-term
291071	Physician Assistants	1	Master's degree	None or N/A
291141	Registered Nurses	1	Associate degree	None or N/A
299011	Occupational Health and Safety Specialists	2	Bachelors degree	Moderate-term
299012	Occupational Health and Safety Technicians	21	HS diploma or GED	Moderate-term
319099	Healthcare Support Workers, All Other	7	HS diploma or GED	Short-term
331099	First-Line Supervisors/Managers, Protective Service Workers, All Other	1	HS diploma or GED	None or N/A
333051	Police and Sheriff's Patrol Officers	1	HS diploma or GED	Moderate-term
339032	Security Guards	42	HS diploma or GED	Short-term
339099	Protective Service Workers, All Other	11	HS diploma or GED	Short-term
351011	Chefs and Head Cooks	49	HS diploma or GED	None or N/A
351012	First-Line Supervisors/Managers of Food Preparation and Serving Workers	11	HS diploma or GED	None or N/A
352012	Cooks, Institution and Cafeteria	139	Less than HS	Short-term
352014	Cooks, Restaurant	46	Less than HS	Moderate-term
352015	Cooks, Short Order	5	Less than HS	Short-term
352019	Cooks, All Other	67	Less than HS	Moderate-term
352021	Food Preparation Workers	92	Less than HS	Short-term
353011	Bartenders	25	Less than HS	Short-term
353021	Combined Food Preparation and Serving Workers, Including Fast Food	60	Less than HS	Short-term
353022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	8	Less than HS	Short-term
353031	Waiters and Waitresses	95	Less than HS	Short-term
353041	Food Servers, Nonrestaurant	1	Less than HS	Short-term
359011	Dining Room and Cafeteria Attendants and Bartender Helpers	21	Less than HS	Short-term
359021	Dishwashers	18	Less than HS	Short-term
359031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	28	Less than HS	None or N/A

359099	Food Preparation and Serving Related Workers, All Other	28	Less than HS	Short-term
371011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	5	HS diploma or GED	None or N/A
371012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	1	HS diploma or GED	None or N/A
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	77	Less than HS	Short-term
372012	Maids and Housekeeping Cleaners	231	Less than HS	Short-term
372019	Building Cleaning Workers, All Other	17	HS diploma or GED	Short-term
372021	Pest Control Workers	1	HS diploma or GED	Moderate-term
373011	Landscaping and Groundskeeping Workers	8	Less than HS	Short-term
373019	Grounds Maintenance Workers, All Other	12	Less than HS	Short-term
393091	Amusement and Recreation Attendants	4	Less than HS	Short-term
396011	Baggage Porters and Bellhops	26	HS diploma or GED	Short-term
397011	Tour Guides and Escorts	110	HS diploma or GED	Moderate-term
397012	Travel Guides	20	HS diploma or GED	Moderate-term
399011	Child Care Workers	1	HS diploma or GED	Short-term
399032	Recreation Workers	23	Bachelors degree	None or N/A
399041	Residential Advisors	1	Some college, no degree	Short-term
399099	Personal Care and Service Workers, All Other	3	HS diploma or GED	Short-term
411011	First-Line Supervisors/Managers of Retail Sales Workers	17	HS diploma or GED	None or N/A
411012	First-Line Supervisors/Managers of Non-Retail Sales Workers	2	HS diploma or GED	None or N/A
412011	Cashiers	75	Less than HS	Short-term
412021	Counter and Rental Clerks	21	Less than HS	Short-term
412022	Parts Salespersons	21	Less than HS	Moderate-term
412031	Retail Salespersons	117	Less than HS	Short-term
413099	Sales Representatives, Services, All Other	34	HS diploma or GED	Short-term
414011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	2	Bachelors degree	Moderate-term
414012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	10	HS diploma or GED	Moderate-term
419091	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers	2	HS diploma or GED	Short-term
419099	Sales and Related Workers, All Other	26	HS diploma or GED	Moderate-term
431011	First-Line Supervisors/Managers of Office and Administrative Support	63	HS diploma or GED	None or N/A

Workers				
433011	Bill and Account Collectors	1	HS diploma or GED	Moderate-term
433021	Billing and Posting Clerks and Machine Operators	24	HS diploma or GED	Short-term
433031	Bookkeeping, Accounting, and Auditing Clerks	124	HS diploma or GED	Moderate-term
433051	Payroll and Timekeeping Clerks	27	HS diploma or GED	Moderate-term
433061	Procurement Clerks	13	HS diploma or GED	Moderate-term
433099	Financial Clerks, All Other	2	None or N/A	None or N/A
434051	Customer Service Representatives	70	HS diploma or GED	Short-term
434071	File Clerks	9	HS diploma or GED	Short-term
434081	Hotel, Motel, and Resort Desk Clerks	35	HS diploma or GED	Short-term
434161	Human Resources Assistants, Except Payroll and Timekeeping	9	HS diploma or GED	Short-term
434171	Receptionists and Information Clerks	34	HS diploma or GED	Short-term
434181	Reservation and Transportation Ticket Agents and Travel Clerks	39	HS diploma or GED	Short-term
434199	Information and Record Clerks, All Other	9	HS diploma or GED	Short-term
434199.03	Financial, Information and Record Clerks, All Other	4	None or N/A	None or N/A
434199.05	Material Recording, Scheduling, Dispatching and Distribution Clerks, All Other	1	None or N/A	None or N/A
435011	Cargo and Freight Agents	44	HS diploma or GED	Short-term
435021	Couriers and Messengers	19	HS diploma or GED	Short-term
435032	Dispatchers, Except Police, Fire, and Ambulance	51	HS diploma or GED	Moderate-term
435051	Postal Service Clerks	2	HS diploma or GED	Short-term
435061	Production, Planning, and Expediting Clerks	16	HS diploma or GED	Moderate-term
435071	Shipping, Receiving, and Traffic Clerks	33	HS diploma or GED	Short-term
435081	Stock Clerks and Order Fillers	62	Less than HS	Short-term
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	1	HS diploma or GED	Short-term
436011	Executive Secretaries and Administrative Assistants	32	HS diploma or GED	None or N/A
436014	Secretaries, Except Legal, Medical, and Executive	17	HS diploma or GED	Short-term
439011	Computer Operators	3	HS diploma or GED	Moderate-term
439021	Data Entry Keyers	3	HS diploma or GED	Moderate-term
439022	Word Processors and Typists	5	HS diploma or GED	Short-term
439051	Mail Clerks and Mail Machine Operators, Except Postal Service	2	HS diploma or GED	Short-term
439061	Office Clerks, General	334	HS diploma or GED	Short-term
439199	Office and Administrative Support	92	HS diploma or GED	Short-term

Workers, All Other				
451011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	100	HS diploma or GED	None or N/A
452011	Agricultural Inspectors	7	Bachelors degree	Moderate-term
452041	Graders and Sorters, Agricultural Products	96	Less than HS	Short-term
452093	Farmworkers, Farm and Ranch Animals	62	Less than HS	Short-term
452099	Agricultural Workers, All Other	167	Less than HS	Short-term
453011	Fishers and Related Fishing Workers	875	Less than HS	Moderate-term
471011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	5	HS diploma or GED	None or N/A
472031	Carpenters	49	HS diploma or GED	Apprenticeship
472051	Cement Masons and Concrete Finishers	1	Less than HS	Moderate-term
472061	Construction Laborers	145	Less than HS	Short-term
472073	Operating Engineers and Other Construction Equipment Operators	11	HS diploma or GED	Moderate-term
472111	Electricians	63	HS diploma or GED	Apprenticeship
472141	Painters, Construction and Maintenance	31	Less than HS	Moderate-term
472152	Plumbers, Pipefitters, and Steamfitters	5	HS diploma or GED	Apprenticeship
472211	Sheet Metal Workers	2	HS diploma or GED	Apprenticeship
472221	Structural Iron and Steel Workers	10	HS diploma or GED	Apprenticeship
473012	Helpers--Carpenters	2	Less than HS	Short-term
473013	Helpers--Electricians	4	HS diploma or GED	Short-term
473019	Helpers, Construction Trades, All Other	27	Less than HS	Short-term
474011	Construction and Building Inspectors	3	HS diploma or GED	Moderate-term
474031	Fence Erectors	2	HS diploma or GED	Moderate-term
474041	Hazardous Materials Removal Workers	14	HS diploma or GED	Moderate-term
474099	Construction and Related Workers, All Other	7	HS diploma or GED	Moderate-term
475013	Service Unit Operators, Oil, Gas, and Mining	1	Less than HS	Moderate-term
491011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	45	HS diploma or GED	None or N/A
492021	Radio Mechanics	1	Associate degree	Moderate-term
492093	Electrical and Electronics Installers and Repairers, Transportation Equipment	3	Postsecondary non-degree award	Long-term
492095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	9	Postsecondary non-degree award	Long-term
493011	Aircraft Mechanics and Service Technicians	5	Postsecondary non-degree award	None or N/A
493023	Automotive Service Technicians and Mechanics	30	HS diploma or GED	Long-term

493031	Bus and Truck Mechanics and Diesel Engine Specialists	46	HS diploma or GED	Long-term
493042	Mobile Heavy Equipment Mechanics, Except Engines	6	HS diploma or GED	Long-term
493043	Rail Car Repairers	2	HS diploma or GED	Long-term
493051	Motorboat Mechanics	29	HS diploma or GED	Long-term
493052	Motorcycle Mechanics	3	HS diploma or GED	Long-term
493053	Outdoor Power Equipment and Other Small Engine Mechanics	7	HS diploma or GED	Moderate-term
493092	Recreational Vehicle Service Technicians	12	HS diploma or GED	Long-term
499021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	31	Postsecondary non-degree award	Long-term
499041	Industrial Machinery Mechanics	26	HS diploma or GED	Long-term
499043	Maintenance Workers, Machinery	81	HS diploma or GED	Moderate-term
499044	Millwrights	1	HS diploma or GED	Long-term
499071	Maintenance and Repair Workers, General	159	HS diploma or GED	Moderate-term
499092	Commercial Divers	7	Postsecondary non-degree award	Moderate-term
499093	Fabric Menders, Except Garment	1	Less than HS	Long-term
499098	Helpers--Installation, Maintenance, and Repair Workers	102	HS diploma or GED	Moderate-term
499099	Installation, Maintenance, and Repair Workers, All Other	111	HS diploma or GED	Moderate-term
499099.0 2	Electrical and Electronic Equipment Maintenance, Installation and Repairers, All other	1	None or N/A	None or N/A
499099.0 3	Vehicle, Mobile Equipment Mechanics, Installers, and Repairers, All Other	1	None or N/A	None or N/A
511011	First-Line Supervisors/Managers of Production and Operating Workers	386	Postsecondary non-degree award	None or N/A
511011.0 1	First-line Supervisors/Managers of Seafood Processing Workers	284	None or N/A	None or N/A
512041	Structural Metal Fabricators and Fitters	8	HS diploma or GED	Moderate-term
512091	Fiberglass Laminators and Fabricators	11	HS diploma or GED	Moderate-term
512099	Assemblers and Fabricators, All Other	6	HS diploma or GED	Moderate-term
513011	Bakers	5	Less than HS	Long-term
513022	Meat, Poultry, and Fish Cutters and Trimmers	2503	Less than HS	Short-term
513022.0 5	Seafood Processing Workers, Except Surimi and Fish Roe	14390	None or N/A	None or N/A
513091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders	12	Less than HS	Moderate-term
513092	Food Batchmakers	72	HS diploma or GED	Short-term
513092.0 1	Surimi Technicians	387	None or N/A	None or N/A

513092.0 2	Fish Roe Technicians	133	None or N/A	None or N/A
513093	Food Cooking Machine Operators and Tenders	3	HS diploma or GED	Short-term
513099	Food Processing Workers, All Other	44	None or N/A	None or N/A
514031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	23	HS diploma or GED	Moderate-term
514041	Machinists	145	HS diploma or GED	Long-term
514121	Welders, Cutters, Solderers, and Brazers	127	HS diploma or GED	Moderate-term
514192	Lay-Out Workers, Metal and Plastic	3	HS diploma or GED	Moderate-term
514199	Metal Workers and Plastic Workers, All Other	4	HS diploma or GED	Moderate-term
516011	Laundry and Dry-Cleaning Workers	19	Less than HS	Short-term
517099	Woodworkers, All Other	1	HS diploma or GED	Moderate-term
518013	Power Plant Operators	6	HS diploma or GED	Long-term
518021	Stationary Engineers and Boiler Operators	8	HS diploma or GED	Long-term
518093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	2	HS diploma or GED	Long-term
518099	Plant and System Operators, All Other	2	HS diploma or GED	Long-term
519012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	4	HS diploma or GED	Moderate-term
519031	Cutters and Trimmers, Hand	21	Less than HS	Short-term
519032	Cutting and Slicing Machine Setters, Operators, and Tenders	27	HS diploma or GED	Short-term
519032.0 5	Baader Machine Setters, Operators and Tenders	66	None or N/A	None or N/A
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	26	HS diploma or GED	Moderate-term
519111	Packaging and Filling Machine Operators and Tenders	70	HS diploma or GED	Moderate-term
519122	Painters, Transportation Equipment	5	HS diploma or GED	Moderate-term
519193	Cooling and Freezing Equipment Operators and Tenders	13	HS diploma or GED	Moderate-term
519198	Helpers--Production Workers	12	Less than HS	Short-term
519199	Production Workers, All Other	10	HS diploma or GED	Moderate-term
531011	Aircraft Cargo Handling Supervisors	1	HS diploma or GED	None or N/A
531021	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	29	HS diploma or GED	None or N/A
531031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	32	HS diploma or GED	None or N/A
532011	Airline Pilots, Copilots, and Flight Engineers	1	HS diploma or GED	Long-term

532012	Commercial Pilots	2	HS diploma or GED	Long-term
532021	Air Traffic Controllers	2	Associate degree	Long-term
532031	Flight Attendants	1	HS diploma or GED	Moderate-term
533021	Bus Drivers, Transit and Intercity	6	HS diploma or GED	Moderate-term
533022	Bus Drivers, School	2	HS diploma or GED	Moderate-term
533031	Driver/Sales Workers	25	HS diploma or GED	Short-term
533032	Truck Drivers, Heavy and Tractor-Trailer	59	HS diploma or GED	Short-term
533033	Truck Drivers, Light or Delivery Services	59	HS diploma or GED	Short-term
533041	Taxi Drivers and Chauffeurs	7	Less than HS	Short-term
533099	Motor Vehicle Operators, All Other	38	HS diploma or GED	Short-term
535011	Sailors and Marine Oilers	798	Less than HS	Short-term
535021	Captains, Mates, and Pilots of Water Vessels	560	Bachelors degree	None or N/A
535022	Motorboat Operators	24	HS diploma or GED	Short-term
535031	Ship Engineers	211	Bachelors degree	None or N/A
536031	Service Station Attendants	9	Less than HS	Short-term
536051	Transportation Inspectors	3	Some college, no degree	Short-term
536061	Transportation Attendants, Except Flight Attendants	94	HS diploma or GED	Short-term
536099	Transportation Workers, All Other	30	HS diploma or GED	Short-term
536099.05	Water Transportation Workers, All Other	59	None or N/A	None or N/A
537011	Conveyor Operators and Tenders	9	Less than HS	Short-term
537021	Crane and Tower Operators	68	Less than HS	Long-term
537032	Excavating and Loading Machine and Dragline Operators	1	Less than HS	Moderate-term
537041	Hoist and Winch Operators	2	Less than HS	Moderate-term
537051	Industrial Truck and Tractor Operators	89	Less than HS	Short-term
537061	Cleaners of Vehicles and Equipment	11	Less than HS	Short-term
537062	Laborers and Freight, Stock, and Material Movers, Hand	332	Less than HS	Short-term
537064	Packers and Packagers, Hand	10	Less than HS	Short-term
537081	Refuse and Recyclable Material Collectors	1	Less than HS	Short-term
537121	Tank Car, Truck, and Ship Loaders	118	Less than HS	Short-term
537199	Material Moving Workers, All Other	598	Less than HS	Short-term