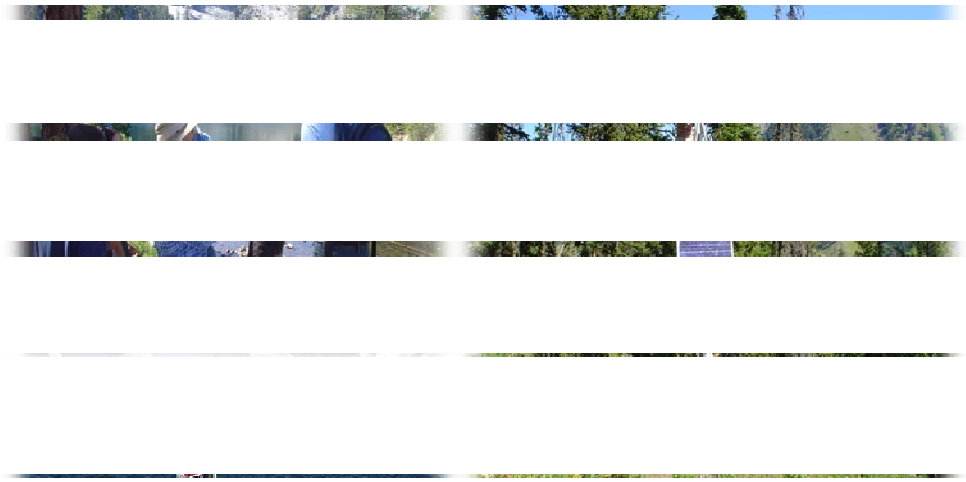
2009

Status of the Geoscience Workforce

Appendix A: Defining the Geosciences



American Geological Institute

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Table of Contents

Defining the Geosciences 1

Educational Classifications 2

Occupational Classifications 7

Industry Classifications 13

AGI's Working Definition of Geoscience Occupations 14

Defining the Geosciences

Given its complexity, the geoscience occupation is difficult to define under existing nomenclature. This is due to the educational pathways geoscientists pursue and because of the different industries in which geoscientists work. Additionally, each federal data source (U.S. Bureau of Labor Statistics, U.S. Census Bureau, National Center for Education Statistics, National Science Foundation, U.S. Bureau of Economic Analysis, Office of Personnel Management), professional society, and industry classifies geoscientists differently depending on the intent of the data collection (national occupation trends, science & engineering trends, education vs. occupation, internal classification codes, etc.), the characteristics of the population surveyed, and the focus of the organization.

Federal policy and funding is in part determined by the economic activity and employment trends of a given profession. Accurate measurement and analysis of the geoscience profession are thus central to successful decisions that support the improvement of the geosciences in the U.S. The lack of a consistent definition of geosciences across data sources is a major handicap for the geoscience profession, both for cultivating the future geoscience workforce and for characterizing geoscience economic drivers. Attracting new students into geoscience degree programs is influenced by federal statistics (current and projected employment numbers, salary information, funding, etc.) about the geosciences. Currently, the geoscience profession is poorly characterized by federal data sources. At best, geoscientists are spread across several occupational classifications that are vague in their definition. In addition, the lack of consistency makes establishing baseline metrics for the measurement of the geoscience contribution to the economy very difficult.

To address this issue, AGI is establishing a working definition for the geoscience profession in order to improve comparability of data across sources and time periods. Now that the national census is a rolling monthly survey, the Standard Occupational Classification (SOC) codes will now be updated every 5 to 10 years. This is an opportunity for AGI and its partners to edit the SOC codes so that they capture the depth and breadth of the geoscience profession, clearly define it, and estimate employment over at least 5 years. This data can then be included in a proposal to federal data agencies to more accurately represent the occupation.

Many federal data sources use the Classification of Instructional Programs (CIP) codes to classify educational programs, the Standard Occupational Classification (SOC) codes to classify occupations, and the North American Industry Classification System (NAICS) to classify industries. In this appendix we report how each data source defines a geoscientist. The CIP codes are managed by the U.S. Department of Education's National Center for Education Statistics. The SOC codes were developed by the U.S. Office of Management and Budget and are managed by the Standard Occupational Classification Revision Policy Committee. This committee consists of representatives from the U.S. Bureau of Labor Statistics, the U.S. Bureau of Census, The U.S. Department of Labor (Employment and Training Administration), the Office

of Personnel Management, The Defense Manpower Data Center, the National Science Foundation, the National Occupational Information Coordinating Committee, and the Office of Management and Budget. The NAICS was developed under the guidance of the Office of Management and Budget by the U.S. Economic Classification Policy Committee, Statistics Canada, and Mexico's Instituto Nacional de Estadistica, Geografia e Informatica in order to allow for economic comparisons between North American countries.

Educational Classifications

Classification of Instructional Programs (CIP)

The National Science Foundation and National Center for Education Statistics use the Classification of Instructional Programs (CIP) is to classify educational programs including fields of study and program completions. The CIP website (http://nces.ed.gov/pubs2002/cip2000/index.asp) also has an online application that allows for the cross-referencing of instructional programs to the Standard Occupational Classification codes.

CIP codes that refer to geoscience programs are:

CIP Code	Title	Description
1.1201	Soil Science and Agronomy, General	A program that generally focuses on the scientific classification of soils, soil properties, and their relationship to agricultural crops. Includes instruction in soil chemistry, soil physics, soil biology, soil fertility, morphogenesis, mineralogy, hydrology, agronomy, and soil conservation and management
1.1202	Soil Chemistry and Physics	A program that focuses on the application of chemical and physical principles to research and analysis concerning the nature and properties of soils and the conservation and management of soils. Includes instruction in soil and fluid mechanics, mineralogy, sedimentology, thermodynamics, geomorphology, environmental systems, analytical methods, and organic and inorganic chemistry
3.0104	Environmental Science	A program that focuses on the application of biological, chemical, and physical principles to the study of the physical environment and the solution of environmental problems, including subjects such as abating or controlling environmental pollution and degradation; the interaction between human society and the natural environment; and natural resources management. Includes instruction in biology, chemistry, physics, geosciences, climatology, statistics, and mathematical modeling

CIP Code	Title	Description
14.0802	Geotechnical Engineering	A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems for manipulating and controlling surface and subsurface features at or incorporated into structural sites, including earth and rock moving and stabilization, land fills, structural use and environmental stabilization of wastes and by-products, underground construction, and groundwater and hazardous material containment
14.0805	Water Resources Engineering	A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems for collecting, storing, moving, conserving and controlling surface- and groundwater, including water quality control, water cycle management, management of human and industrial water requirements, water delivery, and flood control
14.1401	Environmental/Environmental Health Engineering	A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems for controlling contained living environments and for monitoring and controlling factors in the external natural environment, including pollution control, waste and hazardous material disposal, health and safety protection, conservation, life support, and requirements for protection of special materials and related work environments
14.2101	Mining and Mineral Engineering	A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of mineral extraction, processing and refining systems, including open pit and shaft mines, prospecting and site analysis equipment and instruments, environmental and safety systems, mine equipment and facilities, mineral processing and refining methods and systems, and logistics and communications systems
14.2501	Petroleum Engineering	A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems for locating, extracting, processing and refining crude petroleum and natural gas, including prospecting instruments and equipment, mining and drilling systems, processing and refining systems and facilities, storage facilities, transportation systems, and related environmental and safety systems

CIP Code	Title	Description
14.3901	Geological/Geophysical Engineering	A program that prepares individuals to apply mathematical and geological principles to the analysis and evaluation of engineering problems, including the geological evaluation of construction sites, the analysis of geological forces acting on structures and systems, the analysis of potential natural resource recovery sites, and applied research on geological phenomena
30.1801	Natural Sciences	A program with a combined or undifferentiated focus on one or more of the physical and biological sciences
40.0101	Physical Sciences	A program that focuses on the major topics, concepts, processes, and interrelationships of physical phenomena as studied in any combination of physical science disciplines
40.0401	Atmospheric Sciences and Meteorology, General	A general program that focuses on the scientific study of the composition and behavior of the atmospheric envelopes surrounding the earth, the effect of earth's atmosphere on terrestrial weather, and related problems of environment and climate. Includes instruction in atmospheric chemistry and physics, atmospheric dynamics, climatology and climate change, weather simulation, weather forecasting, climate modeling and mathematical theory; and studies of specific phenomena such as clouds, weather systems, storms, and precipitation patterns
40.0402	Atmospheric Chemistry and Climatology	A program that focuses on the scientific study of atmospheric constituents, reactions, measurement techniques, and processes in predictive, current, and historical contexts. Includes instruction in climate modeling, gases and aerosols, trace gases, aqueous phase chemistry, sinks, transport mechanisms, computer measurement, climate variability, paleoclimatology, climate diagnosis, numerical modeling and data analysis, ionization, recombination, photoemission, and plasma chemistry
40.0403	Atmospheric Physics and Dynamics	A program that focuses on the scientific study of the processes governing the interactions, movement, and behavioral of atmospheric phenomena and related terrestrial and solar phenomena. Includes instruction in cloud and precipitation physics, solar radiation transfer, active and passive remote sensing, atmospheric electricity and acoustics, atmospheric wave phenomena, turbulence and boundary layers, solar wind, geomagnetic storms, coupling, natural plasma, and energization

CIP Code	Title	Description
40.0601	Geology/Earth Science, General	A program that focuses on the scientific study of the earth; the forces acting upon it; and the behavior of the solids, liquids and gases comprising it. Includes instruction in historical geology, geomorphology, and sedimentology, the chemistry of rocks and soils, stratigraphy, mineralogy, petrology, geostatistics, volcanology, glaciology, geophysical principles, and applications to research and industrial problems
40.0602	Geochemistry	A program that focuses on the scientific study of the chemical properties and behavior of the silicates and other substances forming, and formed by geomorphological processes of the earth and other planets. Includes instruction in chemical thermodynamics, equilibrium in silicate systems, atomic bonding, isotopic fractionation, geochemical modeling, specimen analysis, and studies of specific organic and inorganic substances
40.0603	Geophysics and Seismology	A program that focuses on the scientific study of the physics of solids and its application to the study of the earth and other planets. Includes instruction in gravimetric, seismology, earthquake forecasting, magnetrometry, electrical properties of solid bodies, plate tectonics, active deformation, thermodynamics, remote sensing, geodesy, and laboratory simulations of geological processes
40.0604	Paleontology	A program that focuses on the scientific study of extinct life forms and associated fossil remains, and the reconstruction and analysis of ancient life forms, ecosystems, and geologic processes. Includes instruction in sedimentation and fossilization processes, fossil chemistry, evolutionary biology, paleoecology, paleoclimatology, trace fossils, micropaleontology, invertebrate paleontology, vertebrate paleontology, paleobotany, field research methods, and laboratory research and conservation methods
40.0605	Hydrology and Water Resources Science	A program that focuses on the scientific of study of the occurrence, circulation, distribution, chemical and physical properties, and environmental interaction of surface and subsurface waters, including groundwater. Includes instruction in geophysics, thermodynamics, fluid mechanics, chemical physics, geomorphology, mathematical modeling, hydrologic analysis, continental water processes, global water balance, and environmental science

CIP Code	Title	Description
40.0606	Geochemistry and Petrology	A program that focuses on the scientific study of the igneous, metamorphic, and hydrothermal processes within the earth and the mineral, fluid, rock, and ore deposits resulting from them. Includes instruction in mineralogy, crystallography, petrology, volcanology, economic geology, meteoritics, geochemical reactions, deposition, compound transformation, core studies, theoretical geochemistry, computer applications, and laboratory studies
40.0607	Oceanography, Chemical and Physical	A program that focuses on the scientific study of the chemical components, mechanisms, structure, and movement of ocean waters and their interaction with terrestrial and atmospheric phenomena. Includes instruction in material inputs and outputs, chemical and biochemical transformations in marine systems, equilibria studies, inorganic and organic ocean chemistry, oceanographic processes, sediment transport, zone processes, circulation, mixing, tidal movements, wave properties, and seawater properties
45.0701	Geography	A program that focuses on the systematic study of the spatial distribution and interrelationships of people, natural resources, plant and animal life. Includes instruction in historical and political geography, cultural geography, economic and physical geography, regional science, cartographic methods, remote sensing, spatial analysis, and applications to areas such as land-use planning, development studies, and analyses of specific countries, regions, and resources

The College Board

The College Board (http://www.collegeboard.com) has its own definitions for geoscience educational programs which it lists on its careers site. For the SAT Reasoning Test, the geoscience coursework is listed under “Natural Sciences”. This heading includes biology, chemistry, physics, geology/earth or space science, and other sciences. Intended college major choices include “Natural Resources and Conservation”, “Multi/Interdisciplinary Studies”, “Physical Sciences”, and “Engineering”.

Test scores, goals for higher education, and related information published by the College Board are used for various purposes. Universities and colleges use test scores in conjunction with other relevant application information to assess an incoming student’s preparedness for academic study. Counselors use the information to provide students with information about course selection, college programs, and career pathways. Recruiters also use the information to assess the relative strengths of students and their preparedness for certain careers. Additionally, the

data provided by the College Board is used by researchers to study trends in academic performance between disciplines as well as trends in national academic performance relative to other countries.

GeoRef

AGI's GeoRef database contains over 2.9 million references to geoscience journal articles, books, maps, conference papers, reports and theses. GeoRef includes all geoscience publications that pertain only to surface and sub-surface processes. Publications pertaining to atmospheric and space sciences are excluded.

Occupational Classifications

Standard Occupational Classification Codes

The U.S. Census Bureau, U.S. Bureau of Labor Statistics, and National Science Foundation (NSF) use the 2000 Standard Occupational Classification (SOC) codes (http://www.bls.gov/soc/home.htm) to classify geoscientists; however, each organization has a different focus for its surveying and data collection. The Office of Personnel Management uses its *Handbook of Occupational Groups and Families* to define occupations.

Data from the U.S. Census Bureau and U.S. Bureau of Labor Statistics, and the Office of Personnel Management are coarse because the first two agencies focus on national population trends, and the third agency focuses on trends across all sectors of the federal government. Data from the National Science Foundation has a finer resolution because it is focused on specific data topics within the science and engineering fields. Data from all of these sources are too coarse to establish precise trends for geoscientists because geoscientists fall within twenty-three occupational categories in the SOC codes, thirteen occupational categories within the National Science Foundation's National Survey of College Graduates, sixteen occupational series within the OPM's *Handbook of Occupational Groups and Families.*

In data classified by the SOC codes, some geoscientists are grouped in categories with other non-geoscience scientists and engineers. For example, soil scientists who study the chemical, physical and mineralogical composition of soils are grouped with the Soil and Plant Scientists whose focus is on agriculture. Geotechnical engineers who study the structural behavior of soil and rocks, perform soil investigations, design structure foundations, and provide field observations of foundation investigation and construction are grouped with civil engineers who perform construction. Geoscientists at the professional or managerial level are grouped with either Engineering Managers or Natural Sciences Managers. Geoscience teachers at post-secondary institutions are grouped into the Environmental Science Teacher, Atmospheric, Earth, Marine, and Space Science Teacher, Geography Teacher, or Engineering Teacher categories.

The National Science Foundation's classification of geoscientists provides better resolution than the SOC codes; however, there are no categories for geographers, hydrologists, geoscience managers and soil scientists. Additionally, many of the challenges with identifying geoscientsts that occur in the SOC codes (such as post-secondary geoscience teachers) also occur within the National Science Foundation's classification schema.

Geoscientists are found in the following SOC definitions:

SOC Code	SOC Title	Definition
11-9041	Engineering Managers	Plan, direct, or coordinate activities in such fields as architecture and engineering or research and development in these fields. Exclude "Natural Sciences Managers"
11-9121	Natural Sciences Managers	Plan, direct, or coordinate activities in such fields as life sciences, physical sciences, mathematics, statistics, and research and development in these fields. Exclude "Engineering Managers" (11-9041) and "Computer and Information Systems Managers" (11-3021)
17-2051	Civil Engineers	Perform engineering duties in planning, designing, and overseeing construction and maintenance of building structures, and facilities, such as roads, railroads, airports, bridges, harbors, channels, dams, irrigation projects, pipelines, power plants, water and sewage systems, and waste disposal units. Include architectural, structural, traffic, ocean, and geo-technical engineers. Exclude "Hydrologists" (19-2043)
17-2081	Environmental Engineers	Design, plan, or perform engineering duties in the prevention, control, and remediation of environmental health hazards utilizing various engineering disciplines. Work may include waste treatment, site remediation, or pollution control technology
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	Determine the location and plan the extraction of coal, metallic ores, nonmetallic minerals, and building materials, such as stone and gravel. Work involves conducting preliminary surveys of deposits or undeveloped mines and planning their development; examining deposits or mines to determine whether they can be worked at a profit; making geological and topographical surveys; evolving methods of mining best suited to character, type, and size of deposits; and supervising mining operations
17-2171	Petroleum Engineers	Devise methods to improve oil and gas well production and determine the need for new or modified tool designs. Oversee drilling and offer technical advice to achieve economical and satisfactory progress

SOC Code	SOC Title	Definition
19-1013	Soil and Plant Scientists	Conduct research in breeding, physiology, production, yield, and management of crops and agricultural plants, their growth in soils, and control of pests; or study the chemical, physical, biological, and mineralogical composition of soils as they relate to plant or crop growth. May classify and map soils and investigate effects of alternative practices on soil and crop productivity
19-1031	Conservation Scientists	Manage, improve, and protect natural resources to maximize their use without damaging the environment. May conduct soil surveys and develop plans to eliminate soil erosion or to protect rangelands from fire and rodent damage. May instruct farmers, agricultural production managers, or ranchers in best ways to use crop rotation, contour plowing, or terracing to conserve soil and water; in the number and kind of livestock and forage plants best suited to particular ranges; and in range and farm improvements, such as fencing and reservoirs for stock watering. Exclude "Zoologists and Wildlife Biologists" (19-1023) and "Foresters" (19-1032)
19-2021	Atmospheric and Space Scientists	Investigate atmospheric phenomena and interpret meteorological data gathered by surface and air stations, satellites, and radar to prepare reports and forecasts for public and other uses. Include weather analysts and forecasters whose functions require the detailed knowledge of a meteorologist
19-2041	Environmental Scientists and Specialists, Including Health	Conduct research or perform investigation for the purpose of identifying, abating, or eliminating sources of pollutants or hazards that affect either the environment or the health of the population. Utilizing knowledge of various scientific disciplines may collect, synthesize, study, report, and take action based on data derived from measurements or observations of air, food, soil, water, and other sources. Exclude "Zoologists and Wildlife Biologists" (19-1023), "Conservation Scientists" (19-1031), "Forest and Conservation Technicians" (19-4093), "Fish and Game Wardens" (33-3031), and "Forest and Conservation Workers" (45-4011)
19-2042	Geoscientists, Except Hydrologists and Geographers	Study the composition, structure, and other physical aspects of the earth. May use geological, physics, and mathematics knowledge in exploration for oil, gas, minerals, or underground water; or in waste disposal, land reclamation, or other environmental problems. May study the earth's internal composition, atmospheres, oceans, and its magnetic, electrical, and gravitational forces. Include mineralogists, crystallographers, paleontologists, stratigraphers, geodesists, and seismologists

SOC Code	SOC Title	Definition
19-2043	Hydrologists	Research the distribution, circulation, and physical properties of underground and surface waters; study the form and intensity of precipitation, its rate of infiltration into the soil, movement through the earth, and its return to the ocean and atmosphere
19-3092	Geographers	Study nature and use of areas of earth's surface, relating and interpreting interactions of physical and cultural phenomena. Conduct research on physical aspects of a region, including land forms, climates, soils, plants and animals, and conduct research on the spatial implications of human activities within a given area, including social characteristics, economic activities, and political organization, as well as researching interdependence between regions at scales ranging from local to global
25-1032	Engineering Teachers, Postsecondary	Teach courses pertaining to the application of physical laws and principles of engineering for the development of machines, materials, instruments, processes, and services. Include teachers of subjects, such as chemical, civil, electrical, industrial, mechanical, mineral, and petroleum engineering. Include both teachers primarily engaged in teaching and those who do a combination of both teaching and research. Exclude "Computer Science Teachers, Postsecondary" (25-1021)
25-1043	Forestry and Conservation Science Teachers, Postsecondary	Teach courses in environmental and conservation science. Include both teachers primarily engaged in teaching and those who do a combination of both teaching and research. Exclude "Agricultural Science Teachers" (25-1041)
25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	Teach courses in the physical sciences, except chemistry and physics. Include both teachers primarily engaged in teaching, and those who do a combination of both teaching and research
25-1053	Environmental Science Teachers, Postsecondary	Teach courses in environmental science. Include both teachers primarily engaged in teaching and those who do a combination of both teaching and research
25-1064	Geography Teachers, Postsecondary	Teach courses in geography. Include both teachers primarily engaged in teaching and those who do a combination of both teaching and research

Office of Personnel Management: *Handbook of Occupational Groups and Families*

The Office of Personnel Management's *Handbook of Occupational Groups and Families* defines geoscience occupations in the following manner:

Code-Title	Description
0028 – Environmental Protection Specialist Series	This series covers positions that involve advising on, managing, supervising, or performing administrative or program work relating to environmental protection programs (e.g., programs to protect or improve environmental quality, control pollution, remedy environmental damage, or ensure compliance with environmental laws and regulations). These positions require specialized knowledge of the principles and methods of administering environmental protection programs and the laws and regulations related to environmental protection activities.
0150 – Geography Series	This series covers positions the duties of which involve professional work in the field of geography, including the compilation, synthesis, analysis, interpretation and presentation of information regarding the location, distribution, and interrelationships of and processes of change affecting such natural and human phenomena as the physical features of the earth, climate, plant and animal life, and human settlements and institutions.
0401 – General Natural Resources Management and Biological Science Series	This series covers positions that involve professional work in biology, agriculture, or related natural resource management when there is no other more appropriate series. Thus included in this series are positions that involve: (1) a combination of several professional fields with none predominant; or (2) a specialized professional field not readily identified with other existing series.
0457 – Soil Conservation Series	This series covers positions involving the performance of professional work in the conservation of soil, water, and related environmental resources to achieve sound land use. Conservation work requires knowledge of: (1) soils and crops; (2) the pertinent elements of agronomy, engineering, hydrology, range conservation, biology, and forestry; and (3) skill in oral and written communication methods and techniques sufficient to impart these knowledge to selected client groups.
0470 – Soil Science Series	This series covers positions that involve professional and scientific work in the investigation of soils, their management, and their adaptation for alternative uses. Such work requires knowledge of chemical, physical, mineralogical and biological properties and processes of the soils and their relationships to climatic, physiographic, and biologic influences.
0819 – Environmental Engineering Series	This series covers positions that involve professional engineering work to protect or improve air, land, and water resources in order to provide a clean and healthful environment. Such work requires the application of: (1) professional knowledge of the principles, methods, and techniques of engineering concerned with facilities and systems for controlling pollution and protecting quality of resources and the environment; and (2) an understanding of and the ability to utilize pertinent aspects of chemistry, biological sciences, and public health that pertain to the control or elimination of pollutants.

Code-Title	Description
0880 – Mining Engineering Series	This series covers positions that require primarily the application of professional knowledge of mining engineering. The work requires the ability to apply the principles of mathematics, chemistry, geology, physics, and engineering to mining technology. It also requires general knowledge of construction and excavation methods, materials handling, and the processes involved in preparing mined materials for use. Mining engineer positions are concerned with the search for, efficient removal, and transportation of ore to the point of use; conservation and development of mineral lands, materials, and deposits; and the health and safety of mine workers.
0881 – Petroleum Engineering Series	This series covers positions that require primarily the application of a professional knowledge of petroleum engineering. The work is concerned with exploration and development of oil and natural gas fields; production, transportation, and storage of petroleum, natural gas, and helium; investigation, evaluation, and conservation of these resources; regulation of transportation and sale of natural gas; valuation of production and distribution facilities for tax, regulatory, and other purposes; and research on criteria, principles, methods, and equipment.
1301 – General Physical Science Series	This series includes positions that involve professional work in the physical sciences when there is no other more appropriate series, that is, the positions are not classifiable elsewhere. This series also includes work in a combination of physical science fields, with no one predominant.
1313 – Geophysics Series	This series includes professional scientific positions requiring application of knowledge of the principles and techniques of geophysics and related sciences in the investigation, measurement, analysis, evaluation, and interpretation of geophysical phenomena and artificially applied forces and fields related to the structure, composition, and physical properties of the earth and its atmosphere.
1315 – Hydrology Series	This series includes positions that involve professional work in hydrology, the science concerned with the study of water in the hydrologic cycle. The work includes basic and applied research on water and water resources; the collection, measurement, analysis, and interpretation of information on water resources; the forecast of water supply and water flows; and the development of new, improved or more economical methods, techniques, and instruments.
1321 – Metallurgy Series	This series includes positions that require primarily professional education and training in the field of metallurgy, including ability to apply the relevant principles of chemistry, physics, mathematics, and engineering to the study of metals. Metallurgy is the art and science of extracting metals from their ores, refining them, alloying them and preparing them for use, and studying their properties and behavior as affected by the composition, treatment in manufacture, and conditions of use.
1340 – Meteorology Series	This series includes positions that involve professional work in meteorology, the science concerned with the earth s atmospheric envelope and its processes. The work includes basic and applied research into the conditions and phenomena of the atmosphere; the collection, analysis, evaluation, and interpretation of meteorological data to predict weather and determine climatological conditions for specific geographical areas; the development of new or the improvement of existing meteorological theory; and the development

Code-Title	Description
	or improvement of meteorological methods, techniques, and instruments. Positions in this occupation require full professional knowledge and application of meteorological methods, techniques, and theory.
1350 – Geology Series	This series includes professional scientific positions applying a knowledge of the principles and theories of geology and related sciences in the collection, measurement, analysis, evaluation, and interpretation of geologic information concerning the structure, composition, and history of the earth. This includes the performance of basic research to establish fundamental principles and hypotheses to develop a fuller knowledge and understanding of geology, and the application of these principles and knowledge to a variety of scientific, engineering, and economic problems.
1360 – Oceanography Series	This series includes professional scientific positions engaged in the collection, measurement, analysis, evaluation and interpretation of natural and physical ocean phenomena, such as currents, circulations, waves, beach and near shore processes, chemical structure and processes, physical and submarine features, depth, floor configuration, organic and inorganic sediments, sound and light transmission, color manifestations, heat exchange, and similar phenomena (e.g., biota, weather, geological structure, etc.). Oceanographers plan, organize, conduct, and administer seagoing and land based study and research of ocean phenomena for the purpose of interpreting, predicting, utilizing and controlling ocean forces and events. This work requires a fundamental background in chemistry, physics, and mathematics and appropriate knowledge in the field of oceanography.

Industry Classifications

North American Industry Classification System (NAICS)

The NAICS (http://www.census.gov/epcd/www/naics.html) is the federal government's standard industry classification system that groups employers into industries based on the activities in which they are primarily engaged. The United States, Canada, and Mexico developed the system to provide comparable statistics across the three countries. The NAICS is a comprehensive system covering the entire field of economic activities. There are 20 sectors in the NAICS and 1,170 detailed industries in the NAICS for the United States. The NAICS (United States version) is used by U.S. statistical agencies to facilitate the collection, tabulation, presentation, and analysis of data relating to business establishments. It allows for inter-agency comparison of statistical data describing the U.S. economy. The NAICS is used by the U.S. Census Bureau, U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, and by the National Science Foundation.

The top-level categories for NAICS are as outlined in following table. Geoscientists work in the Mining, Utilities, Construction, Manufacturing, Wholesale Trade, Transportation and Warehousing, Information, Finance and Insurance, Professional Scientific, and Technical

Services, Management of Companies and Enterprises, Administrative and Support and Waste Management and Remediation Services, Educational Services, and Public Administration industries.

NAIC Code	NAICS Industry Title
11	Agriculture, Forestry, Fishing and Hunting
21	Mining
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)
92	Public Administration

Energy Information Administration

The Energy Information Administration (EIA) is part of the U.S. Department of Energy. It collects and analyzes data related to energy issues, and publishes reports and relevant information on its website: http://www.eia.doe.gov/. EIA provides useful educational tools about the energy industry and maintains an online glossary of terms related to the energy industry.

AGI's Working Definition of Geoscience Occupations

In light of how existing federal data sources define the geosciences, AGI has worked with its stakeholders to establish a working definition for the geoscience profession in order to improve comparability of data across sources and time periods. With this definition, AGI and its partners will be able to capture the depth and breadth of the geoscience profession, clearly define it, and estimate employment trends. The resulting data can then be used in a proposal to federal data agencies to more accurately define the geosciences in federal data sources.

AGI's working definition of the geosciences is as follows:

AGI's Working Definition of Geoscience Occupations

Geoscientist

Subfields: Environmental science, Hydrology, Oceanography, Atmospheric science, Geology, Geophysics, Climate science, Geochemistry, Paleontology

Studies the composition, structure, and other physical aspects of the earth. Includes the study of the chemical, physical and mineralogical composition of soils, analysis of atmosphere phenomenon, and study of the distribution, circulation, and physical and chemical properties of underground and surface waters. May study the earth's internal composition, atmospheres, oceans, and its magnetic, electrical, thermal, and gravitational forces. May utilize knowledge of various scientific disciplines to collect, synthesize, study, report, and take action based on data derived from measurements or observations of air, soil, water, and other resources. May use geological, environmental, physics, and mathematics knowledge in exploration for oil, gas, minerals, or underground water; or in waste disposal, elimination of pollutants/hazards that effect the environment, land reclamation, or management of natural resources.

Geoengineer

Subfield: Environmental

Designs, plans, or performs engineering duties in the development of water supplies and prevention, control, and remediation of environmental hazards utilizing various engineering disciplines. Work may include waste treatment, site remediation, pollution control technology, or the development of water supplies.

Subfield: Exploration

Determines the location and plan the extraction of coal, metallic ores, nonmetallic minerals, and building materials, such as stone and gravel. Work involves conducting preliminary surveys of deposits or undeveloped mines and planning their development; examining deposits or mines to determine whether they can be worked at a profit; making geological and topographical surveys; evolving methods of mining best suited to character, type, and size of deposits; and supervising mining operations. Devises methods to improve oil and gas well production and determine the need for new or modified tool designs. Oversees drilling and offer technical advice to achieve economical and satisfactory progress.

Subfield: Geotechnical

Studies the structural behavior of soil and rocks, perform soil investigations, design structure foundations, and provides field observations of foundation investigation and foundation construction.

Geomanager

Plans, directs, or coordinates activities in such fields as geoengineering and geoscience. Engages in complex analysis of geoscience principles. Generally oversees one or more professionals, but may still be active in technical work.

The "Status of the Geoscience Workforce" Report

The "Status of the Geoscience Workforce" report provides a comprehensive benchmark of the geoscience profession. The report is based on original data collected by the American Geological Institute as well as from existing data from federal data sources, professional membership organizations, and industry data sources. The report synthesizes all available data for the geosciences, from the supply and training of new students, to workforce demographics and employment projections, to trends in geoscience research funding and economic indicators. The report is available as a complete document, as well as on a per chapter basis. It will be available for download from AGI's website: http://www.agiweb.org/.

Report Summary

This 32 page summary provides an in-depth summary of each chapter of the report.

Chapter 1: Trends in Geoscience Education from K-12 through Community College

This chapter examines the student participation in geoscience education at the K-12 level and includes data on state requirements for earth science education in middle and high school, and data pertaining to the number of earth science high school teachers. The chapter also examines trends in college bound students including SAT scores, aspirations for higher education, and choice of college major. Additionally, this chapter examines the availability of geoscience education at community colleges and examines the trends in Associate degrees conferred from geoscience programs at these institutions.

Chapter 2: Trends in Geoscience Education at Four-Year Institutions

This chapter summarizes all available data pertaining to geoscience enrollments, degrees conferred, field camp attendance, and funding of geoscience undergraduate and graduate students. The chapter also explores trends in department size, faculty numbers and research specialties, and funding of geoscience research at the university level.

Chapter 3: Geoscience Employment Sectors

This chapter explores the transition of geoscience graduates into the workforce, age demographics of the industries where geoscientists work, and projected workforce demand. Data pertaining to the current number of jobs and projected number of jobs in 2016 is also provided, as is current salary information for each profession.

Chapter 4: Economic Metrics and Drivers of the Geoscience Pipeline

This chapter provides data on productive activity (number of oil rigs, mines, etc.), commodity pricing and output, gross domestic product, and market capitalization of the industries where geoscientists work.

Appendix A: Defining the Geosciences

This appendix outlines how geoscience occupations and industries are defined in federal data sources. Additionally, the appendix details the working definition proposed by AGI for tracking the geoscience occupation.

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Questions and More Information

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