

..... Forging the Economic Future of

THE DULUTH-ARROWHEAD REGION

A Report for Mining Minnesota, March 2017



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INTRODUCTION AND SUMMARY

The unique Duluth-Arrowhead region was founded on the shoulders of the industrial revolution. Rich forests, ore deposits, and shipping on Lake Superior brought new families to the region, and the region's outdoor life and unique identity made them want to stay. Today, the Duluth-Arrowhead region has some of the most attractive and varied outdoor amenities in the nation. Although it has a strong blue collar history, the region is also home to major educational institutions, three Chippewa tribes, and a strong arts and culture community.

occupations with a median pay of at least \$25 per hour. Just 7% of tourism cluster jobs offer a median wage of at least \$25 per hour.

A strong economy must have high-quality, high-paying jobs to improve the quality of life for local residents. **Because of its high wages, significant exports, and purchasing from regional suppliers, the mining cluster delivers significant local economic impact.** One job in the mining cluster creates 1.24 jobs in other industry sectors. Jobs in mining, or those supported by mining, average \$68,444 in earnings per worker and generate \$19,380 in annual federal, state, and local tax revenues.

One job in the mining cluster supports...	One job in the tourism cluster supports...
2.24 total jobs in all industries	1.23 total jobs in all industries
\$68,444 in earnings per job	\$24,878 in earnings per job
\$19,380 in tax revenues per job	\$5,592 in tax revenues per job

Expansion of the Duluth-Arrowhead mining industry offers perhaps the most attainable path to creating more good jobs, and future growth in mining will provide

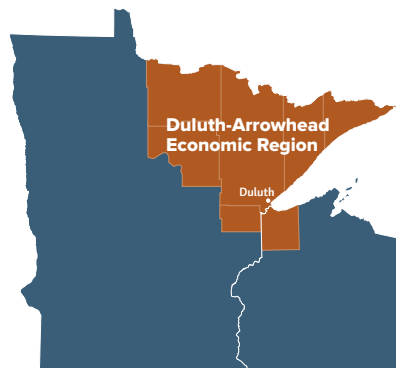
A strong economy must have high-quality, high-paying jobs to improve the quality of life for local residents. **In recent years the region's economy has not kept pace with regional peers such as Fargo and Sioux Falls,** even though these places offer much less in the way of outdoor pursuits. Growth in both jobs and economic output has lagged in the past 15 years and per capita income in the region's metropolitan counties is well below national average.

significantly more economic impact than equivalent tourism growth. Outdoor activities are a critical competitive advantage for the Duluth-Arrowhead region and growing tourism should remain a key pillar in the region's economic development strategy.

The region has become a center for tourism and health care industries, but **productive sectors such as mining, forest and wood products, and rail and water transportation remain most dominant.** Seen by some as a savior of the economy, the tourism sector employs 31% more workers in the local region than the national average, but growth in the sector has trailed the Great Lakes average in recent years. Sometimes pitted as rivals in public discussion, the Duluth-Arrowhead mining cluster employs about 5,100 workers and the tourism cluster about 6,400.

However, **growth in tourism is not an equivalent economic substitute for growth in mining,** particularly for the middle class. Tourism jobs simply do not pay high enough wages or generate enough economic impact to sustain the region on its own. These clusters complement one another. Mining generates high-paying jobs and broad-based impact that creates demand for tourism and tourism makes the region a place where mining workers want to live. **Both sectors are part of the region's identity and economic DNA, and both are likely to be a part of any evenly-distributed success in the future.** The tourism and mining sectors need not be adversaries in the public eye, local government chambers, or economist's calculations.

The mining cluster of industries remains a **critical pillar of the region's economy with many good jobs.** The cluster injects about \$420 million in earnings per year into the region, about \$81,000 per worker. Earnings in the larger tourism cluster total about \$116 million per year, or \$18,000 per worker. About 59% of workers in the mining cluster work in



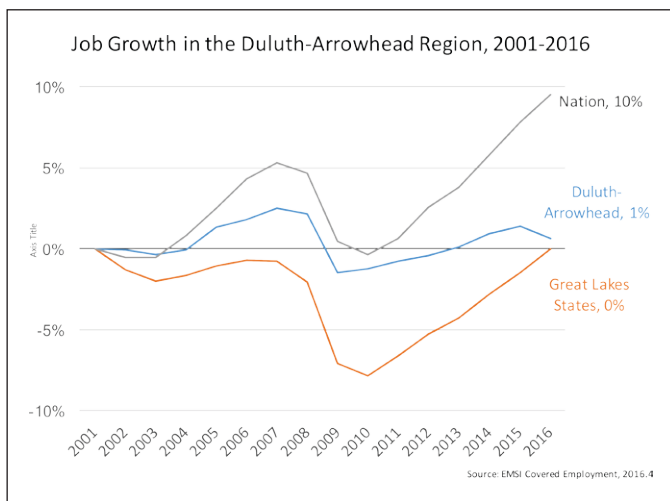
THE NEED FOR A STRONG DULUTH-ARROWHEAD REGIONAL ECONOMY

The Duluth-Arrowhead economy is facing a crossroads. Anchored by the Duluth-Superior urbanized area, the Duluth-Arrowhead economic region covers seven connected counties:

- St. Louis, Carlton, and Douglas (WI); inextricably linked as part of the Duluth Metropolitan Area;
- Lake and Itasca, where there is a very strong mining industry presence;

- Cook and Koochiching, smaller counties with significant tourism enterprise and relying upon Duluth as its regional center.

This seven-county region has lagged the nation in job growth over the past 15 years, particularly since the Great Recession of 2008. This lag is partly due to the region’s ties to the old industrial economy, yet the region’s economy has generally performed better than the average of five other Great Lakes states: Wisconsin, Illinois, Indiana, Michigan, and Ohio. By maintaining stable employment, the region beat this “rust belt average.”



The rest of the nation has bounced back quickly from the Great Recession, but the Duluth-Arrowhead region has not yet returned to its 2008 level of employment. The Duluth-Arrowhead region has seen modest job growth since 2010, but only two major local industry sectors – construction and private education services – have kept pace with national growth over that time.

THE INDUSTRIAL SECTOR DRIVES REGIONAL ECONOMIC SUCCESS

The region’s economy has evolved over time, but it continues to be dominated by its ties to the productive economy, including high concentrations in mining, forestry, and logging along with associated paper and wood products manufacturing, and rail and water transportation. Health care is another dominant sector, and the region is home to a strong tourism industry. In 2016, the Duluth-Arrowhead region had roughly twice as many jobs in traveler accommodations (211%), museums and historical sites (187%) as a national average region.

Dominant Industries in the Duluth-Arrowhead Region Productive Industry, Tourism and Health Care

Industry Sector	2016 Jobs	Local Industry Concentration Compared to National Average
Mining (except Oil and Gas)	3,310	1712%
Forestry and Logging	681	805%
Pipeline Transportation	347	682%
Rail Transportation	1,219	493%
Paper Manufacturing	1,710	429%
Nursing and Residential Care Facilities	11,002	306%
Water Transportation	210	294%
Utilities	1,615	266%
Gasoline Stations	2,536	254%
Textile Product Mills	294	225%
Hospitals	11,553	215%
Accommodations	4,420	211%
Museums, Historical Sites, and Similar Institutions	330	187%
Wood Product Manufacturing	738	170%

Source: EMSI Covered Employment, 2016.4

The Duluth-Arrowhead region must improve its economic competitiveness and create more high-paying jobs. Income is the most important factor creating a high-quality of life for local residents. Good jobs come from high-value industries that export products and services to customers all over the world.

Other small metropolitan areas on the plains – particularly Fargo and Sioux Falls – have shown over the past 15 years that robust job growth is possible. Small metropolitan areas with a strong job market and high-quality of life are quickly becoming an alternative to living in the suburbs. The Duluth-Arrowhead region has many amenities and a strong quality of life, but it needs more good jobs to compete.

Tourism Assets

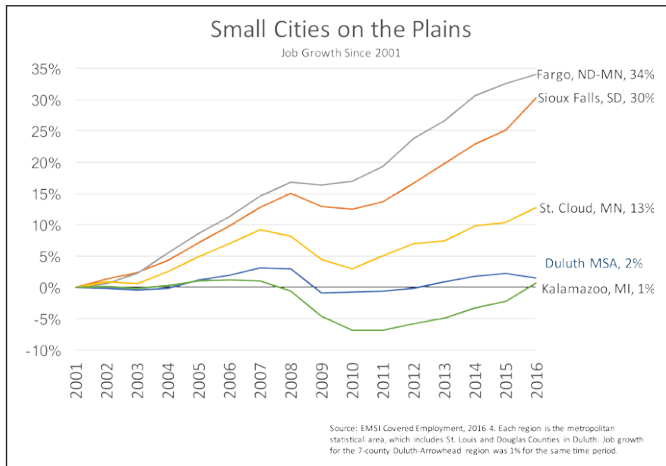
In 2016 the Duluth-Arrowhead region had roughly twice as many jobs in traveler accommodations (211%) and museums and historical sites (187%) as a national average region.

Over time, the overall value of economic activity in the Duluth metropolitan area has remained stagnant. In terms of gross regional product (GRP, dollar value of regional economic activity), Duluth is one of the slowest-growing

metropolitan area in the region and well below the U.S. metropolitan average (see GRP Growth chart at bottom of page 3). Duluth's GRP growth since 2001 ranks just 231 among the nation's 382 metropolitan areas. Per capita personal income in Duluth was \$40,166 in 2014, significantly lower than the national average per capita personal income of \$46,414.

The Rise of Small Cities

Other small metropolitan areas on the plains – particularly Fargo and Sioux Falls – have shown over the past 15 years that robust job growth is possible. The Duluth-Arrowhead region has many amenities and a strong quality of life, but it needs more good jobs to compete.



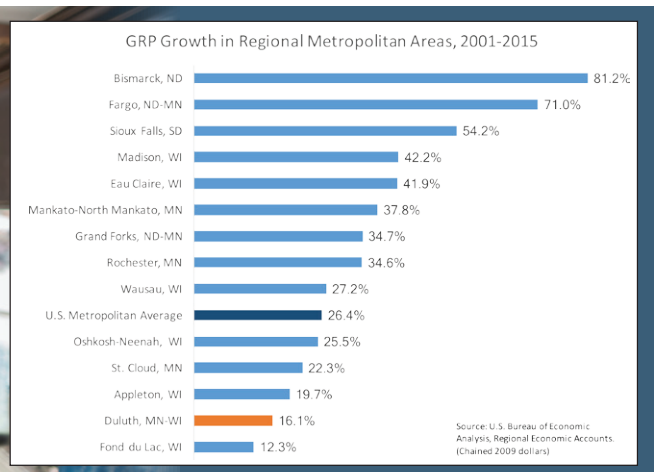
A PRODUCTIVITY PROBLEM

Good jobs come from productive sectors of the economy. The average earnings per worker in the Duluth-Arrowhead region is \$39,379, but earnings vary widely across different sectors of the economy. The highest-paying industries include utilities, corporate headquarters offices, and mining. Earnings in each of those sectors is roughly double the overall average pay in the Duluth-Arrowhead region. Other high-value industries in the region include manufacturing, knowledge-based services, transportation and warehousing, construction, and finance. The lowest-paying sectors in the region are the accommodations and food services sector and the group of industries covering arts, entertainment, and recreation.

The global economy is shifting. Knowledge-based business services and finance are becoming key regional drivers. This shift is occurring in the Duluth-Arrowhead region, but the productive industry sectors – particularly in energy, mining, and manufacturing – remain critical drivers of economic activity. Higher-paying jobs in these sectors deliver an additional economic return to the region: more spending at local businesses and more taxes paid to support the community.

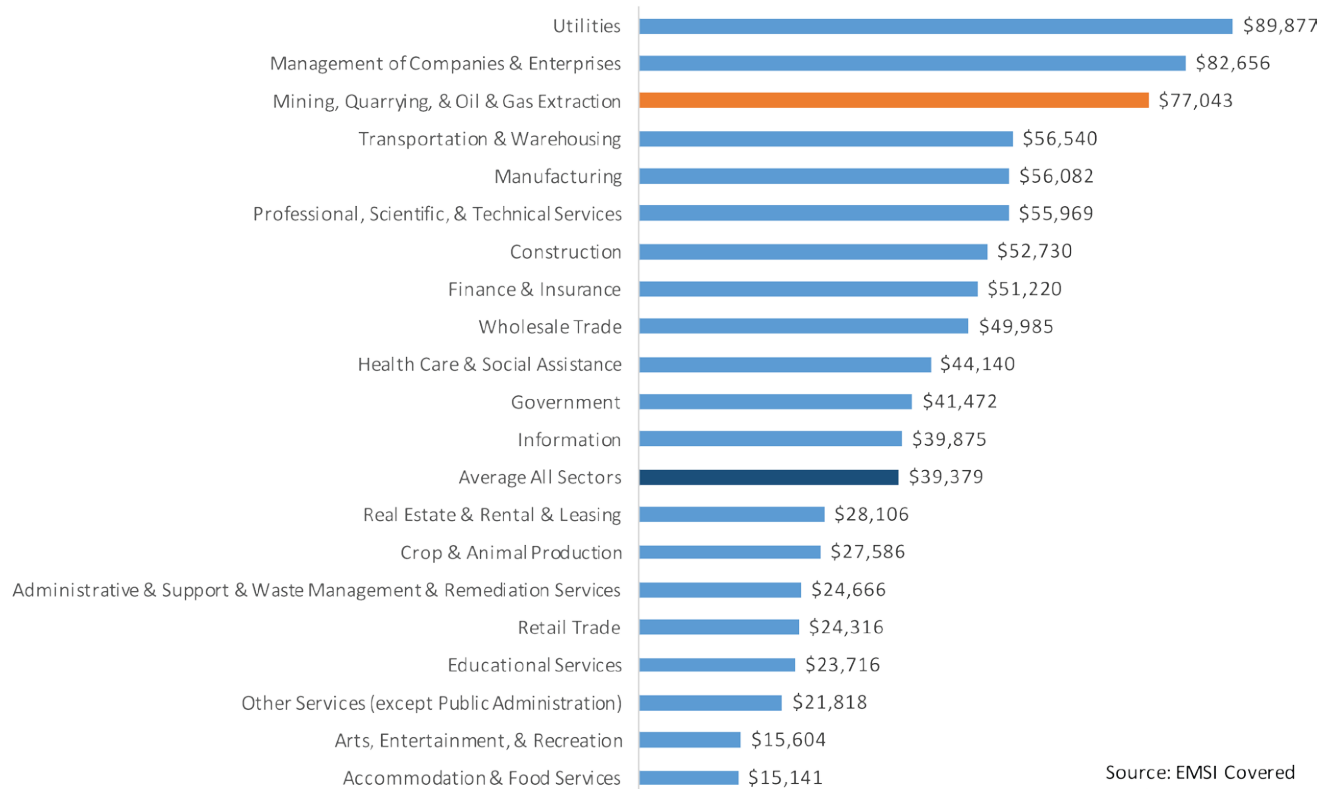
Productive Anchors

The highest-paying local industries include utilities, mining, and corporate headquarters offices. Earnings in each of those sectors is double the overall average pay in the Duluth-Arrowhead region.



Duluth-Arrowhead Earnings by Sector

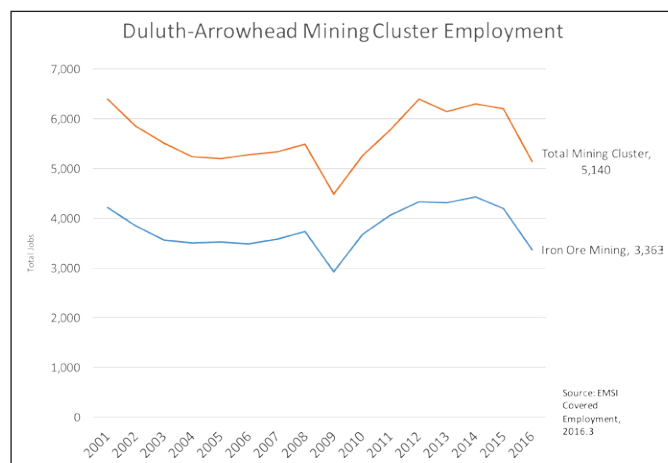
Current Wages, Salaries, & Proprietor Earnings per Worker



Source: EMSI Covered Employment, 2016.4

THE MINING CLUSTER IN THE DULUTH-ARROWHEAD REGION

The mining cluster of industries includes 31 sectors, including mining activities, rail and Great Lakes water transportation, and jobs in the mining machinery manufacturing sector. For a full list of industry sectors and employment in the Duluth-Arrowhead mining cluster, see Appendix A at the end of this report. Jobs in the sector track closely with iron ore manufacturing. The sector performed relatively well over the past decade before a recent decline beginning in 2015.



Source: EMSI Covered Employment, 2016.3

A Source of Good Jobs

The 5,140 total jobs in the mining cluster average \$81,483 in earnings per worker. Workers in the cluster cover a broad spectrum of education levels and skills. Roughly 78% of workers in the cluster work in jobs with a median wage of at least \$20/hr, 59% in jobs paying at least \$25/hr, and 14% in jobs with a median wage of more than \$30/hr. The cluster directly employs engineers and scientists, finance workers, rail transportation workers, and hundreds of workers in good-paying technical blue collar occupations.

The Mining Cluster is a Direct Source of Good Jobs

Most mining cluster workers hold jobs with median pay of more than \$25/hr. The cluster directly employs engineers and scientists, finance workers, rail transportation workers, and hundreds of workers in good-paying technical blue collar occupations.

Good Jobs in the Mining Cluster vs. Tourism Cluster Occupations paying more than \$25/hr

Mining Cluster Occupation	Employed in Mining Cluster (2016)	Median Hourly Earnings	Tourism Cluster Occupation	Employed in Tourism Cluster (2016)	Median Hourly Earnings
Operations Specialties Managers	100	\$42.19	Operations Specialties Managers	23	\$42.19
Engineers	142	\$37.40	Health Diagnosing and Treating Practitioners	<10	\$39.42
Top Executives	70	\$35.10	Advertising, Marketing, Promotions, Public Relations, and Sales Managers	23	\$39.07
Supervisors of Installation, Maintenance, and Repair Workers	83	\$30.71	Engineers	<10	\$37.40
Computer Occupations	29	\$30.60	Top Executives	99	\$35.10
Other Healthcare Practitioners and Technical Occupations	25	\$30.41	Social Scientists and Related Workers	<10	\$31.91
Other Management Occupations	46	\$30.15	Supervisors of Installation, Maintenance, and Repair Workers	12	\$30.71
Water Transportation Workers	27	\$29.82	Computer Occupations	10	\$30.60
Supervisors of Construction and Extraction Workers	61	\$29.64	Other Healthcare Practitioners and Technical Occupations	<10	\$30.41
Plant and System Operators	20	\$29.45	Other Management Occupations	177	\$30.15
Physical Scientists	31	\$29.31	Water Transportation Workers	<10	\$29.82
Architects, Surveyors, and Cartographers	11	\$29.22	Supervisors of Construction and Extraction Workers	<10	\$29.64
Rail Transportation Workers	538	\$29.16	Plant and System Operators	<10	\$29.45
Financial Specialists	32	\$27.89	Supervisors of Protective Service Workers	<10	\$29.45
Supervisors of Production Workers	98	\$27.76	Life Scientists	14	\$28.57
Drafters, Engineering Technicians, and Mapping Technicians	100	\$26.97	Postsecondary Teachers	<10	\$28.18
Business Operations Specialists	111	\$25.60	Financial Specialists	18	\$27.89
Extraction Workers	355	\$25.39	Supervisors of Production Workers	<10	\$27.76
Electrical and Electronic Equipment Mechanics, Installers, and Repairers	36	\$25.01	Drafters, Engineering Technicians, and Mapping Technicians	<10	\$26.97
			Preschool, Primary, Secondary, and Special Education School Teachers	<10	\$25.61
			Business Operations Specialists	59	\$25.60
			Electrical and Electronic Equipment Mechanics, Installers, and Repairers	<10	\$25.01

Source: EMSI Covered Employment, 2016.3

Supporting the Region's Economy

The larger mining industry cluster includes all of the sectors related to the industry, but the broad cluster is driven by its core activity: ore mining. In the Duluth-Arrowhead region, the two major ore mining industry sectors are iron ore mining and copper-nickel ore mining. The jobs and wealth generated by these two sectors create strong ripples of impact in all industries across the region.

This analysis uses the EMSI Input-Output (I-O) system to model the economic impact of the mining and tourism sectors of the Duluth-Arrowhead region. The EMSI model is similar to the commonly-used IMPLAN model. Both the EMSI and IMPLAN models are based on the U.S. National Input-Output Model produced by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). See Appendix C at the end of this report for more discussion on the data sources in this report and the EMSI and IMPLAN I-O models. Using the EMSI model, a scenario is created where jobs in these two sectors are deleted from the economy for the year 2015 and direct, indirect, and induced economic ripple-effects are measured.

Across the entire economy, work in these two mining sectors supports 9,446 jobs according to the EMSI model. Every job at a mining company supports 1.24 jobs in other sectors of business outside of mining. This means that mining delivers a job multiplier of 2.24 in the region: one initial mining job plus 1.24 jobs in other sectors due to mining impact. The jobs supported by mining are good jobs, averaging \$68,444 in annual earnings per worker. These jobs inject \$647 million per year in earnings into the Duluth-Arrowhead region and generate \$183 million in annual local, state, and federal tax revenues.

AGGREGATE IMPACT OF MINING INDUSTRY SECTORS

\$646,518,504
Impact in Earnings
1.53 Multiplier

\$68,444
Average Earnings
Per Job (2015)

9,446
Impact in Jobs
2.24 Multiplier

\$183,065,164
Impact in Taxes on
Production and Imports

Source: EMSI Input-Output Model, 2015. Figures depict overall impact of jobs in iron ore and copper-nickel ore mining industry sectors.

This mining activity supports jobs across the economy. Without these two mining sectors, the Duluth-Arrowhead region would be without 644 health care jobs, 663 retail jobs, 587 government jobs, 551 construction jobs, and 493 in accommodations and food services jobs. It is clear that mining activity supports many jobs in the tourism sector.

Growing the professional, scientific, and technical services sector is a critical strategy for the future of the Duluth-Arrowhead economy, particularly considering that the region trails the national average in this knowledge-based sector by 52%. Mining activity already supports 372 jobs in professional, scientific, and technical services in the Duluth-Arrowhead region. Losing the mining sector in the region would eliminate 7% of these key high-wage service positions.

Impact of Mining Industries on Key Tourism Sectors

In 2015, the 4,226 jobs in the iron ore and copper and nickel ore sectors supported a significant number of jobs in tourism and recreation. Without this mining activity in the region, the Duluth-Arrowhead region could expect to lose 415 jobs in food service, 79 jobs in all types of travel accommodations, 50 jobs in arts and sports sectors, and 45 jobs in amusement and recreation businesses.

Jobs and Earnings Supported by Ore Mining Sectors

Industry	Jobs	Earnings
Food Services and Drinking Places	415	\$6,626,869
Accommodations	79	\$1,747,005
Performing Arts, Spectator Sports, and Related Industries	50	\$648,548
Amusement, Gambling, and Recreation Industries	45	\$761,639
Sporting Goods, Hobby, Musical Instrument, and Book Stores	31	\$608,138
Museums, Historical Sites, and Similar Institutions	2	\$54,032
Scenic and Sightseeing Transportation	1	\$10,815

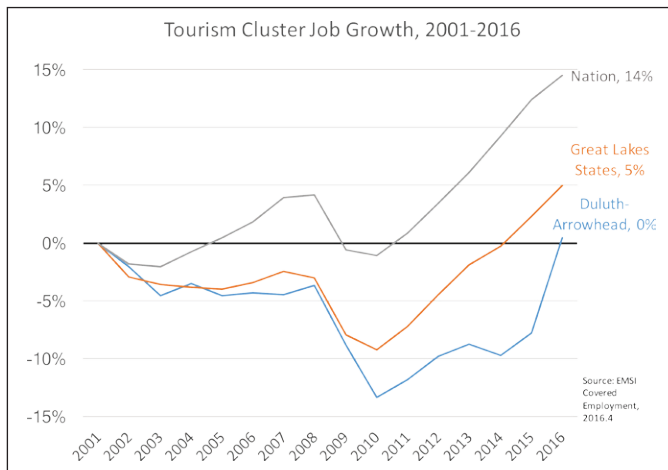
Source: EMSI Social Accounting Matrix Input-Output Model, 2015

THE TOURISM CLUSTER IN THE DULUTH-ARROWHEAD REGION

Tourism, outdoor recreation, and the arts is a key industry cluster in the Duluth-Arrowhead region. The tourism cluster includes 39 industry sectors covering various lodging and touring sectors, the arts, outdoor activities, sports retailers and outfitters, and sporting equipment manufacturers. The tourism cluster holds 6,390 jobs in the Duluth-Arrowhead region. For a full list of industry sectors and employment in the Duluth-Arrowhead tourism cluster, see Appendix B at the end of this report.

This definition of the tourism cluster does not include the 11,700 regional jobs in food services and drinking places. Economic development is created by industries which draw sales from customers from outside the region, and thereby draw “new money” into the region. Food services and drinking places tend to primarily recycle money within a region.

The Duluth-Arrowhead region is a center for tourism and outdoors activities, as this cluster is 31% more concentrated in the region than the national average. However, along with much of the regional economy, employment growth in the cluster has been stagnant since 2001, with roughly the same number of jobs in the tourism cluster as 2001. In comparison, the five Great Lakes states carry a concentration 23% below average in this cluster, and tourism jobs in these states have grown at roughly the same rate as the nation since 2010.



The Impact of Tourism

In 2015, economic activity generated by the tourism cluster supported a total of 9,149 jobs in the Duluth-Arrowhead region. The cluster’s job multiplier is 1.23, meaning that for every job in the cluster, another .23 jobs are created in other local industries. These jobs deliver about \$230 million in annual earnings, just

AGGREGATE IMPACT OF THE TOURISM CLUSTER

\$227,604,678

Impact in Earnings
1.38 Multiplier

9,149

Impact in Jobs
1.23 Multiplier

\$24,878

Average Earnings
Per Job (2015)

\$ 51,159,720

Impact in Taxes on
Production and Imports

Source: EMSI Input-Output Model, 2015

under \$25,000 per job. Tourism business in the Duluth-Arrowhead region generates about \$51 million in federal, state, and local taxes on production and imports.

About 52% (3,300) of the workers in the local tourism cluster are employed by hotels. Other workers are scattered across various sectors, most of which are highly concentrated but lower paying. The highest-paying industry in the region is the sports and athletic equipment manufacturing sector with 126 workers at \$57,500 in earnings per worker.

Overall, earnings per worker across the 39 tourism sectors is just \$18,207, less than half the average rate among all industry sectors in the region and only 22% of the average worker in the mining cluster.

Annual Earnings Per Cluster

	Total Jobs	Earnings Per Worker	Total Earnings Paid Per Year
Mining Cluster	5,140	\$81,483	\$418,822,620
Tourism Cluster	6,390	\$18,207	\$116,342,730

Source: EMSI Covered Employment, 2016.3

Even with 1,200 fewer jobs than the tourism cluster, the mining cluster contributes significantly more in earnings per year to the local economy: \$420 million for mining compared to just \$116 million for tourism.

The differences between the two clusters is clear by the types of workers employed by each. Roughly 59% of occupations in the Duluth-Arrowhead mining cluster make at least \$25 per hour, compared to just 7% of workers in the tourism cluster.

Cluster Pay Distribution Comparison

Share of cluster occupations paying more than...	Mining Cluster	Tourism Cluster
\$20/hr	78%	12%
\$25/hr	59%	7%
\$30/hr	14%	4%

Source: EMSI Covered Employment, 2016.3

Sources of Good Jobs

Roughly 59% of occupations in the Duluth-Arrowhead mining cluster make at least \$25 per hour, compared to just 7% of workers in the tourism cluster.

DRIVING FUTURE GROWTH: MINING VS. TOURISM

How would growth in the mining cluster impact the Duluth-Arrowhead region compared to tourism growth? Measuring the impacts across the economy of a 10% growth scenario in each cluster can help address this question. This analysis models the impacts of 10% growth distributed evenly across all industry sectors in each cluster.

The overall economic impact delivered by growth in the mining cluster compared to the tourism cluster is significantly different. Though it is smaller than tourism, 10% growth in the mining cluster generates more new jobs overall than equivalent growth in the tourism cluster. The total impact of 10% mining cluster growth is 1,075 new jobs, compared to 840 generated by tourism growth.

The Impact of Mining

10% mining growth creates a strong ripple effect across the economy: 567 new jobs in other sectors outside the cluster, more than three times the 161 new jobs generated by equivalent tourism growth.

The new jobs created in the mining growth scenario average \$66,300 in earnings per worker. 10% tourism growth would create jobs averaging less than \$25,000 per worker in earnings.

Mining growth creates a stronger ripple effect across the economy, creating 567 new jobs in other sectors outside the cluster, more than three times the jobs generated by tourism growth. These new jobs generated by mining cluster growth are good jobs. The 1,075 total jobs generated by 10% mining growth average \$66,300 in earnings per worker. The 840 total jobs created by tourism growth average less than \$25,000 per worker in earnings. This puts the total earnings gain in the economy at \$71 million for the mining cluster and \$21 million for the tourism cluster in this scenario.

Because of its connection to higher-value industries, mining growth generates significantly more federal, state, and local tax revenue impact as well. This 10% growth scenario in each cluster would generate nearly \$17 million in taxes from mining growth compared to roughly \$5 million for the equivalent growth in tourism employment.

10% Cluster Growth Scenarios

	Mining Cluster	Tourism Cluster
2016 Cluster Employment	5,067	6,774
New Cluster Jobs from 10% Growth	508	679
Jobs Created by Economic Impact	567	161
Total Change In Jobs	1,075	840
Change in Earnings	\$71,273,028	\$20,958,628
Earnings per New Job	\$66,300	\$24,951
New Tax Revenue Generated	\$16,811,823	\$4,876,242

Source: EMSI Social Accounting Matrix Input-Output Model, 2015
2016 cluster job totals are EMSI Covered Employment, 2016.4

FINDING THE WAY FORWARD

After several years of stagnation and lagging incomes, adding good jobs to the Duluth-Arrowhead region is a critical concern. The region is home to a rich heritage of success in the mining industry and that industry continues to be a strong part of the local economic DNA. Mining remains a foundation of the Duluth-Arrowhead economy. The region's topography, climate, and outdoor amenities make it unique. Looking to the region's future, the mining and tourism industries are often pitted as adversaries. Must it be one or the other?

The tourism economy and outdoor assets are important for the Duluth-Arrowhead region. This is part of what gives the region its unique identity and is a key part of the local quality of life. The tourism cluster is 31% more concentrated in the Duluth-Arrowhead region than the national average. However, the tourism economy simply does not generate enough value and high-paying jobs to sustain the region's economy. The mining and tourism clusters need not compete. These clusters complement one another. Mining generates high-paying jobs and broad-based impact that creates demand for tourism. Tourism and the outdoors make the region unique, making it easier for all industries – including mining – to attract high-quality talent to the Duluth-Arrowhead region.

The region's economy over the past 15 years has remained stagnant. The economy is not creating enough value for its residents, lagging in per capita income and GDP per job. Improving the economic future of the region should be a chief concern of local policymakers. Expansion of the mining industry offers a clear, attainable chance for the region to create more high-paying jobs.

“The tourism and mining sectors need not be adversaries in the public eye, local government chambers, or economist’s calculations.”

Appendix A: List of Industries in Mining Cluster

The following table lists the 31 industries defining the mining cluster in this report. The table includes employment, earnings per worker, and the number of business establishments in the Duluth-Arrowhead region for each sector in the cluster.

Duluth-Arrowhead Mining Industry Cluster

NAICS Industry Code	Sector Description	2016 Jobs in Duluth-Arrowhead	Current Wages, Salaries, and Proprietor Earnings	2015 Establishments in Duluth-Arrowhead
212210	Iron Ore Mining	3,363	\$82,846	9
482110	Rail transportation	1,194	\$82,987	2
333131	Mining Machinery and Equipment Manufacturing	207	\$51,384	3
483113	Coastal and Great Lakes Freight Transportation	198	\$100,054	6
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing	54	\$66,473	5
213114	Support Activities for Metal Mining	44	\$49,532	4
212321	Construction Sand and Gravel Mining	30	\$61,027	8
212234	Copper Ore and Nickel Ore Mining	15	\$83,133	1
488390	Other Support Activities for Water Transportation	14	\$47,051	4
213113	Support Activities for Coal Mining	14	\$59,876	2
212319	Other Crushed and Broken Stone Mining and Quarrying	<10	Insf. Data	2
212312	Crushed and Broken Limestone Mining and Quarrying	<10	Insf. Data	0
483211	Inland Water Freight Transportation	<10	Insf. Data	1
212392	Phosphate Rock Mining	0	\$0	0
212393	Other Chemical and Fertilizer Mineral Mining	0	\$0	0
212391	Potash, Soda, and Borate Mineral Mining	0	\$0	0
213115	Support Activities for Nonmetallic Minerals (except Fuels) Mining	0	\$0	0
212399	All Other Nonmetallic Mineral Mining	0	\$0	0
212322	Industrial Sand Mining	0	\$0	0
212222	Silver Ore Mining	0	\$0	0
212231	Lead Ore and Zinc Ore Mining	0	\$0	0
212221	Gold Ore Mining	0	\$0	0
212113	Anthracite Mining	0	\$0	0
212112	Bituminous Coal Underground Mining	0	\$0	0
212291	Uranium-Radium-Vanadium Ore Mining	0	\$0	0
212299	All Other Metal Ore Mining	0	\$0	0
212324	Kaolin and Ball Clay Mining	0	\$0	0
212111	Bituminous Coal and Lignite Surface Mining	0	\$0	0
212313	Crushed and Broken Granite Mining and Quarrying	0	\$0	0
212311	Dimension Stone Mining and Quarrying	0	\$0	0
212325	Clay and Ceramic and Refractory Minerals Mining	0	\$0	0
Total Jobs in Duluth-Arrowhead Cluster		5,140	\$81,483	47

Source: EMSI Complete Employment, 2016.3

Appendix B: List of Industries in Tourism Cluster

The following table lists the 39 industries defining the tourism cluster in this report. The table includes employment, earnings per worker, and the number of business establishments in the Duluth-Arrowhead region for each sector in the cluster.

Duluth-Arrowhead Tourism Industry Cluster

NAICS Industry Code	Sector Description	2016 Jobs in Duluth-Arrowhead	Current Wages, Salaries, and Proprietor Earnings	2015 Establishments in Duluth-Arrowhead
721110	Hotels (except Casino Hotels) and Motels	3,316	\$18,058	155
451110	Sporting Goods Stores	462	\$17,113	47
713990	All Other Amusement and Recreation Industries	348	\$14,588	61
721199	All Other Traveler Accommodations	307	\$17,812	70
713940	Fitness and Recreational Sports Centers	279	\$9,028	30
721214	Recreational and Vacation Camps (except Campgrounds)	190	\$16,494	14
712110	Museums	190	\$18,675	27
611620	Sports and Recreation Instruction	146	\$7,491	12
339920	Sporting and Athletic Goods Manufacturing	126	\$57,505	3
713920	Skiing Facilities	111	\$18,136	3
532292	Recreational Goods Rental	98	\$15,768	17
453920	Art Dealers	72	\$13,874	14
713930	Marinas	72	\$31,093	10
721310	Rooming and Boarding Houses	71	\$16,246	8
712130	Zoos and Botanical Gardens	64	\$21,087	2
712120	Historical Sites	59	\$18,466	3
711310	Promoters of Performing Arts, Sports, and Similar Events with Facilities	54	\$12,391	9
711219	Other Spectator Sports	46	\$8,838	1
721211	RV (Recreational Vehicle) Parks and Campgrounds	46	\$19,968	5
711320	Promoters of Performing Arts, Sports, and Similar Events without Facilities	43	\$23,047	5
721191	Bed-and-Breakfast Inns	40	\$35,184	7
444210	Outdoor Power Equipment Stores	36	\$29,077	6
561510	Travel Agencies	35	\$38,398	7
711212	Racetracks	32	\$5,749	2
713120	Amusement Arcades	31	\$10,078	1
561591	Convention and Visitors Bureaus	25	\$36,664	7
711211	Sports Teams and Clubs	23	\$20,995	4
712190	Nature Parks and Other Similar Institutions	18	\$24,142	1
114210	Hunting and Trapping	15	\$24,073	3
487210	Scenic and Sightseeing Transportation, Water	12	\$17,447	1
487110	Scenic and Sightseeing Transportation, Land	11	\$8,892	2
713290	Other Gambling Industries	10	\$28,836	2
561520	Tour Operators	<10	Insf. Data	1
711190	Other Performing Arts Companies	<10	Insf. Data	1
487990	Scenic and Sightseeing Transportation, Other	0	\$0	0
561599	All Other Travel Arrangement and Reservation Services	0	\$0	0
713110	Amusement and Theme Parks	0	\$0	0
713210	Casinos (except Casino Hotels)	0	\$0	0
721120	Casino Hotels	0	\$0	0
Total Jobs in Duluth-Arrowhead Cluster		6,390	\$18,207	541

Source: EMSI Complete Employment, 2016.3

Appendix C: Data Sources and Methods

The analysis in this report uses data from EMSI, Inc., which is primarily based upon the Bureau of Labor Statistics Quarterly Census of Employment and Wages and includes dozens of federal sources along with data produced by all 50 individual states. The data includes estimates of full-time, self-employed workers. More information about the EMSI data is included below, a full list of sources is available at: <http://www.economicmodeling.com/data-sources/>.

This report uses data primarily from the EMSI's third quarter 2016 data set. Impact analyses in this report use data from EMSI's fourth quarter 2016 data, analyzed with the EMSI 2015 Input-output model. This may cause some jobs totals discussed in the report to vary slightly. Other figures vary slightly due to rounding. Industry impacts were calculated by removing all jobs in a target industry at a single point in time and measuring the direct, indirect, and induced impacts.

Other individual federal data sources are used in this report as noted.

Industry Data

EMSI industry data have various sources depending on the class of worker. (1) For QCEW Employees, EMSI primarily uses the QCEW (Quarterly Census of Employment and Wages), with supplemental estimates from County Business Patterns and Current Employment Statistics. (2) Non-QCEW Employees data are based on a number of sources including QCEW, Current Employment Statistics, County Business Patterns, BEA State and Local Personal Income reports, the National Industry-Occupation Employment Matrix (NIOEM), the American Community Survey, and Railroad Retirement Board statistics. (3) Self-Employed and Extended Proprietor classes of worker data are primarily based on the American Community Survey, Nonemployer Statistics, and BEA State and Local Personal Income Reports. Projections for QCEW and Non-QCEW Employees are informed by NIOEM and long-term industry projections published by individual states.

Occupation Data

EMSI occupation employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level EMSI earnings by industry.

Staffing Patterns Data

The staffing pattern data in this report are compiled from several sources using a specialized process. For QCEW and Non-QCEW Employees classes of worker, sources include Occupational Employment Statistics, the National Industry-Occupation Employment Matrix, and the American Community Survey. For the Self-Employed and Extended Proprietors classes of worker, the primary source is the American Community Survey, with a small amount of information from Occupational Employment Statistics.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Wisconsin Department of Workforce Development, Bureau of Workforce Information.

Input-Output Model

The input-output model in this report is EMSI's gravitational flows multi-regional social account matrix model (MR-SAM). It is based on data from the Census Bureau's Current Population Survey and American Community Survey; as well as the Bureau of Economic Analysis' National Income and Product Accounts, Input-Output Make and Use Tables, and Gross State Product data. In addition, several EMSI in-house data sets are used, as well as data from Oak Ridge National Labs, on the cost of transportation between counties. MR-SAMs have the ability to model the flow of goods and services between regions (i.e., a collection of counties). EMSI's MR-SAM modeling system is a "comparative static" type model in the same general class as RIMS II (Bureau of Economic Analysis) and IMPLAN (Minnesota Implan Group). It relies on a matrix representation of industry-to-industry purchasing patterns originally based on national data which are regionalized with the use of local data and mathematical manipulation (i.e., non-survey methods). Models of this type estimate the ripple effects of changes in jobs, earnings, or sales in one or more industries upon other industries in a region. The EMSI I-O model differs from the IMPLAN model in that it includes more industry sector detail, currently 1,000 industry sectors. Compared to IMPLAN, the EMSI I-O model uses a gravity flows technique for calculating regional purchasing coefficients, improving accuracy and granularity for multi-industry impact scenarios. Compared to IMPLAN, the EMSI SAM I-O model offers impact in dimensions of occupations and demographics. The EMSI model does not produce sub-regionalized geographic impacts or allow for model adjustments based on user knowledge.

About Praxis Strategy Group

Praxis Strategy Group is an economic research, policy and strategy company that works with leaders across a variety of industries to develop and implement action-oriented initiatives and business ventures.

Praxis Strategy Group was founded in 1994 and has offices in Grand Forks and Fargo, ND.

With more than 30 years of research, policy and experience in economic development, Praxis Strategy Group's core services include industry analyses, competitive assessments, development strategies and the specification of new business development opportunities. Praxis Strategy Group offers expert assistance in formulating strategy, identifying opportunities and implementing solutions that best meet clients' capabilities and requirements. Praxis Strategy Group specializes in:

- Policy and Research
- Economic Development
- Community Development
- Initiative Management
- Enterprise Development
- International Development

Praxis Strategy Group helps multi-stakeholder groups develop initiatives that get results. Over the past several years, Praxis Strategy Group has worked with groups in multiple communities throughout the region, helping identify solutions to problems, engaging citizens in important community discussions, and developing strategies to improve economic vitality and livability.

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