



Montana Department of **LABOR & INDUSTRY**

Registered Apprenticeship Program Data Report September 25, 2017

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Apprenticeships are a time-honored tradition of passing on craftsmanship, knowledge, and skills to the next generation in the workplace. This tried-and-true method of on-the-job training is just as integral to our worker training systems today as it has been in century's past, but today's apprenticeships have evolved to meet the needs of our economy. Modern apprentices now study in fields like information technology and healthcare, in addition to the traditional apprenticeships for plumbers, carpenters, and electricians. Apprenticeships also often require college-level classroom learning to keep up with the science, computing, and technologies needed for modern day success.

The Montana Department of Labor & Industry's Registered Apprenticeship program partners with union and non-union employers to establish registered apprenticeship programs in our state. A registered apprenticeship program provides on-the-job and classroom training required to meet national requirements for an industry-recognized certificate through a curriculum customized to meet the needs of the employer. Once an apprentice has completed a registered apprenticeship program, he or she obtains an industry-recognized credential indicating to employers in all fifty states that the worker is qualified and trained. This credential also provides future employers and customers with a guarantee that the worker is appropriately trained and capable of getting the job done right.

Since 2000, the Montana Registered Apprenticeship program has overseen 7,682 apprenticeships in over 60 occupations involving over 1,000 businesses. The apprenticeship option offers workers a way to earn while they learn, reducing the amount of time the worker must spend out of the labor force while obtaining a certification. The training program typically runs three or four years to completion, depending on the occupation, but apprentices are offered an hourly wage while learning hands-on skills alongside a journeyman or mentor. Apprentices that successfully completed the program earned average wages of \$60,754 in 2016, much higher than the statewide average wage of \$40,735.

Over the last five years, the program has graduated an average of 144 apprentices per year, making a large contribution to the training of Montana's successful workforce, and producing a graduation cohort roughly the same size as Helena College.¹ This report provides additional information on the apprenticeship program (including data on past participants' demographics, program participation, and employment outcomes), providing insight to policy makers and program administrators looking to improve program success. Some highlights include:

- Apprenticeship training has been gaining popularity in the last five years, responding to the increased demand for trained workers by businesses. In 2016, there were 628 workers who joined an apprenticeship program. In comparison, only 349 apprentices enrolled into the program in 2011.
- Apprenticeships result in high-paying jobs. Apprentices who successfully completed their training had an average wage of \$60,754 in 2016, nearly \$20,000 higher than the statewide average wage and 77% higher than participants that started the program, but did not finish it.
- Graduates that completed their program in 2014 saw a 12% increase in wages within one year of graduation. Wages during the year after graduation were 87% higher than their wages five years earlier.
 - In comparison, participants who did not complete their apprenticeship training experienced a wage decrease of 2% over the year and an increase of 26% from five years prior.
- Apprentices help keep skilled workers in Montana. Eighty-six percent of apprentices that have graduated from the program since 2011 are currently working for a Montana employer.

- The number of sponsors has been increasing by approximately five percent per year in the last five years.
- The programs are largely based in the more populated counties. In fact, 42% of all apprenticeship programs are in the three counties of Lewis & Clark, Gallatin, and Yellowstone County.
- 53 out of Montana's 56 counties have had an apprenticeship since 2000.
- There are 68 different occupations available for apprenticing in Montana, with more occupations being added when employers express interest. Twenty-three of the 60 occupations have been started since 2013, including nursing aides.
- The majority of apprentices are in the traditional fields, with 36% of programs for electricians and 22% for plumbing. These two occupations require an apprentice certificate for licensing in Montana.
- Nursing aides is the fastest growing new program. There have been 63 apprentices in this occupation since it first started in 2015.
- Ninety-two percent of apprentices are men. The number of women participating is related to the size of the childcare and nursing aide programs. While nursing aide programs are increasing, the childcare programs have decreased in participation, with no new apprentices in 2016.
- Since 2000, 6,502 people have participated in the Montana Registered Apprenticeship Program. Of the 6,502 people, 38.1% completed a program, 24.4% are currently in a program, and 37.5% cancelled a program without going on to complete one.
 - In comparison, 20%-24% of associate degree seekers entering Montana University System Schools successfully graduate within four years.
- Although roughly 75% of the apprentice sponsors have just one or two apprentices, the success of the program is highly reliant on a handful of large employers. In 2016 there were 15 sponsors that had over 20 apprentices each.

Contents

- How does the Montana Registered Apprentice Program Work?6
 - Figure 1: Illustration of Terminology used in the Registered Apprenticeship Program.....7
- Apprenticeship Completion Rates.....7
 - Figure 2: Apprenticeship Trainings by Outcome Percentage7
 - Figure 3: Individual Apprentices by Final Result.....8
- Growth in the Apprentice Program.....8
 - Figure 4: Apprenticeship Program Participation8
- Business Sponsors and Number of Programs.....9
 - Figure 5: Number of Apprenticeship Programs.....9
 - Figure 6: Number of Apprenticeship Sponsors9
 - Figure 7: Total Number of Apprenticeships and Programs by Year 10
- Sponsors by Industry 10
 - Figure 8: Apprenticeship Sponsors by Industry..... 10
- Work Location of Apprenticeships and Sponsors..... 10
 - Figure 9: Top Five Counties with the most Apprenticeships - January 1, 2000 to June 30, 2017 11
 - Figure 10: Number of Apprenticeship Sponsors by County 11
- Types of Occupations Trained 11
 - Figure 11: New Apprenticeship Programs by Occupation..... 12
 - Figure 12: New Registered Apprenticeship Occupations Since 2013..... 13
 - Figure 13: Number of Active Apprenticeships in 2016..... 14
- Apprentices by Industry 14
 - Figure 14: Apprentices by Industry 15
- Age of Apprentices 15
 - Figure 15: New Apprenticeships by Age..... 15
- Gender of Apprentices 15
 - Figure 16: New Apprenticeships by Gender..... 16
 - Figure 17: Females in New Apprenticeships by Occupation 16
 - Figure 18: Apprenticeship Occupations with more Women than Men 17
- Race of Apprentices..... 17
 - Figure 19: New Apprenticeships by Race 17
- Veterans in Apprenticeship 18
 - Figure 20: New Apprenticeships by Veteran Status 18

Wages of Apprentices..... 18

 Figure 21: Average Wages of Apprentices Before, During, and After Graduation..... 19

 Figure 22: Average Wages of Recent Apprenticeship Graduates Compared with Occupational Entry-Level and Average Wages 20

Apprenticeships in the future - Expected Worker Demand for Apprenticeable Jobs..... 20

 Figure 23: Annual Employment Needs for Apprenticeable Occupations..... 21

Appendix: Data Tables..... 22

 Figure 24: Apprenticeships by County (January 2000 to June 30, 2017) 22

 Figure 25: New Apprentices by County 24

 Figure 26: New Apprenticeship Programs by Occupation..... 26

How does the Montana Registered Apprenticeship Program Work?

Registered apprenticeships involve a worker (apprentice) participating in a structured work-based learning environment that involves both technical instruction and on-the-job practical training from an assigned mentor. In order to be a Registered Apprenticeship, the program must meet national standards for curriculum and training under the monitoring of the Montana Department of Labor & Industry. The Montana Department of Labor & Industry's Registered Apprenticeship Program is a recognized State Apprenticeship Agency by the U.S. Department of Labor, allowing the Department to monitor the apprenticeship and award the apprentice credentials.

After completing a registered apprenticeship, the participant receives a national industry-recognized credential. Many states, including Montana, require a registered apprentice certification for state licensing in trade occupations like plumbers or electricians. In many instances, the participant also has the opportunity to earn a simultaneous post-secondary degree.

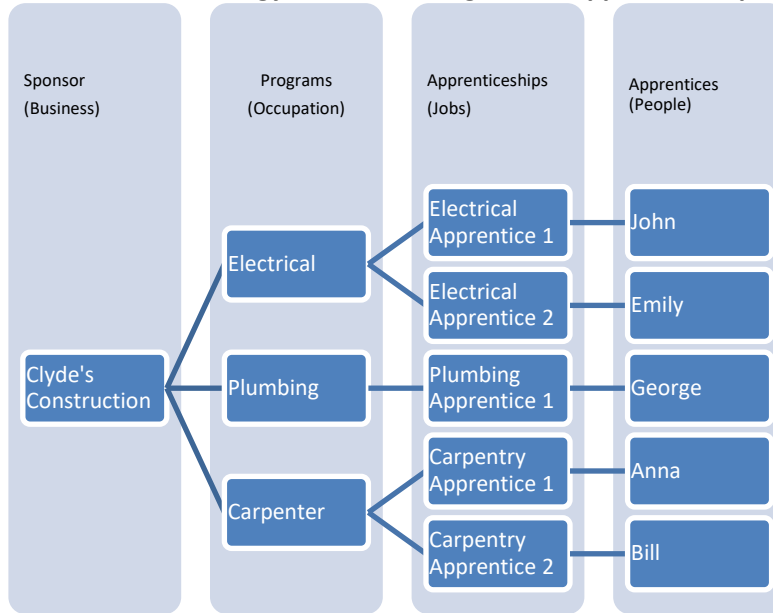
The role of the Montana Department of Labor & Industry is to work with employers to help them set up programs that follow the recommended curriculum, then monitor progress to ensure that the apprentice and business sponsor are meeting program goals. The Montana Department of Labor & Industry can also help businesses find potential workers to fill the apprenticeship position, but the hiring process is completed by the employer. There were about 570 Montana businesses serving as apprenticeship sponsors in 2016.

The U.S. Department of Labor maintains a list of all occupations that can be trained through a registered apprentice program. Montana offers training in roughly 60 of these occupations. The largest occupations trained in Montana are electricians and plumbers, but training programs are diverse and include non-trade occupations like nursing aides, daycare providers, radiologic technicians, and computer programming.

Most apprenticeships are expected to be completed in 8,000 hours, or approximately four years. However, the training for some occupations can be completed in as short as one year. There is a probation period equal to six months, or 25% of the length of the program, whichever is shorter. Apprenticeships can be cancelled by either the employer or the apprentice if the job match is not working. The costs of training, such as tuition payments, books, or supplies, are typically paid for by the apprentice, although sponsors can also meet these needs. Sponsors also pay for the additional time and effort to provide on-the-job guidance, but gain in having a worker that is specifically trained to meet the exact needs of the business. Sponsors may also be eligible for a tax credit for sponsoring an apprentice starting in the 2018 tax year.

In terms of terminology, sponsors are businesses that are willing to pay and train an apprentice. Programs are the different occupations in which an apprentice will be trained. Apprenticeships are the jobs that exist, within which the worker will receive apprentice training. Apprentices are the people that fill the apprenticeships. One apprentice may have participated in more than one apprenticeship. Figure 1 illustrates this terminology.

Figure 1: Illustration of Terminology used in the Registered Apprenticeship Program



Apprenticeship Completion Rates

From January 1, 2000 to June 30, 2017, the Montana Department of Labor & Industry’s apprenticeship program has overseen 7,682 apprenticeships participated in by 6,502 individuals. Figure 2 shows the number of apprenticeship positions that were completed, cancelled (includes transfers and suspensions), or are currently in progress.

Roughly 45% apprenticeships are not successfully completed. Most of these cancellations occur after the probation period. Like many other permanent employment positions, apprenticeships have a probation period of six months or 25% of the training period, whichever is shorter. Many employers and apprentices find that the job match is not working out well, or that the worker is no longer needed, and end the work partnership.

Figure 2: Apprenticeship Trainings by Outcome Percentage

	Apprentice Positions	Outcome Percent
Completed	2,568	33%
Cancelled	3,473	45%
Ongoing	1,641	21%
	7,682	100%

Source: MT DLI Registered Apprenticeship Program. Data from 2000 to June 30, 2017

Many of the apprenticeship candidates who cancel with one apprenticeship transfer to a different apprenticeship either in a different training program or in the same training program with a different employer. In addition, some apprentices complete more than one program, resulting in 7,682 different apprenticeships participated in by 6,502 individuals. If an apprentice transfers to a different program, it is recorded as a cancellation of the first apprenticeship. Of the individuals with duplicate records:

- 69 completed multiple training programs;
- 18 completed at least one program and are currently enrolled in another program;
- 395 cancelled a program, but then also successfully completed a training program;
- 201 cancelled a program and are currently enrolled in a different program; and
- 222 individuals cancelled multiple programs but never completed a program and are no longer enrolled in a program.

Figure 3: Individual Apprentices by Final Result		
	Apprentice Positions	Outcome Percent
Completed	2,477	38.1%
Cancelled	2,438	37.5%
Ongoing	1,587	24.4%
	6,502	100%

Source: MT DLI Registered Apprentice Program. Data from 2000 to June 30, 2017

Figure 3 shows the number of individuals in an apprenticeship by their final result. Occasionally, an apprentice will complete a program first, and cancel a second program later. In those instances, their completed apprenticeship is counted as the final result. By individual, roughly 38% of people successfully complete an apprenticeship, although their first apprenticeship position may have been cancelled at either their request or their employer’s request. Roughly 38% of apprenticeships are cancelled without the apprentice finding another apprentice training position.

Excluding ongoing apprenticeships, the completion rate is 50.6%. This rate is higher than the graduation rates of similar educational

programs. Only 20% to 24% of first-time, full-time associate degree seekers successfully graduated within four years among those entering the Montana University System schools from 2005 to 2010.ⁱⁱ

Further, unlike educational institutions that accept all qualified and willing applicants, apprenticeships require both the apprentice and the employer to be willing to continue the training agreement. Data from the Bureau of Labor Statistics shows that the median duration with one employer for U.S. workers is 4.2 years, with workers aged 25 to 34 (the most common apprentice age group) having even shorter duration of 2.8 years.ⁱⁱⁱ

As can be seen from Figure 2 and Figure 3, participation in the apprenticeship program can either be calculated as the count of training positions started (7,682), or by the number of people who have filled these positions (6,502). For example, if a person starts an electrician program then transfers to a plumbing program, they are counted in two apprenticeships (one for electrician and one for plumbing), but only once if counting individuals trained. Unless otherwise stated, the remainder of the report will summarize information by apprenticeships, not by individuals.

Growth in the Apprentice Program

The number of new apprenticeships has been steadily growing in recent years with a small dip in new apprenticeships in 2012. In 2016, there were 628 new apprenticeship training positions, which is nearly 300 more than in 2011. Because of this, the total number of apprenticeships has increased from 1,402 in 2011 to 1,921 in 2016. Figure 4 illustrates participation in the registered apprentice program by year since 2011, separating out those who start during the year, or who cancel or complete during the year. “In program” is the total amount of apprenticeships including those that started in that year, ended in that year, or that are ongoing. The in-program metric is conceptually similar to enrollment statistics for colleges and universities, including all student served regardless of outcome. Data for 2017 and 2018 is estimated by increasing program participation in 2016 by 5% per year.

Figure 4: Apprenticeship Program Participation

Result	2011	2012	2013	2014	2015	2016	2017	5% increase per year	
							(6 months)	2018	2019
In program	1,402	1,236	1,278	1,458	1,709	1,921	1,873	2,118	2,224
Completed	232	159	146	121	163	131	115	144	152
Cancelled	258	218	203	211	251	255	117	281	295
Ongoing	912	859	929	1,126	1,294	1,535	1,641	1,692	1,777
New	349	324	419	531	583	628	338	692	727

Source: MT DLI Registered Apprentice Program, 2017. Data from 2000 to June 30, 2017.

In 2016, there were 1,921 apprentices enrolled in the apprentice program at some point during the year. In comparison to other workforce training institutions in Montana, the enrollment in 2015 was roughly the same size as the enrollment of Helena College or City College.^{iv} The apprenticeship program is a sizeable and important component of Montana’s overall workforce training system.

Business Sponsors and Number of Programs

There are 1,092 businesses that have sponsored an apprentice since 2000. Many businesses host different programs, or fields of study, for apprentices, for a total of 1,254 different programs since 2000. A program is a separate field of study with a specific business. For example, if a business hosts two plumbing apprentices and one electrician apprentice, the business would be hosting two programs and three apprenticeships. See Figure 1 for an illustration of the terminology.

Figure 5 lists the number of programs by year since 2007 and Figure 6 lists the number of sponsors by year since 2007. Over the past four years, there has been over a 5% annual increase in both programs and sponsors. Recent expansion of programs has come from the traditional trades occupations, plus some expansion into new fields as a success of the Department’s initiatives to expand work-based learning into non-traditional fields like healthcare and IT.

Figure 5: Number of Apprenticeship Programs

Year	Total Programs	% Change	New Programs
Before 2007	731		
2007	783	7.11%	52
2008	821	4.85%	38
2009	863	5.12%	42
2010	891	3.24%	28
2011	921	3.37%	30
2012	961	4.34%	40
2013	1,013	5.41%	52
2014	1,071	5.73%	58
2015	1,125	5.04%	54
2016	1,209	7.47%	84
2017 (6 months)	1,254	3.72%	45

Source: MT DLI Registered Apprentice Program, 2017.
Data from 2000 to June 30, 2017.

Figure 6: Number of Apprenticeship Sponsors

Year	Total Sponsors	% Change	New Sponsors
Before 2006	606		
2007	655	8.09%	49
2008	689	5.19%	34
2009	730	5.95%	41
2010	758	3.84%	28
2011	783	3.30%	25
2012	822	4.98%	39
2013	873	6.20%	51
2014	927	6.19%	54
2015	976	5.29%	49
2016	1,050	7.58%	74
2017 (6 months)	1,092	4.00%	42

Source: MT DLI Registered Apprentice Program, 2017.
Data from 2000 to June 30, 2017.

Although there are 1,254 programs in the database, slightly less than half of them are active in each year. Figure 7 lists the number of active programs since 2011. For example, in 2016, there were 571 programs participated in by 1,921 apprenticeships. The 571 programs in 2016 were sponsored by 534 businesses. Of these businesses:

- 55% of the 534 businesses sponsored just one apprenticeship;
- 20% of the 534 businesses sponsored two apprenticeships;
- 15 businesses sponsored over 20 apprenticeships

Figure 7: Total Number of Apprenticeships and Programs by Year

	2011	2012	2013	2014	2015	2016	2017 (6 months)
Apprenticeships	1,402	1,236	1,278	1,458	1,709	1,921	1,873
Programs	499	463	464	490	532	571	574

Source: MT DLI Registered Apprenticeship Program, 2017. Data through June 30, 2017.

Sponsors by Industry

Sponsors are displayed by their primary industry sector in Figure 8. Of the 851 sponsors where industry could be determined, 658 of them are in construction.

Figure 8: Apprenticeship Sponsors by Industry

NAICS	NAICS description	Total
11	Agriculture, Forestry, Fishing and Hunting	1
21	Mining, Quarrying, and Oil and Gas Extraction	6
22	Utilities	18
23	Construction	658
31-33	Manufacturing	16
42	Wholesale Trade	4
44-45	Retail Trade	15
48-49	Transportation and Warehousing	1
51	Information	3
52	Finance and Insurance	2
53	Real Estate and Rental and Leasing	5
54	Professional, Scientific, and Technical Services	5
56	Administrative and Support Services	4
61	Educational Services	14
62	Health Care and Social Assistance	76
71	Arts, Entertainment, and Recreation	1
72	Accommodation and Food Services	1
81	Other Services (except Public Administration)	17
92	Public Administration	0
Total		847

Source: DLI apprentice program and UI wage match, 2017. Data from 2000 to June 30, 2017.

Work Location of Apprenticeships and Sponsors

The Registered Apprenticeship Program has trained workers in nearly every Montana county, but the majority of apprenticeships train in the urban counties. Out of the 56 counties in Montana, 53 have had at least one apprenticeship since 2000. Forty-six of these have had at least one successful apprenticeship. The three counties without an apprenticeship program are Carter, Petroleum, and Treasure Counties.

Lewis and Clark, Gallatin, and Yellowstone Counties are the three counties that have had the most apprenticeships. These three counties combined account for approximately 42% of all apprenticeship locations

since 2000. Figure 9 lists the five counties with the most apprenticeships and the number of apprenticeships that have been completed or are ongoing. The full table including all counties is in Figure 26 in the appendix.

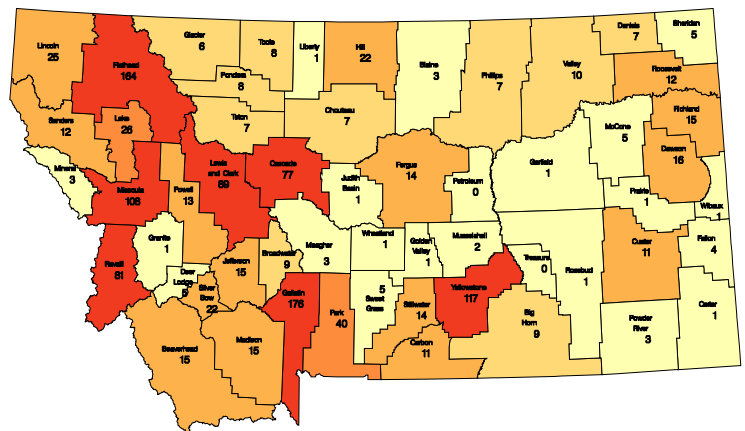
Figure 9: Top Five Counties with the most Apprenticeships - January 1, 2000 to June 30, 2017

County	Total Programs	Completed/Ongoing
Lewis and Clark	1,412	801
Gallatin	978	493
Yellowstone	866	531
Silver Bow	624	441
Flathead	554	272
Total	4,434	2,538

Source: MT DLI Registered Apprentice Program, 2017. 2000 to June 30, 2016

As mentioned before, the number of new apprenticeships each year has been increasing. This increase has been predominantly in the largest counties. For example, Lewis and Clark County had 82 new apprenticeships in 2011 and 115 new apprenticeships in 2016. Yellowstone County had 45 new apprenticeships in 2011 and 85 new in 2016. Figure 27 in the appendix lists all new apprentices by county for the years 2013 to 2016

Figure 10: Number of Apprenticeship Sponsors by County



Apprentices come from 53 Montana counties. Each of these counties must also have a sponsor to host the apprentices, with some sponsors hosting multiple apprentices. Figure 10 illustrates the number of sponsors by county. In general, the counties with the most apprentices also have the most sponsors, reflecting the fact that most sponsors host one or two apprentices.

Frequency 0-5 6 to 10 11-25 26-50 Greater than 50

Source: DLI Registered Apprenticeship Program. Data from 2000 to June 30, 2017

Types of Occupations Trained

Apprentices have trained in 68 different occupations since 2000, with the majority of the training in the trades. Thirty-six percent of apprenticeships are electrician programs, and 22% are programs for plumbing. The remaining 42% of the apprenticeships are split between 66 occupations; 39 of those occupations have had less than 10 participants over the 17 years of data.

Since 2011, apprentices have trained in 57 different occupations. The occupations that have not had an apprentice in the last six years include many construction and housing-related occupations (appraisers, real estate; insulation workers, mechanical; maintenance and repair workers, general; telecommunications line installers and repairers; and tile and marble setters) that may gain more interest as the construction industry returns. However, pharmacy aides is an occupation that has not had an apprentice in the last six years even though the health care industry is rapidly growing and has high worker demand.

Figure 11 lists the number of new apprenticeships per year by occupation, sorted by the total trained since 2000. Data presented is limited to occupations that have had more than 10 apprenticeships. The total column

represents the total amount of apprenticeships in that occupation since 2000. For example, since 2000, 2,798 apprenticeships were in an electrician program. The full table can be found in Figure 28 in the appendix.

Figure 11: New Apprenticeship Programs by Occupation

ONET	Occupation	2011	2012	2013	2014	2015	2016	2017 6 months	Total Trained since 2000
47211100	Electricians	145	136	174	196	245	258	120	2,798
47215202	Plumbers	75	62	108	128	128	165	79	1,716
47222100	Structural Iron and Steel Workers	14	14	19	38	10	15	3	388
47203101	Construction Carpenters	14	5	15	22	24	30	17	314
39901100	Child Care Workers	20	10	4	1	0	0	0	310
47221100	Sheet Metal Workers	8	9	22	25	17	27	11	301
47215201	Pipe Fitters	22	27	24	31	25	26	21	288
47201100	Boilermakers	10	6	18	8	22	3	13	235
49905100	Electrical Power-Line Installers & Repairers	13	16	6	14	24	9	15	225
47218100	Roofers	4	6	7	17	18	19	2	108
51802102	Stationary Engineers	6	8	2	11	7	4	0	104
47206100	Construction Laborers	2	1	4	2	8	1	1	93
47207302	Operating Engineers	10	8	4	0	1	0	0	88
49904100	Industrial Machinery Mechanics	4	1	2	11	7	3	0	79
47202100	Brickmasons and Blockmasons	1	1	1	4	5	4	1	78
33201101	Municipal Fire Fighters	0	6	6	1	2	0	0	74
31101200	Nursing Aides, Orderlies, & Attendants	0	0	0	0	2	37	24	63
49902101	Heating & Air Conditioning Mechanics	1	2	3	7	4	8	9	50
47402100	Elevator Installers and Repairers	0	0	0	1	7	3	1	46
49209800	Security and Fire Alarm Systems Installers	0	1	1	1	0	0	0	37
49202205	Station Installers and Repairers, Telephone	1	0	0	0	0	0	0	35
47205100	Cement Masons and Concrete Finishers	0	2	0	0	2	0	0	19
49202201	Central Office and PBX Installers and Repairers	0	0	0	0	0	0	0	18
49902102	Refrigeration Mechanics	0	0	0	0	3	0	2	14
49209500	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	0	0	0	0	2	0	1	13
51801200	Power Distributors and Dispatchers	0	0	0	0	3	1	1	12
51302300	Slaughterers and Meat Packers	0	1	0	1	0	3	0	12
49904200	Maintenance and Repair Workers, General	0	0	0	0	0	0	0	11
51801301	Power Generating Plant Operators, Except Auxiliary Equipment Operators	0	0	0	0	0	0	0	11

Source: MT DLI Registered Apprentice Program, 2017. 2000 to June 30, 2017

Of the top ten occupations in Figure 11, nearly all of the occupations continue to grow in participation with the exception of childcare workers. Apprenticeships for childcare workers declined to the point that there have been no new apprenticeships since 2014. The increase in childcare occupations followed by the rapid decline is related to temporary grant funding available for childcare occupations that expired, highlighting the importance of funding to promote and create apprenticeships.

Twenty-three new occupations have been added since 2013. The new occupations, year they were added, and number of participants are listed in Figure 12.

Figure 12: New Registered Apprenticeship Occupations Since 2013

Year Added	ONET	Occupation	Participants
2013	51302100	Butchers and Meat Cutters	7
2013	17302200	Civil Engineering Technicians	2
2013	51604100	Shoe and Leather Workers and Repairers	1
2014	49209300	Electrical & Electronics Installers & Repairers, Transportation Equipment	1
2014	49909700	Signal and Track Switch Repairers	8
2014	49304300	Rail Car Repairers	6
2014	51401101	Numerical Control Machine Tool Operators and Tenders, Metal and Plastic	1
2015	31101200	Nursing Aides, Orderlies, and Attendants	63
2015	47203103	Carpenter Assemblers and Repairers	6
2015	49901203	Meter Mechanics	2
2015	51412102	Welders and Cutters	1
2015	49302302	Automotive Specialty Technicians	1
2016	11911100	Medical and Health Services Managers	3
2016	29205200	Pharmacy Technicians	2
2016	15102100	Computer Programmers	1
2016	29203402	Radiologic Technicians	1
2016	13103102	Insurance Adjusters, Examiners, and Investigators	0
2017	31909400	Medical Transcriptionists	5
2017	43303100	Bookkeeping, Accounting, and Auditing Clerks	1
2017	29205500	Surgical Technologists	1
2017	45209100	Agricultural Equipment Operators	0
2017	29206100	Licensed Practical and Licensed Vocational Nurse	0
2017	29207100	Medical Records and Health Information Technicians	0

Source: MT DLI Registered Apprentice Program, 2017. 2000 to June 30, 2017

In some occupations, apprentices comprise a significant portion of employment. For example, over one-third of all electricians employed in Montana in 2016 were apprentices being trained through the Registered Apprentice Program. Figure 13 shows occupations with 15 or more active apprenticeships in 2016, along with the employment level for the occupation in Montana. Overall, workers currently undergoing apprentice training

comprise 4.0% of Montana’s employment in the apprenticeable occupations in 2016, underscoring the importance of the program to meet training needs for some types of jobs.

Figure 13: Number of Active Apprenticeships in 2016

ONET	Occupation	2016 Active Apprenticeships	2016 Total Employment	Apprenticeships as a % of Employment
47211100	Electricians	793	2090	37.9%
47215202	Plumbers	455	1810	25.1%
47215201	Pipe Fitters	103	1810	5.7%
47221100	Sheet Metal Workers	78	610	12.8%
47203101	Construction Carpenters	67	4270	1.6%
47222100	Structural Iron and Steel Workers	66	170	38.8%
49905100	Electrical Power-Line Installers and Repairers	47	740	6.4%
47218100	Roofers	39	470	8.3%
31101200	Nursing Aides, Orderlies, and Attendants	39	5600	0.7%
47201100	Boilermakers	39	160	24.4%
51802102	Stationary Engineers	23	190	12.1%
49904100	Industrial Machinery Mechanics	22	700	3.1%
49902101	Heating and Air Conditioning Mechanics	20	920	2.2%
Total of Listed Apprenticeships		1,791	19,540	9.2%
Total of all Apprenticeable Occupations		1,921	47,788	4.0%
Total of all Apprenticeable Occupations excluding Electricians and Plumbers		673	43,888	1.5%

Notes: Listed apprenticeships include only those with at least 15 active apprenticeships in 2016.

Sources: MT DLI Registered Apprenticeship Program, 2017. Employment data from the Bureau of Labor Statistics Occupational Employment Statistics, 2016.

Apprentices by Industry

With most of the apprentices in construction-related occupations, it is no surprise to find the majority of apprentices working in the construction industry. Figure 14 shows the primary work industry that apprentices have worked in 2016, including only apprentices starting a program after 2010.

Figure 14: Apprentices by Industry

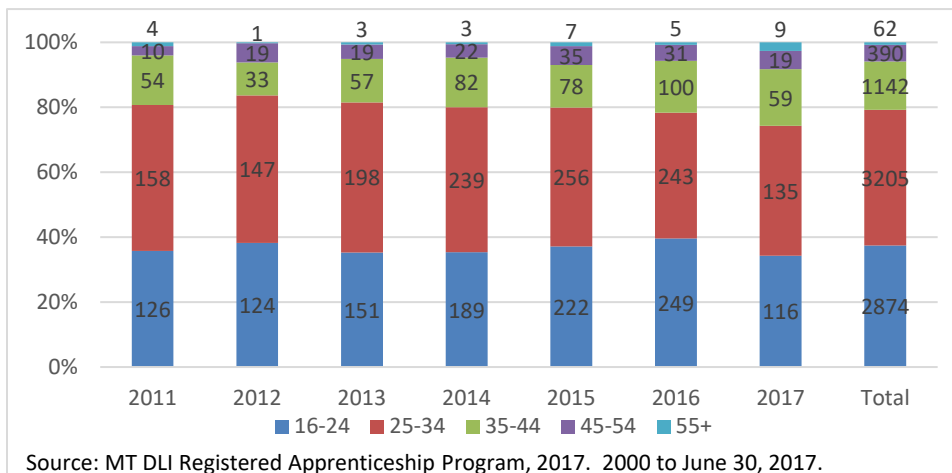
NAICS	NAICS description	Total
21	Mining, Quarrying, and Oil and Gas Extraction	29
22	Utilities	162
23	Construction	1,383
31-33	Manufacturing	38
42, 44, 45	Wholesale and Retail Trade	94
48-49	Transportation and Warehousing	14
52-53	Financial Activities	10
54, 56	Business Services	43
61, 62	Healthcare and Education	79
71, 72	Leisure Activities	15
11, 81, 51	Other	25
92	Public Administration	28
Total		1,920

Source: DLI apprentice program and UI wage match, 2017. Data includes new apprentices from January 1, 2011 to December 31, 2015.

Age of Apprentices

Apprentices are generally between the ages of 25 and 44. Figure 15 illustrates new apprenticeships by age. Total is the sum of apprenticeships since 2000.

Figure 15: New Apprenticeships by Age



Gender of Apprentices

Apprenticeships are predominantly participated in by men, who account for ninety-two percent of total apprenticeships since 2000. Figure 16 lists new apprenticeships by gender.

Figure 16: New Apprenticeships by Gender

Gender	2011	2012	2013	2014	2015	2016	2017 (6 months)	Total
Women	26	13	12	13	26	53	45	576
Men	323	311	407	518	557	572	292	7,099
Total	349	324	419	531	583	628	338	7,682
%Women	7.4%	4.0%	2.9%	2.4%	4.5%	8.4%	13.3%	7.5%
% Men	92.6%	96.1%	97.1%	97.6%	95.5%	91.1%	86.4%	92.4%

Source: DLI Registered Apprentice Program, 2017. 2000 to June 30, 2017.

The number of women participating in apprenticeship is related to the size of the childcare and nursing aide programs, although there are some women training in other occupations. The peak year of women involved in apprenticeships was 2002 with 65 women beginning a program, which is also the peak year for the female-dominated childcare program. The nursing aides, orderlies, and attendants program has grown quickly; in 2016, 36 women started in as apprentices in nursing aides, orderlies, and attendants compared to 2 in 2015.

Figure 17: Females in New Apprenticeships by Occupation

ONET	Occupation	2011	2012	2013	2014	2015	2016	2017 (6 months)	Total Trained since 2000
39901100	Child Care Workers	18	9	4	0	0	18	0	299
47211100	Electricians	3	1	2	9	12	6	4	72
31101200	Nursing Aides, Orderlies, and Attendants	0	0	0	0	2	36	21	59
47215202	Plumbers	1	1	0	0	1	2	5	22
47206100	Construction Laborers	1	0	0	0	2	1	0	15
47203101	Construction Carpenters	1	0	2	0	2	3	1	14
47207302	Operating Engineers	1	1	0	0	0	0	0	14
47201100	Boilermakers	0	0	0	0	1	0	2	13
49904100	Industrial Machinery Mechanics	1	0	1	1	2	0	0	9
51802102	Stationary Engineers	0	0	0	2	1	0	0	9
47215201	Pipe Fitters	0	1	0	0	0	2	1	8
47222100	Structural Iron and Steel Workers	0	0	0	0	1	0	0	8
31909400	Medical Transcriptionists	0	0	0	0	0	0	4	4
33201101	Municipal Fire Fighters	0	0	0	0	1	0	0	3
	Total	26	13	9	12	25	68	38	549

Notes: Table includes occupations with at least 3 female apprenticeships since 2000 and at least one female apprentice since 2010

Source: MT DLI Registered Apprenticeship Program. 2000 to June 30, 2017.

Part of the reason for low enrollment of female apprentices is that the most popular apprenticeship programs are typically male-dominated occupations. According to the U.S. Census Bureau, 3.7% of Montana’s construction and extraction workers are women.^v The construction programs tend to be the most popular apprenticeships, with plumbing and electricians at the top of the list. Since 2000, there have been 72 women in the electrician program (2.6%), and 22 women in the plumber program (1.3%). Figure 17 lists the new apprenticeships by occupation participated in by women from 2010 to 2017. Total is the total number of women since 2000.

There are twelve occupations with greater female participation than male participation. Figure 18 lists these seven occupations and the total number of apprenticeships in those occupations since 2000.

Figure 18: Apprenticeship Occupations with more Women than Men

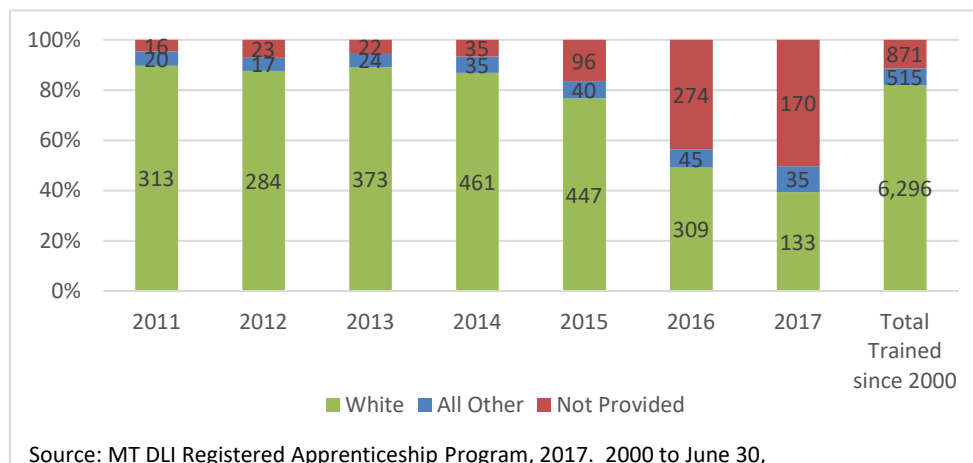
ONET	Occupation	Female	Male
39901100	Child Care Workers	299	10
31101200	Nursing Aides, Orderlies, and Attendants	59	4
31909400	Medical Transcriptionists	4	1
31909500	Pharmacy Aides	4	0
11911100	Medical and Health Services Managers	2	1
13103102	Insurance Adjusters, Examiners, and Investigators	2	0
29205200	Pharmacy Technicians	2	0
29203402	Radiologic Technicians	1	0
29205500	Surgical Technologists	1	0
29206100	Licensed Practical and Licensed Vocational Nurses	1	0
29207100	Medical Records and Health Information Technicians	1	0
51604100	Shoe and Leather Workers and Repairers	1	0

Source: MT DLI Registered Apprenticeship Program. 2000 to June 30, 2017.

Race of Apprentices

Figure 19 lists new apprenticeships by race. Over the last six years, the amount of people signing up in the “all other” category has increased. Total is a sum for all apprenticeships since 2000.

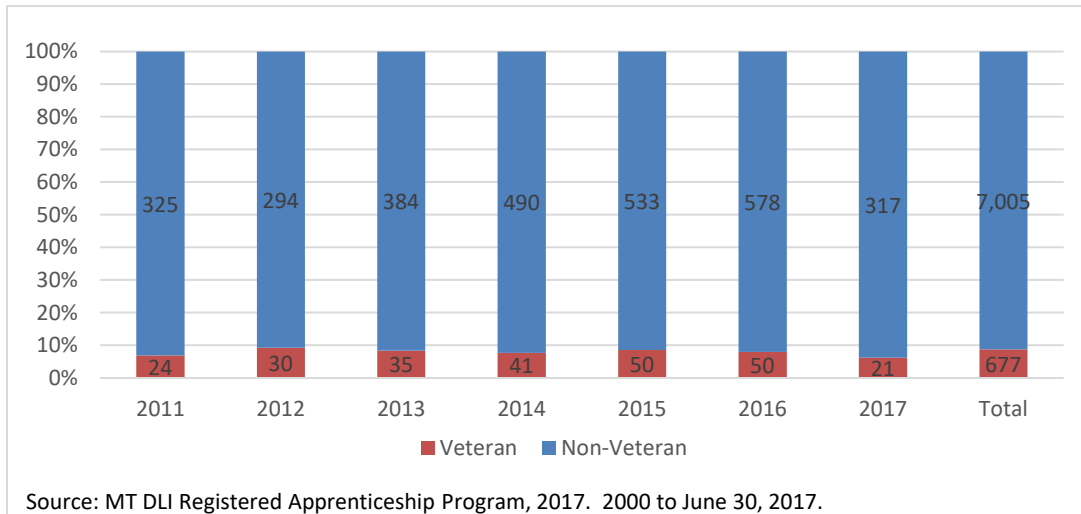
Figure 19: New Apprenticeships by Race



Veterans in Apprenticeship

Figure 20 lists new apprenticeships by veteran status. The number of new veterans being signed up for apprenticeships has increased from 24 new in 2011 to 53 new in 2015 and 50 new in 2016.

Figure 20: New Apprenticeships by Veteran Status



Wages of Apprentices

The wage and employment outcomes of apprentices can be tracked after the completion of their training using information from the mandatory reporting of employment and wages from the Unemployment Insurance program. This data source provides information on the quarterly earnings of individuals from nearly all Montana employers. However, self-employed individuals and employers outside Montana are not included in the data, which may result in underestimates of the number of apprentices working after training. The wage match was completed for 2,477 apprentices who successfully completed their training, plus the 2,438 participants who started an apprenticeship but did not complete it. The non-completers were included in the analysis to provide a group of workers who are similar to the successful apprentices prior to the training, thus allowing us to conclude that the wage gains are due to the apprentice training instead of pre-existing characteristics.

Among graduates from 2011 to 2015, 86.4% were employed and working for a Montana employer, providing an important source of trained workers for our state. Comparing all apprentices that graduated since 2000, 78.8% of apprentices were working for Montana employers. In comparison, only 63.3% of cancelled participants (since 2011) were working for Montana employers in 2016. The percentage of apprentices working in Montana will decrease over time as workers die, leave the workforce, or move out of state.

Successful apprentices also had wages that are roughly 50% higher than the average Montana wage, and 77% higher than those who did not complete their apprentice program. Successful apprentices had average wages of \$60,754 in 2016, \$20,000 higher than the 2016 average wage for all Montana workers of \$40,735. In comparison, workers that did not complete their apprenticeship training had an average wage of \$34,237 in 2016.

Not only do apprentices see high wages post-graduation, but they also earn wages while earning their certification. This has led some policy makers and economists to argue that apprenticeship offers a solution to rising tuition costs and high student debt loads, thus strengthening the middle class.^{vi} The average wage for

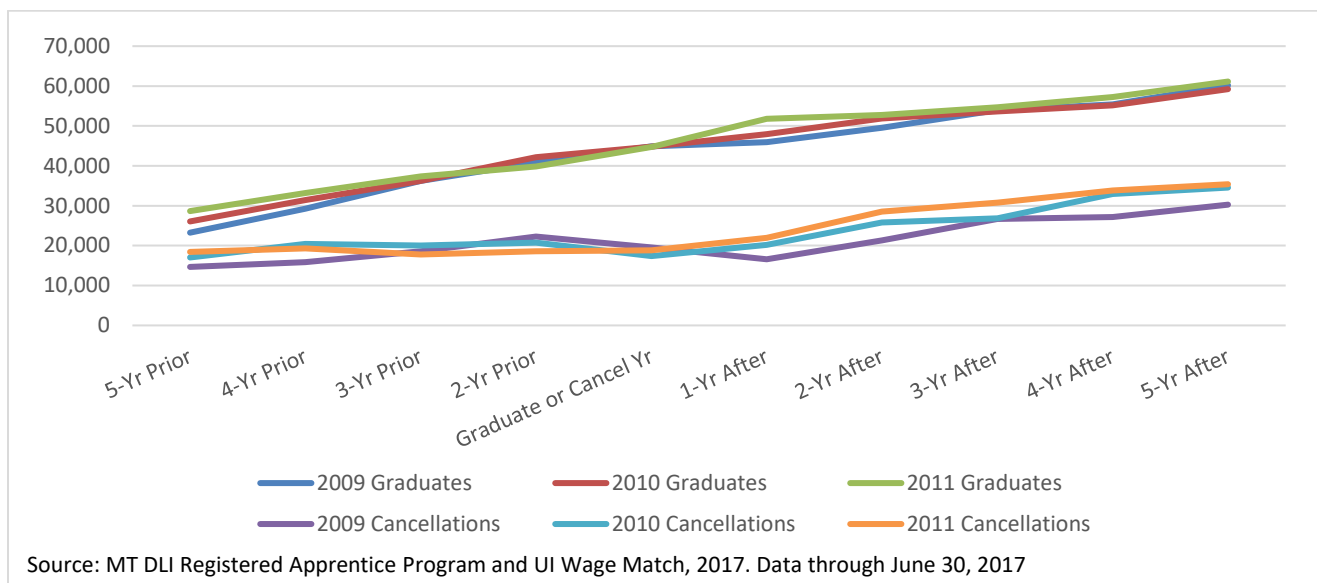
Montanans currently in registered apprenticeship training in 2016 was about \$38,915, which is higher than the typical income potential of a college student working around a class schedule.

The wages earned normally increase while in training as skills progress and continue to increase post-graduation. The wage match shows this increase. Among those who successfully completed their apprenticeship in 2015, wages increased by 11.8% within the first year after graduation. These post-graduation earnings were 86.7% higher than the annual wage earnings five years before graduating (typically before the apprentice started their training).

In comparison, those that did not complete the apprenticeship training, who were likely similar in demographic and economic characteristics as completers when starting the apprenticeship training, had five-year wage gains of only 26.4%. One year after cancellation, those that did not complete training had negative wages growth of -2.2%.

Long-term average wage gains are shown in Figure 21. This graph includes individuals that ended a program between 2009 and 2011 and their average wages from 5-years before graduation or cancellation to 5-years after graduation or cancellation.

Figure 21: Average Wages of Apprentices Before, During, and After Graduation



Many apprenticeships are in occupations that pay high wages, which is one of the reasons for the high wages after graduation. However, Figure 22 illustrates the wages earned by recent graduates from the apprentice program by occupation compared to Montana wages at the 25th-percentile wage and the Montana average wages. The 25th-percentile is provided to represent the expected entry-level wages for workers just starting out in their careers, while the average wages is all workers, including those with extensive training and experience. The table compares the 2016 wages earned for apprentices who graduated in 2013, 2014, or 2015 to the expected wages for all occupations with three or more graduates. For roughly half of the occupations, the recent apprenticeship graduates were earning wages significantly higher than the statewide average. In 9 of the 11 of the occupations shown, the apprentice graduates were earning wages that were above the entry-level occupational wage. Given that apprentices are just starting out in their chosen careers, apprenticeship appears

to give workers a leg up over other workers, bringing them to average or above average wages even though they are recent graduates and just starting out in their careers.

Figure 22: Average Wages of Recent Apprenticeship Graduates Compared with Occupational Entry-Level and Average Wages

ONET	Occupation	N	Graduated Apprentice 2016 Average Wage	2016 MT 25 th Percentile Wage	2016 MT Average Wage
49905100	Electrical Power-Line Installers and Repairers	35	99,176	69,110	79,220
33201101	Municipal Fire Fighters	8	77,926	42,510	49,310
47215201	Pipe Fitters	18	77,027	47,470	58,440
47215202	Plumbers	106	56,852	47,470	58,440
47201100	Boilermakers	14	55,646	40,310	58,160
47211100	Electricians	150	55,310	50,390	61,580
47221100	Sheet Metal Workers	15	51,386	35,110	49,440
47207302	Operating Engineers	6	41,997	41,110	48,810
47203101	Construction Carpenters	9	37,912	32,050	40,360
47222100	Structural Iron and Steel Workers	5	34,653	33,690	46,780
39901100	Child Care Workers	16	25,599	18,250	20,760

Source: MT DLI Registered Apprenticeship Program, 2017. Data through June 30, 2017. Montana wages from Bureau of Labor Statistics Occupational Employment Statistics.

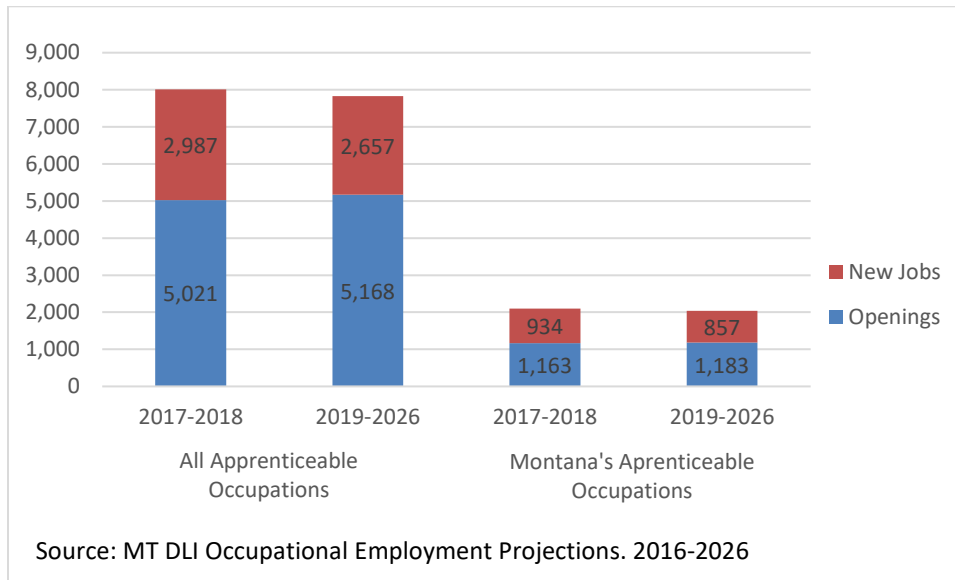
These high wages suggest apprentices are getting a good return on their investment, which is consistent with other research on apprenticeship. One study found that the returns to apprenticeship training exceed the return on investment for other types of training, with the long-term gains or apprenticeship training of about \$266,000 over the worker’s career compared to only \$130,000 for a community college degree.^{vii}

Apprenticeships in the future - Expected Worker Demand for Apprenticeable Jobs

The Department of Labor & Industry’s forecasts for 2017-2018 and 2019-2026 show that the apprenticeship program has potential to expand (Figure 23). Looking at the national list of all possible occupations that are apprenticeable, the total demand for apprentices are 8,008 for the next two years with 2,987 of those jobs coming from growth and the rest coming from openings. Apprenticeable occupations represent 45% of our total worker demand.

However, Montana does not offer programs in all of those occupations. Including only occupations for which Montana has a program, there is demand for 2,096 new apprentices annually for the next two years, representing 12% of total worker demand.

Figure 23: Annual Employment Needs for Apprenticeable Occupations



Appendix: Data Tables

Figure 24: Apprenticeships by County (January 2000 to June 30, 2017)

County	Total Apprenticeships	Completed/Ongoing
Lewis and Clark	1412	801
Gallatin	978	493
Yellowstone	866	531
Silver Bow	624	441
Flathead	554	272
Missoula	490	308
Cascade	372	165
Ravalli	236	99
Park	173	81
Hill	118	68
Richland	106	45
Lincoln	68	38
Jefferson	52	29
Lake	49	22
Deer Lodge	46	23
Beaverhead	45	18
Custer	42	17
Roosevelt	39	29
Carbon	38	20
Dawson	38	17
Madison	36	19
Stillwater	34	16
Valley	32	16
Big Horn	31	26
Fallon	29	19
Broadwater	29	16
Fergus	28	16
Pondera	24	11
Powell	22	10
Sanders	20	9
McCone	19	14
Sheridan	19	12
Phillips	17	10
Glacier	16	3
Teton	15	7
Musselshell	12	8

Sweet Grass	9	6
Chouteau	8	
Blaine	8	7
Toole	8	2
Judith Basin	8	2
Daniels	8	
Powder River	8	2
Prairie	7	
Meagher	6	
Wibaux	6	3
Rosebud	4	
Golden Valley	4	
Mineral	3	
Garfield	2	1
Liberty	1	1
Wheatland	1	
Granite	1	1

Source: MT DLI Registered Apprentice Program, 2017. 2000 to June 30, 2017

Figure 25: New Apprentices by County

County	2013	2014	2015	2016	2017 (6)
Beaverhead	3	1	6	1	0
Big Horn		1		7	4
Blaine					6
Broadwater		2	4		0
Carbon	2	1		3	1
Cascade	15	24	16	19	18
Chouteau	2	1			0
Custer	3	6	5	2	2
Daniels	1				0
Dawson	2	2		1	0
Deer Lodge	1				0
Fallon	1	1	1		3
Fergus	4	2	2	1	2
Flathead	26	22	42	14	21
Gallatin	71	79	76	67	59
Garfield	1		1		0
Glacier		2			0
Granite				1	0
Hill	2	2	8	1	7
Jefferson	3	4	4	2	3
Judith Basin			1	1	0
Lake	2	3	1	3	1
Lewis and Clark	77	88	12	52	45
Liberty			1		0
Lincoln	3	5	2	2	4
Madison	1	2	2	4	2
McCone	2		2		0
Meagher	2	1	1		0
Mineral					0
Missoula	26	48	47	24	25
Musselshell	1	1	1	1	1
Park	8	8	11	16	5
Phillips	1	1	1		1
Pondera	2	2	3		1
Powder River				2	0
Powell	1	1	1		1
Prairie					0
Ravalli	8	12	17	17	16
Richland	7	9	8		0
Roosevelt	5	4		1	6

Sanders		4	1	1	2
Sheridan	2	2			0
Silver Bow	24	34	54	34	41
Stillwater	4	4	7		1
Sweet Grass		1			0
Teton	1	1	1	1	1
Toole			1		0
Valley	2	4	5	1	0
Wibaux			1		2
Yellowstone	61	77	97	52	24

Source: MT DLI Registered Apprenticeship Program, 2017. Data through June 30, 2017.

Figure 26: New Apprenticeship Programs by Occupation

ONET	Occupation	2013	2014	2015	2016	2017 (6 months)	Total Trained since 2000
47211100	Electricians	173	196	243	258	120	2798
47215202	Plumbers	106	126	123	165	79	1716
47222100	Structural Iron and Steel Workers	19	37	10	15	3	388
39901100	Child Care Workers	4	1	0	0	0	310
47203101	Construction Carpenters	15	22	24	30	17	314
47221100	Sheet Metal Workers	20	25	17	27	11	301
47215201	Pipe Fitters	23	31	24	26	21	288
47201100	Boilermakers	16	7	21	3	13	235
49905100	Electrical Power-Line Installers and Repairers	6	13	22	0	0	0
51802102	Stationary Engineers	2	11	7	4	0	104
47218100	Roofers	7	17	16	19	2	108
47206100	Construction Laborers	4	2	7	1	1	93
47207302	Operating Engineers	4	0	1	0	0	88
47202100	Brickmasons and Blockmasons	1	4	5	4	1	78
49904100	Industrial Machinery Mechanics	2	10	6	3	0	79
33201101	Municipal Fire Fighters	6	1	2	0	0	74
47402100	Elevator Installers and Repairers	0	1	7	3	1	46
49902101	Heating and Air Conditioning Mechanics	3	7	4	0	0	0
49209800	Security and Fire Alarm Systems Installers	1	1	0	0	0	37
49202205	Station Installers and Repairers, Telephone	0	0	0	0	0	35
31101200	Nursing Aides, Orderlies, and Attendants	0	0	2	0	0	0
47205100	Cement Masons and Concrete Finishers	0	0	2	0	0	19
49902102	Refrigeration Mechanics	0	0	3	0	2	14
49209500	Electrical & Electr. Repairers, Powerhouse, Substation, Relay	0	0	2	0	0	0
51302300	Slaughtermen and Meat Packers	0	1	0	3	0	12
51801301	Power Gen Plant Operators, Except Auxiliary Equipment Op.	0	0	0	0	0	0
51801200	Power Distributors and Dispatchers	0	0	3	1	1	12
49209300	Electrical & Electr. Installers & Repairers, Transp. Equi.	0	6	3	0	0	0

47214100	Painters, Construction and Maintenance	0	0	1	0	0	9
49909700	Signal and Track Switch Repairers	0	3	5	0	0	8
51404100	Machinists	0	3	3	0	0	8
47203103	Carpenter Assemblers and Repairers	0	0	6	0	0	6
49304300	Rail Car Repairers	0	2	4	0	0	6
49202203	Communication Equip. Mechanics, Installers, & Repairers	0	0	3	0	0	0
49302100	Automotive Body and Related Repairers	0	0	1	0	3	9
49305200	Motorcycle Mechanics	0	0	1	0	0	6
49303100	Bus and Truck Mechanics and Diesel Engine Specialists	0	1	0	1	0	6
49304200	Mobile Heavy Equipment Mechanics, Except Engines	3	0	0	0	0	5
51302100	Butchers and Meat Cutters	2	1	0	3	0	7
49904400	Millwrights	0	0	0	0	0	3
49901203	Meter Mechanics	0	0	2	0	0	2
17302200	Civil Engineering Technicians	1	0	1	0	0	2
49209400	Electrical & Electr. Repairers, Commercial & Industrial Equip.	0	1	0	0	0	0
49302302	Automotive Specialty Technicians	0	0	1	0	0	1
51412102	Welders and Cutters	0	0	1	0	0	1
15102100	Computer Programmers	0	0	0	1	0	1
29203402	Radiologic Technicians	0	0	0	1	0	1
51902100	Crushing, Grinding, & Polishing Machine Setters, Operators	0	0	0	0	0	0
51401101	Numerical Control Machine Tool Operators, Metal & Plastic	0	1	0	0	0	0
51604100	Shoe and Leather Workers and Repairers	1	0	0	0	0	1

Source: MT DLI Registered Apprenticeship Program, 2017. Data through June 30, 2017.

ⁱ Office of the Commissioner of Higher Education, Enrollment Statistics available at [http://mus.edu/CCM/CCA%20Context%20Metric%201%20-%20Enrollment%20\(A%20undup\)%202015.pdf](http://mus.edu/CCM/CCA%20Context%20Metric%201%20-%20Enrollment%20(A%20undup)%202015.pdf). The 2014-2015 enrollment for Helena College was 1,921 and for City College was 1,641.

ⁱⁱ Office of the Commissioner of Higher Education, Graduation Rates, System Level for the MUS total. <http://mus.edu/CCM/CCA%20Outcome%20Metric%202%20-%20Grad%20Rates,%20ASSOCIATES.pdf>

ⁱⁱⁱ Bureau of Labor Statistics Employee Tenure data, available at www.bls.gov.

^{iv} Office of the Commissioner of Higher Education, Enrollment Statistics available at [http://mus.edu/CCM/CCA%20Context%20Metric%201%20-%20Enrollment%20\(A%20undup\)%202015.pdf](http://mus.edu/CCM/CCA%20Context%20Metric%201%20-%20Enrollment%20(A%20undup)%202015.pdf). The 2014-2015 enrollment for Helena College was 1,921 and for City College was 1,641.

^v 2016 American Community Survey 1-Year Estimates, U.S. Census Bureau

^{vi} Lerman, Robert. 2012. "Can the United States Expand Apprenticeship? Lessons from Experience" American University and the Urban Institute. Available at www.american.edu/cas/economics/research/upload/2012-18.pdf.

^{vii} Ibid.