# EXPLORE Nature Path

## CAREER CATEGORIES

- Agriculture, Farming, Ranching and Forestry
- Environmental Matters - Conservation and Sustainability
- Space
- Sciences (Life, Physical, Social)
- Technology


# EXPLORE Agriculture, Farming, Ranching and Forestry





## CAREER EXAMPLES

### Agriculture

- Farmer
- Agricultural Engineer
- Agricultural and Food Scientist
- Agricultural Science Technician
- Agronomist
- Farm Manager
- Rancher
- Horticulturist
- Agricultural Consultant
- Agricultural Economist
- Agricultural Inspector
- Agricultural Appraiser
- Livestock Inspector
- Agricultural Sales Representative
- Crop Consultant
- Soil and Plant Scientist
- Agricultural Extension Agent
- Agricultural Educator
- Irrigation Manager
- Agricultural Technician
- Agricultural Machinery Operator
- Agricultural Biotechnologist
- Agricultural Journalist
- Farm Laborer
- Fishing and Hunting Workers
- Greenhouse Manager
- Agricultural Economist
- Precision Agriculture Specialist
- Pest Control Technician
- Dairy Farmer
- Poultry Farmer
- Aquaculture Farmer
- Viticulturist
- Entomologist
- Agricultural Policy Analyst
- Agricultural Marketing Specialist
- Agricultural Loan Officer
- Agricultural Supply Sales Representative
- Agricultural Production Manager
- Grain Elevator Operator
- Farm Equipment Mechanic
- Agricultural Researcher
- Agricultural Business Manager
- Community Supported Agriculture

# EXPLORE Agriculture, Farming, Ranching and Forestry

## CAREER EXAMPLES

### Farming

Farmer
Agricultural Technician
Farm Manager
Agricultural Inspector
Crop Consultant
Agricultural Engineer
Agricultural Scientist
Agronomist
Soil and Plant Scientist
Horticulturist
Irrigation Manager
Farm Laborer
Livestock Farmer
Poultry Farmer
Dairy Farmer
Aquaculture Farmer
Agricultural Economist
Precision Agriculture Specialist
Agricultural Extension Agent
Agricultural Educator
Pest Control Technician
Agricultural Machinery Operator
Greenhouse Manager
Viticulturist
Agricultural Biotechnologist
Entomologist
Agricultural Policy Analyst
Agricultural Marketing Specialist
Grain Elevator Operator
Farm Equipment Mechanic
Agricultural Researcher
Agricultural Business Manager
Farm Sales Representative
Agricultural Loan Officer
Farm Supply Sales Representative
Agricultural Production Manager
Organic Farming Specialist
Farm Inspection Officer
Agricultural Chemist
Farm Equipment Salesperson

### Ranching

Ranch Manager
Ranch Hand
Livestock Supervisor
Herdsman
Animal Breeder
Rangeland Manager
Livestock Buyer
Livestock Veterinarian
Range Technician
Livestock Feed Sales Representative
Livestock Nutritionist
Livestock Geneticist
Livestock Auctioneer
Livestock Transporter
Livestock Equipment Operator
Ranch Accountant
Ranch Consultant
Pasture Manager
Grazing Specialist
Cattle Wrangler
Equine Manager
Ranch Appraiser
Ranch Real Estate Agent
Livestock Breeding Technician
Livestock Marketing Specialist
Livestock Insurance Agent
Livestock Farm Equipment Salesperson
Livestock Production Supervisor
Ranch Maintenance Worker
Rodeo Manager
Horse Trainer
Equine Nutritionist
Ranch Foreman
Livestock Fence Builder
Livestock Researcher
Livestock Grader
Ranch Operations Director
Livestock Health and Safety Inspector
Livestock Slaughterhouse Manager
Ranch Financial Analyst





# EXPLORE
# *Agriculture, Farming, Ranching and Forestry*

## CAREER EXAMPLES

### *Forestry*

- Forester
- Forest Ranger
- Park Ranger
- Wildlife Biologist
- Arborist
- Forest Ecologist
- Silviculturist
- Forest Technician
- Forest Engineer
- Fire Prevention Specialist
- Timber Cruiser
- Logging Operations Manager
- Logger
- Forest Products Sales Representative
- Urban Forester
- Park Naturalist
- Forest Inventory Specialist
- Environmental Compliance Inspector
- Forest Economist
- Forest Health Specialist
- Forest Policy Analyst
- Forest Conservationist
- Forest Land Appraiser
- Timber Buyer
- Range Manager
- Soil Conservational and Technician
- Land Stewardship Coordinator
- Forest Carbon Specialist
- Forest Operations Supervisor
- Forest Inventory Analyst
- Forest GIS Specialist
- Forest Inventory Crew Leader
- Forest Products Quality Control Specialist
- Forest Equipment Operator
- Forest Operations Planner
- Forest Education Specialist
- Forest Pathologist
- Forest Nursery Manager
- Forest Resource Information Manager
- Forest Biomass Specialist
- Forest Watershed Manager
- Forest Genetics Researcher
- Forest Inventory Auditor
- Forest Restoration Technician
- Forest Products Manufacturing Supervisor
- Forest Inventory Modeler
- Forest Management
- Conservation Land Managers

# EXPLORE

## Agriculture, Farming, Ranching and Forestry

## CAREER EXPLORATION

Pick 2-3 jobs that interest you from the list of career examples. Write them down.

- ___________________________
- ___________________________
- ___________________________

Where (location) would you need to go to pursue (or get) these jobs?

What are some of the qualifications (for example: skills, degrees, knowledge) you need to have these jobs?

How could you make an impact in the world with these jobs?

# EXPLORE Agriculture, Farming, Ranching and Forestry

## APPLYING GEOGRAPHY

### Agriculture

Agriculture is dependent upon the **site selection of farms**. Geography is used to identify suitable locations for different types of crops based on factors such as soil type, climate, and topography, ensuring optimal growing conditions for specific agricultural products. In addition, an **understanding of soil characteristics** is important. Agricultural professionals use geographic data to understand soil composition, fertility, and drainage patterns, helping them implement appropriate soil management practices and select the right crops for specific soil types. You also have to be able to **analyze climate patterns**. Geography helps in analyzing climate patterns and weather forecasts, enabling farmers to plan planting and harvesting schedules, as well as implement strategies to mitigate the impact of adverse weather conditions on crop production. **Water resource management** is vital. Geographic knowledge is used to assess water availability and quality in agricultural regions, facilitating the implementation of efficient irrigation systems and water management strategies to optimize water usage and conserve resources.

You will want to be able to **map pest and disease prevalence**. Geographic information is utilized to map the prevalence of pests and diseases in specific regions, allowing farmers to implement targeted pest control measures and disease management strategies, reducing crop losses and ensuring better yields.

Agriculture professionals use geographic data to **implement precision farming techniques**, such as GPS-guided equipment and variable rate technology, to optimize the use of inputs, reduce costs, and increase overall farm efficiency.

Geography helps in **managing land use** by providing insights into land productivity and suitability for various crops, enabling farmers to **implement effective crop rotation** strategies and sustainable land management practices.

Geography is important in agriculture to **assess agricultural risk**. Agricultural professionals use geographic knowledge to assess and manage risks associated with natural disasters, climate variability, and market fluctuations, helping them make informed decisions to minimize financial losses and ensure farm sustainability.

Geography plays a role in the **market analysis and supply chain management**. Geography is used to analyze market demand and supply patterns, helping farmers and agricultural businesses make informed decisions about crop selection, production volume, and supply chain logistics to meet consumer demand efficiently.

Geographic information is used to **plan the construction of agricultural infrastructure**, such as irrigation systems, drainage networks, and storage facilities, ensuring the efficient and sustainable use of resources to support agricultural production and distribution.

# EXPLORE
# Agriculture, Farming, Ranching and Forestry


## APPLYING GEOGRAPHY

### Farming and Ranching

Geography is used to **identify suitable locations** for agricultural activities based on factors such as soil quality, climate, and water availability, ensuring optimal conditions for crop cultivation or livestock rearing.

Farmers and ranchers utilize geographic knowledge to **understand the topography** of their land, enabling them to plan the layout of fields and pastures, as well as implement effective erosion control measures on sloped terrains.

Geography helps in **managing water resources** efficiently by understanding natural water sources, such as rivers and aquifers, and planning for irrigation systems and water conservation strategies to ensure adequate water supply for crops and livestock.

Farmers and ranchers use geographic data to **analyze climate patterns and weather forecasts**, helping them make informed decisions about planting schedules, crop selection, and animal husbandry practices to adapt to changing weather conditions.

Geographic knowledge is used to assess land degradation and soil erosion risks, enabling farmers and ranchers to **implement sustainable land management practices**, such as crop rotation, cover cropping, and grazing management, to maintain soil fertility and prevent land degradation.

Ranchers use geographic data to **manage grazing lands** efficiently, ensuring that livestock have access to adequate pasture and water sources throughout different seasons, while also preventing overgrazing and preserving the ecological balance of the rangeland.

Geography helps in **mapping land use and land cover changes over time**, allowing farmers and ranchers to monitor the expansion of agricultural activities, urban development, and changes in natural vegetation, which can inform land management decisions and conservation efforts.

Farmers and ranchers utilize geographic information to **mitigate and assess the risks of natural hazards**, such as floods, wildfires, and droughts, enabling them to develop mitigation strategies and contingency plans to protect crops, livestock, and property from potential disasters.

Geography is used to analyze market demand and transportation networks, helping farmers and ranchers **make informed decisions about agribusiness development**, including crop marketing, livestock distribution, and the establishment of processing and storage facilities.

Geographic data is used to **implement precision farming and ranching techniques**, such as GPS-guided machinery, variable rate technology, and drone technology, to optimize resource use, improve crop yields, and enhance livestock management practices.

# EXPLORE
# Agriculture, Farming, Ranching and Forestry

## APPLYING GEOGRAPHY

### Forestry

Forestry professionals use geographic data to **conduct forest inventories and create detailed maps** of forest resources, including tree species distribution, forest density, and timber volume, to guide sustainable management practices.

Geographic information is used to **assess the biodiversity of forest ecosystems** and identify critical habitats for endangered species, enabling forestry professionals to develop conservation plans and protect sensitive ecological areas.

Geographic knowledge helps in **monitoring forest health** by assessing changes in vegetation cover, **identifying forest disturbances** such as pests, diseases, and wildfires, and implementing timely intervention measures to mitigate their impacts.

Forestry professionals use geographic data to **plan and coordinate forest harvesting activities**, including the identification of suitable logging sites, the calculation of timber volumes, and the implementation of sustainable harvesting practices to minimize environmental impacts.

Geographic knowledge is used to **analyze historical land-use changes**, including deforestation, urbanization, and agricultural expansion, providing insights into the drivers of deforestation and the impact of land-use changes on forest ecosystems.


Forestry professionals use geographic information to **manage protected forest areas**, such as national parks and nature reserves, by delineating boundaries, enforcing regulations, and monitoring illegal activities to preserve biodiversity and ecological integrity.

Geographic data is utilized to **identify suitable areas for reforestation and afforestation projects**, considering factors such as soil quality, climate conditions, and biodiversity goals to promote sustainable forest regeneration and carbon sequestration.

Geographic knowledge helps in **assessing forest carbon stocks** and monitoring carbon sequestration rates, aiding in the implementation of forest management strategies that contribute to climate change mitigation and the reduction of greenhouse gas emissions.

Forestry professionals use geographic data to **evaluate the ecosystem services** provided by forests, such as water regulation, soil protection, and biodiversity conservation, helping to quantify the economic and ecological value of these services for sustainable forest management.

Geographic knowledge is used to **engage and collaborate with local communities, indigenous groups, and other stakeholders** in forest management, facilitating participatory decision-making processes and promoting sustainable forest practices that align with local needs and priorities.

# EXPERIENCE
# Agriculture, Farming, Ranching and Forestry

## MEET THE GEOGRAPHERS

### Agriculture

"Geography and the effects it has on Agricultural Banking from the perspective of a loan officer lending money to farmers --

Production Standpoint:

Agriculture Lending or also known as Ag banking is commonly **affected by the geographical area in which the farm operation is located.** Ag banking is based on production of a tillable acre or production of the animals being raised dependent on if the farm is a crop or livestock operation or in some cases, both. To use corn and soybeans for example, land located in south central Minnesota is highly productive with average yields often being in the 200 bushel per acre range for corn and 60 bushel per acre for soybeans. As you go farther south in northern Iowa, you will see more yields in the range of 220 bushel per acre for corn and 65 bushels for soybeans. As you travel north towards the central part of Minnesota, corn yields will drop to an average of 180 bushel per acre and 55-bushel soybeans. **All these factors are due to the geographical location which influences the number of growing degree units (GDU's) as well as soil type and frost dates.** The question is, what does this have to do with Ag Lending as well as being a loan officer in the agriculture sector? Lending to a corn and soybean producer is primarily based on their Average production history (APH). This means that the amount a bank is willing to lend a farmer for an Operating note, also know as a Line of Credit (LOC) will be dependent on their APH. As mentioned above, a farmer in northern Iowa will raise 40 more bushel of corn and 10 more bushel of soybeans on average than a farmer in central Minnesota. If the price of corn is $4.00/bushel and the price of soybeans is $12.00/bushel, this would mean the farmer in Northern Iowa could receive $200 more per acre on his LOC per acre for corn and $120 more per acre for soybeans. This may not seem like a lot, but when a farmer is raising 500 acres of soybeans and 500 acres of corn, that's an additional $160,000 of credit for operating expenses. The current cost per care to raise an acre of corn is roughly $875-$900 per acre and $575-$600 for soybeans. The job as a loan officer is to make sure the bank gets paid back for the money they lend to an operation. **The amount of money that a farmer qualifies for is extremely dependent on their geographical location and production of the land in which they farm.**

Brent Meshke
Vice President &
Agricultural Lender
MinnStar Bank
Minnesota

Land values:

Land Values are extremely dependent on the geographical location in which they are located. **Factors that go into the value of land include soil type, elevation, proximity to tile outlets for drainage, as well as overall production.** Land values will fluctuate upwards of $4,000 to $5,000 over the span of 10 years solely due to commodity prices, but the factors listed above still come into play. Lending money to someone purchasing a farm is based on an appraisal of that land and where it is "geographically" located as that often is reflected in soil type and future tile outlets if there is not already tile in the farm. If a parcel of land does not have productive soil types or is quite sandy and not suitable to be a highly productive parcel, it will be appraised for less which in turns reduces the overall value of that parcel. If that parcel is sold at a high price, but appraised at a low price, it then causes the buyer to put more cash down on the purchase price. The geographical location alters the values of the land and in turn alters the lending amount that a loan officer can comfortably loan a buyer to ensure timely pay back of that loan."

"Appraisal is estimating what a property is worth such as farms, ranches, orchids, ag business like seed mills, slaughterhouses, even veterinarian pharmaceutical business. I also have my drone license (UAS or UAV) so I've started flying over fields and doing crop analysis using multispectral analysis. Say I'm going to go out and appraise a farm I will do research about where I'm going -- get aerial photos, get tax maps (which are what municipal government entities use to determine boundaries of property that they are going to assess property taxes on), get information from the local assessor (the person who estimates how much that property is worth for tax purposes), talk to the owner. Then get all my gear together (clipboard, cameras, cell phone, lasers to measure) head out to the property and compile all that information. Then compare that property to sales of similar properties. The way that value is perceived in the market is basked upon economics and location."

Christopher Anderson
Agricultural Appraiser
Central New York State
Link to Interview

# EXPERIENCE

# Agriculture, Farming, Ranching and Forestry

Powerful Geography

## MEET THE GEOGRAPHERS

### Farming and Ranching

"When you're farming, you are at the mercy of Mother Nature. **First comes soil types.** The type of soil determines 1) whether you can farm or not, and 2) what you can farm. Here in southern Minnesota we have a clay loamy soil (mixture of sand, silt, and clay) with thick topsoil formed in tall grass prairies from glacial till. The moist soil is very productive for agriculture, especially corn and soybeans - the crops we have grown for generations. **Secondly, you have to understand seasons.** In Minnesota, freezing temperatures and snow can start as early as the end of October and last all the way into April, so we have to make sure to plant seeds when the possibility of freeze has past, usually starting end of April with a plan to start harvesting by the end of September into October, with the goal to be done by November. At this point, the pillage work begins, if Mother Nature allows. In Minnesota, we typically plant a 95-110-day seed variety. **The health and yield of the crop is also contingent upon the amount of rainfall (or lack thereof) we receive throughout the growing season.** Last year (2023), right after we planted, we had 11-inches of rain - drowning them out - causing us to have to replant. This event was followed by a drought during the summer, which ultimately led to stunted growth and our lowest recorded yield in recent years. Many farmers take out crop insurance for these reasons, as an attempt to try to at least break even financially for the year. After harvest, we have to dry the corn down to 13% moisture, which costs money and time. The moisture levels usually start anywhere between 15% (if they were able to stay out in nature) to 30% (if precipitation came early). In our area, a good yield for corn is 200-230 bushels per acre, while a good yield for soybeans is 65 bushels per acre. in 2023, we only yielded 155 bushels of corn and 55 bushels of soybeans.

A farmer's job does not stop in the field, but continues after harvest with the **economic side of farming**, dealing with the storage, transportation and sell of the crop. Some farmers have silos or bins on their property to store their harvested crop, but some farmers rely on 'elevators' to store their crop. Therefore, a farmer must consider transportation and storage costs based upon the number of bushels they have. When a farmer goes to sell the crop, the cost that they can sell it at varies daily upon numerous worldwide factors. At this time (April 4, 2024) corn is $4.3275 per bushel. In April 2022 it was double at $8.14 per bushel. This is due to factors such as the disruption of corn production and shipping from Ukraine, who are the world's fourth largest corn exporter. In 1960 corn sold for $1.10 per bushel. Soybeans have ranged from $8.00 in 2020 to a high of $17.00 in April 2022 back down to $11.00 today, as the US competes with Brazil and Argentina for soybean production and exports.

We also used to raise livestock, including pigs, cows, and up until 2023, sheep. Raising sheep required lots of work as well, especially during lambing season, typically the month of February (the birthing time). The ewes (female sheep) would give birth to 2, 3, or even 4 lambs at a time, putting the number to over 300 sheep. All of them had to be kept inside heated barns or the lambs would freeze because of the weather outside. So you have to make sure to have space! Ultimately, lambs are mostly raised for consumption and sold once they reach the weight of 135 pounds. Unfortunately, wool has little to no value in today's market. One of geography's role in raising livestock, is in terms of transportation to processing plants. As of 2023, there are only three major packing facilities in the United States (California, Colorado, Michigan). Therefore, we would have to drive 2-hours west to a collection point where the sheep would be loaded and trucked to Colorado."

Royce and Sharon Doering
Farmers
Southern Minnesota

"Accelerated climate change is a global challenge that is increasingly putting pressure on the sustainability of livestock production systems that heavily depend on rangeland ecosystems. Rangeland management practices have low potential to sequester greenhouse gases. However, mismanagement of rangelands and their conversion into ex-urban, urban, and industrial landscapes can significantly exacerbate the climate change process. Under conditions of more droughts, heat waves, and other extreme weather events, management of risks (climate, biological, financial, political) will probably be more important to the sustainability of ranching than capability to expand output of livestock products in response to rising demand due to population growth. Replacing traditional domestic livestock with a combination of highly adapted livestock and game animals valued for both hunting and meat may be the best strategy on many arid rangelands. Eventually, traditional ranching could become financially unsound across large areas if climate change is not adequately addressed. Rangeland policy, management, and research will need to be heavily focused on the climate change problem."

- Jerry L. Holecheck, Hatim E. Geli, Andres F. Cibils, & Mohammed N. Sawalhah (2020). Climate change, rangelands, and sustainability of ranching in the western United States. Sustainability 12(12). Link to Article.

# EXPERIENCE
# Agriculture, Farming, Ranching and Forestry

## MEET THE GEOGRAPHERS

### Forestry, Peatlands, and Other Land Conservation

"Performing land use change detection is an important tool to understand the extent of land cover loss and gain over time. Understanding the characteristics, extent and pattern of land use land cover change (LULCC) is an important supporting tool for decision making processes. Detecting land use change over time has become increasingly important consideration for environmental management. [...] Forest plays an important role in climate regulation and carbon sequestration. Komto Forest is one of the remnant natural forests found in Guto Gida district of East Wollega zone, Ethiopia, has been supporting the local community for construction, energy and household furniture. Currently, influenced by land use land cover change (LULCC), this forest has been declining at an alarming rate. Detecting LULCC and understanding the driving forces has important for supporting decision making processes. [...] The LULCC detection results show that a dramatic increase of agricultural land from (24.78%) in 1991 to (33.5%) in 2019 with annual expansion rate (23.68%) per annum, where forest cover declined by 20.1% in 1991 and 37.38% in 2019 with annual decreasing rate of 4.18% per annum. Our finding indicates the increment of agricultural land, grassland, and settlement, while the dense and open forest cover shows a declining trend. The declining of forest coverage is likely to cause unpleasant environment and affects human wellbeing. [...] The massive declined in forest cover change are often associated with agricultural expansion in the periphery of the forest. Timber exploitation and charcoal production are other problems that contribute for the declining of forest coverage. This study used the combination of GIS (geographic information systems) and RS (remote sensing) technologies to detect a spatio-temporal dynamics of Komto Protected Forest Priority Area, Guto Gida district, East Wollega Zone, Oromia National Regional State, Ethiopia. Likewise, focused group discussions, key informant interviews, and household questionnaire survey were used for qualitative information about the land use change of the study area. The qualitative information collected [...] was integrated with GIS and RS results for spatio-temporal forest cover change analysis."

- Milkessa Dangia Megassa, Demissie Tsega Mallie & Dessalegn Obsi Gemeda (2020). Forest cover change detection using Geographic Information Systems and remote sensing techniques: A spatio-temporale study on Komto Protected forest priority area, East Wollega Zone, Ethiopia. Environmental Systems Research, 9(1). Link to Article.

"During the breeding seasons (April to end of July) we're surveying birds and there's different ways of doing that depending on the birds habitat [...]. We're doing a lot of peatland restoration. So the north of Scotland peatlands, where we are, quite a lot of them got planted with invasive conifers, it was a tax break thing, so a lot of our work is about trying to remove the trees and restore the peatlands because the habitats a really important carbon store when it's not damaged. Also the birds and other wildlife that live there are quite rare in the UK, so we need to restore the habitat so that they can come back. So we do things like monitoring the water levels, doing vegetation surveys to see if the plant species are coming back, and looking at the insects because its all very much about all nature and the whole ecosystem. So we need to get the water levels back, we need to get the invertebrates back, and the plants, so that all the other species can come back. The birds aren't going to come back if we don't sort everything else out. Then in the non-bird breeding season (from August to Feburary) thats when we do the practical management work. [...] We use a lot of GIS mapping, we use drones for aerial imagery, we have used drones for aerial mapping as well. Just very much about using technology to help us monitor these large landscape scale projects. [...] In terms of hydrological restoration, some of that is about blocking old forestry drains to retain the water on site and rewet the peatlands. [...] There are a variety of different treatments that we can carry out to try and restore these forested areas back to something that is near natural. We need to look at long-term vision, because these trees were planted in the 1960s and 70s, but its going to take tens to hundreds of years to restore and it will go back to performing like it used to but it won't ever be exactly like it used to before the trees."

Paul and Claire Turner
Nature Wardens
Royal Society for the Protection of Birds,
Forsinard Flows Nature Reserve,
Northern Scotland
Link to Interview

# EXPERIENCE

## Agriculture, Farming, Ranching and Forestry

# FIND LOCAL GEOGRAPHERS

*INSTRUCTIONS* CONDUCT AN ONLINE SEARCH TO FIND LOCAL INDIVIDUALS WHO DO THE JOB YOU ARE INTERESTED IN.

WRITE DOWN THEIR NAME, JOB TITLE, AND USE THE LINES TO WRITE DOWN WHAT THEY DO

Name: ____________________________

Job Title: __________________________

Name: ____________________________

Job Title: __________________________

*EXTENSION* IF POSSIBLE, TRY AND INTERVIEW THE PERSON AND ASK THEM HOW THEY USE GEOGRAPHY! WRITE YOUR FINDINGS IN THE OPEN SPACES

# EXPAND
# Agriculture, Farming, Ranching and Forestry

## TAKE IT GLOBAL
FIND EXAMPLES OF THESE CAREERS IN DIFFERENT REGIONS

### Agriculture

| | |
|---|---|
| **Latin America and Caribbean** | **Europe** |
| **Middle East and North Africa** | **Sub-Saharan Africa** |
| **Central Asia and Russia** | **East Asia** |
| **South Asia** | **Oceania** |

# EXPAND
# Agriculture, Farming, Ranching and Forestry

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## TAKE IT GLOBAL
FIND EXAMPLES OF THESE CAREERS IN DIFFERENT REGIONS

### Farming and Ranching

| | |
|---|---|
| **Latin America and Caribbean** | **Europe** |
| **Middle East and North Africa** | **Sub-Saharan Africa** |
| **Central Asia and Russia** | **East Asia** |
| **South Asia** | **Oceania** |

# EXPAND

# Agriculture, Farming, Ranching and Forestry

______________________

## TAKE IT GLOBAL

FIND EXAMPLES OF THESE CAREERS IN DIFFERENT REGIONS

### Forestry

| | |
|---|---|
| **Latin America and Caribbean** | **Europe** |
| **Middle East and North Africa** | **Sub-Saharan Africa** |
| **Central Asia and Russia** | **East Asia** |
| **South Asia** | **Oceania** |

# EXPAND
# Agriculture, Farming, Ranching and Forestry

Agriculture

## MAKING CONNECTIONS

HOW IS THIS CAREER IMPACTED BY THESE THEMES?
HOW DOES THIS CAREER IMPACT THESE THEMES?

| | |
|---|---|
| **Physical Geography** | **Human Geography** |
| **Places and Region** | **Environment and Society** |

# EXPAND
# Agriculture, Farming, Ranching and Forestry

## MAKING CONNECTIONS

HOW IS THIS CAREER IMPACTED BY THESE THEMES?
HOW DOES THIS CAREER IMPACT THESE THEMES?

### Farming and Ranching

| Physical Geography | Human Geography |
| --- | --- |
| | |
| **Places and Region** | **Environment and Society** |
| | |

# EXPAND

# Agriculture, Farming, Ranching and Forestry

Forestry

## MAKING CONNECTIONS

HOW IS THIS CAREER IMPACTED BY THESE THEMES?
HOW DOES THIS CAREER IMPACT THESE THEMES?

| Physical Geography | Human Geography |
| --- | --- |
| | |
| **Places and Region** | **Environment and Society** |
| | |

Powerful Geography

# EXPLORE *Environmental Matters*




## CAREER EXAMPLES

### *Environmental Matters*

- Environmental Scientist and Geographer
- Conservation Scientist
- Wildlife Biologist
- Forester
- Ecologist
- Environmental Engineer
- Sustainability Analyst
- Environmental Compliance Officer
- Environmental Policy Analyst
- Environmental Lawyer
- Environmental Educator
- Climate Change Analyst
- Renewable Energy Specialist
- Water Resource Specialist
- Environmental Health and Safety Specialist
- Environmental Consultant
- Waste Management Officer
- Recycling Coordinator
- Sustainability Manager
- Green Building Architect
- Urban Planner
- Land Conservation Specialist
- Environmental Economist
- Environmental Health Inspector
- Sustainable Agriculture Specialist
- Marine Biologist
- Environmental Impact Assessment Specialist
- Environmental Health Researcher
- Wildlife Conservationist
- Natural Resource Manager
- Environmental Technician
- Environmental Campaigner
- Environmental Inspector
- Pollution Analyst
- Biodiversity Specialist
- Green Energy Entrepreneur
- Sustainable Development Coordinator
- Environmental Restoration Planner
- Renewable Energy Engineer
- Climate Adaptation Planner
- Environmental Data Analyst
- Environmental Justice Advocate
- Green Careers
- Greenhouse Gas Reduction Specialists
- Environmental Remediation
- Electric Vehicle Researcher

# EXPLORE
## Environmental Matters

## CAREER EXPLORATION

Pick 2-3 jobs that interest you from the list of career examples. Write them down.

- ______________________
- ______________________
- ______________________

Where (location) would you need to go to pursue (or get) these jobs?

What are some of the qualifications (for example: skills, degrees, knowledge) you need to have these jobs?

How could you make an impact in the world with these jobs?

Powerful Geography

# EXPLORE *Environmental Matters*



## APPLYING GEOGRAPHY

### *Environmental Matters*

**Identifying and preserving biodiversity hotspots-** Geographic data helps in identifying regions with high biodiversity value, enabling conservationists to prioritize these areas for protection and implement conservation measures to preserve the rich variety of species and ecosystems.

Geographic knowledge is used to **map and monitor various ecosystems**, such as forests, wetlands, and coral reefs, allowing environmental professionals to track changes over time, assess the health of ecosystems, and identify threats to their sustainability.

Geographic information is used to **plan the establishment and management of protected areas, national parks, and nature reserves**, ensuring the conservation of critical habitats and the promotion of sustainable use of natural resources within these designated areas.

Geographic data is used to **assess environmental risks**, such as pollution, habitat loss, and climate change impacts, enabling professionals to **develop strategies and policies for mitigating these risks** and promoting sustainable environmental practices.

Geographic knowledge helps in **analyzing changes in land use and land cover**, such as deforestation, urbanization, and agricultural expansion, providing insights into the drivers of these changes and guiding efforts to promote sustainable land management and conservation practices.

Geographic data is used to **support the management of natural resources**, such as water, forests, and minerals, facilitating the sustainable use of these resources while minimizing negative environmental impacts and promoting long-term sustainability.

Geographic knowledge is used to **study the impacts of climate change** on various ecosystems and communities, helping professionals understand the spatial patterns of climate-related phenomena and develop adaptation and mitigation strategies to address the challenges posed by global environmental changes.

Geographic information is used to **support sustainable development initiatives**, guiding the planning and implementation of projects that balance economic growth with environmental conservation, social equity, and long-term sustainability.

**Engaging in environmental advocacy and education-** Geographic knowledge is used to raise awareness about environmental issues and advocate for sustainable practices, empowering communities and policymakers to make informed decisions that support environmental conservation and sustainability.

Geographic knowledge is utilized to **facilitate collaboration and engagement with diverse stakeholders and communities**, fostering participatory decision-making processes that promote the shared responsibility for environmental conservation and sustainability at local, regional, and global levels.

# EXPERIENCE *Environmental Matters*

## MEET THE GEOGRAPHERS

### *Environmental Matters*

"The geographies of environmental justice are multifaceted. [...] Research in this area has long examined racial inequality through distributive justice, the spatiality of environmental hazards, and the statistical prevalence of such hazards in marginalized communities. [...] This article contributes to geographies of environmental justice by advancing a critical analysis of Indigenous water access on a settler frontier. Anishinaabek scholar Deborah McGregor's discussion of mino-mnaamodzawin, the ability to live well, informs my approach. Drawing from Anishinaabek intellectual traditions, McGregor argued that Indigenous environmental justice must attend to the ability of peoples to maintain their responsibilities to one another, land, and other-than-human entities through relational practices. Water and land dispossessions disrupt Indigenous systems of relations and responsibilities and thus undermine the ability to live well. Mino-mnaamodzawin is specific to Anishinaabek peoples, yet resonates with many Indigenous conceptions of living well in Latin America, often translated as vivir bien in Spanish but specifically named and practiced in myriad ways. Enxet and Sanapaná interlocutors expressed similar sentiments when equating the ability to drink 'good' water with the statements like 'roikose porã'—literally, we want to live well. In the Chaco, living well requires access to clean water that sustains life rather than undermining it as a harbinger of illness and epistemic violence. [...] Settler colonialism is a geographic process, a form of social-spatial and ecological relations that perpetuate environmental racism. [...] CPG (critical physical geography) is an integrative field that bridges physical and human geography to provide new avenues for inquiry. Emerging from efforts to investigate relationships between the practice of environmental science and political economy [...]."
- Joel R. Correia (2022). Between flood and drought: Environmental racism, settler waterscapes, and Indigenous water justice in South America's Chaco. Annals of the American Association of Geographers, 112(7), 1890-1910.

"Biodynamic winemaking. It sounds idyllic. A farming style that celebrates and encourages the vines growing amongst their natural cousins: herbs and flowers and grasses and even what we often call 'weeds'. It conjures up images of a secret garden, one that existed millennia before 80's hairstyles ever poked a hole in the ozone and mechanized factory farming became the norm. Biodynamic winemakers approach every step of the process differently. They encourage local insects, honey bees, and snails to thrive and contribute to the biome—preventing single super-predators from taking over as is often the case when the land is stripped down to a single crop. They forgo the conveniences of mechanization as well. In Sierra de Gredos (mountain range in Spain), Marc Isart of Bernabeleva is growing in plots that aren't accessible by machinery—for tilling the land he uses a local mule—important because it keeps the chemical residues a tractor would give off away from the vines. They follow the lunar cycle, which makes sense when you think of the incredible forces the moon places on our oceans—raising and lowering the tides. It's a call back to old-fashioned farming straight out of the Almanac. The cycles dictate when to prune and when to harvest—a vibe that's more than just a vibe. It all sounds so complicated...but is it? There's something reassuring about every decision coming down to a simple question: 'how can I help the earth make the healthiest grapes?'"
- Bio-curious: Biodynamic winemaking. Barcelona Wine Bar. Link to Blog.

"I just got a new job at a local Conservation District Palouse Conservation District as the Education and Outreach Manager (more localized focus and has a specified Geography vs the international conservation org). This new position is similar to what I was doing at The Peregrine Fund as the Assistant Director of the Education Program with a lot of informal science education related to habitats, species conservation, and how people interact with the environment. Geography was a very large part of the job for me at The Peregrine Fund, with teaching about different conservation programs all over the world and addressing the landscape-level threats to species in different Geographies and what people are doing to combat the threats or work in their backyards to prevent them. My studies in Graduate School with a Human-Environment interaction focus provided me with the foundation to think critically about Geography and helped provide the resources I needed to inspire people to value nature and their role in preserving it."

Alicia Leacox
Education and Outreach
Idaho // Washington

# EXPERIENCE
## Environmental Matters

## FIND LOCAL GEOGRAPHERS

*INSTRUCTIONS* CONDUCT AN ONLINE SEARCH TO FIND LOCAL INDIVIDUALS WHO DO THE JOB YOU ARE INTERESTED IN.

WRITE DOWN THEIR NAME, JOB TITLE, AND USE THE LINES TO WRITE DOWN WHAT THEY DO

Name: ____________________________

Job Title: __________________________

Name: ____________________________

Job Title: __________________________

*EXTENSION* IF POSSIBLE, TRY AND INTERVIEW THE PERSON AND ASK THEM HOW THEY USE GEOGRAPHY! WRITE YOUR FINDINGS IN THE OPEN SPACES

# EXPAND
# Environmental Matters

TAKE IT GLOBAL

FIND EXAMPLES OF THESE CAREERS IN DIFFERENT REGIONS

Environmental Matters

| | |
|---|---|
| **Latin America and Caribbean** | **Europe** |
| **Middle East and North Africa** | **Sub-Saharan Africa** |
| **Central Asia and Russia** | **East Asia** |
| **South Asia** | **Oceania** |

# EXPAND Environmental Matters

## MAKING CONNECTIONS

HOW IS THIS CAREER IMPACTED BY THESE THEMES?
HOW DOES THIS CAREER IMPACT THESE THEMES?

Environmental Matters

| Physical Geography | Human Geography |
| --- | --- |
| Places and Region | Environment and Society |

Powerful Geography

# EXPLORE *Space*

## CAREER EXAMPLES

### *Space*




- Astronaut
- Aerospace Engineer
- Physicist
- Spacecraft Designer
- Mission Control Specialist
- Rocket Scientist
- Planetary GIS Data Specialist
- Astrodynamics Engineer
- Satellite Systems Engineer
- Space Systems Analyst
- Space Operations Manager
- Payload Specialist
- Geodesy and Geophysical Modeler
- Spacecraft Propulsion Engineer
- Spacecraft Navigation Engineer
- Ground Systems Engineer
- Spacecraft Software Engineer
- Space Mission Planner
- Microbiologist
- Water, Energy, and Carbon Cycle Scientist
- Astronomer
- Planetary Scientist
- Remote Sensing Specialist
- Space Weather Analyst
- Satellite Communications Technician
- Space Policy Analyst
- Space Tourism Guide
- Space Debris Analyst
- Space Industry Journalist
- Extravehicular Activity (EVA) Technician
- Space Robotics Engineer
- Space Station Technician
- Satellite Data Analyst
- Space Architect
- Space Biologist
- Space Economist
- Space Resource Miner
- Space Manufacturing Technician
- Space Communications Specialist
- Space Environmental Engineer
- Space Ethicist
- Space Psychologist
- Space Artist

# EXPLORE *Space*

## CAREER EXPLORATION

Pick 2-3 jobs that interest you from the list of career examples. Write them down.

- ○ ______________________
- ○ ______________________
- ○ ______________________

Where (location) would you need to go to pursue (or get) these jobs?

What are some of the qualifications (for example: skills, degrees, knowledge) you need to have these jobs?

How could you make an impact in the world with these jobs?

# EXPLORE *Space*

## APPLYING GEOGRAPHY

### *Space*

Geographical data is used in **space mission planning** to analyze launch site locations, assess orbital trajectories, and coordinate space missions that consider geographical factors such as topography, weather patterns, and magnetic fields.

Geography is applied in **satellite communication** to understand global communication networks, assess regional coverage areas, and optimize satellite placement and coverage to ensure efficient and reliable communication services worldwide.

Geographical knowledge is utilized in **remote sensing and earth observation** to analyze geographical data, monitor environmental changes, and study land surface patterns from space to support various applications such as environmental monitoring, disaster management, and urban planning.
**Geographical analysis** supports the processing and interpretation of **geospatial data** acquired from space missions, enabling the development of geographic information systems (GIS) and satellite-based mapping tools that provide valuable insights into geographical patterns and earth surface dynamics.

Geography is employed in **planetary exploration** to study celestial bodies, analyze planetary landscapes, and assess geological formations to support space missions that aim to understand the geographical composition and surface characteristics of planets, moons, and asteroids.

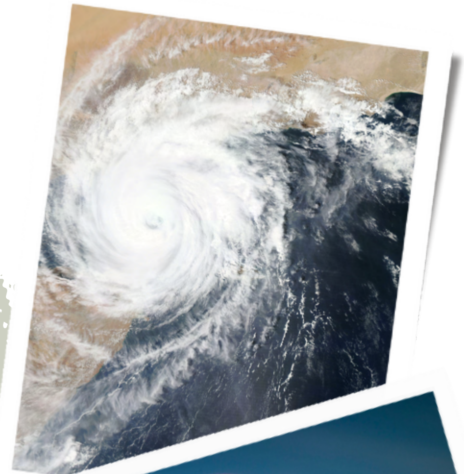
Geography aids in **space weather forecasting** by monitoring solar activities, assessing geomagnetic interactions, and predicting space weather events to protect space missions, satellites, and astronaut activities from potential space weather hazards.

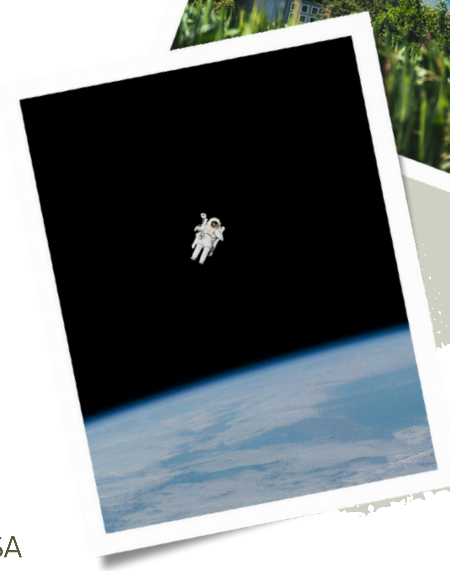
Geographical data is used in **astronomical research** to map celestial objects, analyze cosmic phenomena, and study astronomical events from space observatories to advance the understanding of the universe and its geographical features.

Geography supports **space-based navigation** systems by providing accurate positioning data, understanding global navigation networks, and developing satellite-based navigation technologies that enable precise and reliable navigation services for space missions and global positioning applications.

Geography is applied in **space policy and law** to understand international space regulations, assess global space treaties, and develop space governance frameworks that address geographical considerations, space resource management, and satellite communication rights among different nations.

Geographical knowledge aids in **space tourism planning** by assessing potential launch sites, understanding orbital trajectories, and developing space tourism programs that consider geographical safety parameters and provide unique space travel experiences for commercial space tourists.





# EXPERIENCE *Space*

# MEET THE GEOGRAPHERS

## *Space*

"The cultural, legal, budgetary, infrastructural, and logistical processes through which the contemporary space race unfolds have measurable environmental footprints on Earth and in outer space. The question of where these footprints fall is arbitrated by larger questions of geopolitical power and vulnerability, which means that human engagement with outer space is also a question of environmental justice. On Earth, environmental (in)justice unfolds on multiple scales: local and stratospheric emissions from space launches, the placement of outer space related infrastructure in so-called peripheral places, and the role of power in determining whether the use of such infrastructure aids socio-environmentally constructive or destructive practices. Beyond Earth, the environmental geopolitics are likewise multiscalar, manifesting in contemporary pollution issues such as orbital debris and conservation debates such as planetary protection protocols. The environmental geopolitics of Earth and outer space are inextricably linked by the spatial politics of privilege and the imposition of sacrifice – among people, places, and institutions."

- Julie Michelle Klinger (2021). Environmental geopolitics and outer space. Geopolitics, 26(3), 666-703. Link to Article.

"Analysis of space begins with geography, with accurate mappings of locations and spatial relations. First, space expansionists err in characterizing the size of the Earth's atmosphere. The space parts of the planet Earth are practically very small. Labeling anything associated with outer space small is strongly counterintuitive because cosmic outer space is so unfathomably large. [...] Thinking accurately about the geography of the planet strongly confounds the claim that expansion into space has reduced the closure produced by the expansion of machine civilization within the finite confines of the terrestrial Earth. Space activities are bringing parts of the Earth into much closer interaction rather than reducing their interaction through spatial expansion. [...] Until human activities significantly expand into the outer realms of Earth space and then into the solar system, further activities in the astrophere will intensify, not reduce closure. Recognizing these geographical features of the Earth and its space also undercuts the pervasive space expansionist analogy that space is an ocean."

- Daniel Deudney (2020). Dark Skies: Space expansionism, planetary geopolitics, and the ends of humanity. Oxford University Press, New York: NY.

"I can think I have a good grasp of procedural geographic knowledge which helps in my current job, the knowledge of the climate of a region for example. We work with spatial data and massive amounts of satellite imagery on a regular basis, so having a thorough understanding of these kinds of data is critical to what we're doing on the job. I rely on Landsat data, but for six months out of the year, you don't get a single scene where you can see the landscape because of the monsoons. At Descartes, it's been much easier because we have all of the radar data from the European Space Agency on their Sentinel-1 satellite. Radar data can be difficult to work with, but in regions like the monsoonal tropics, it's the only way you're going to get data throughout the whole year. Having that knowledge of where you're actually studying and understanding those climatic impacts is crucial."

Caitlin Kontgis, PhD
Applied Scientist Lead (Solutions)
Descartes Labs

# EXPERIENCE *Space*

# FIND LOCAL GEOGRAPHERS

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WRITE DOWN THEIR NAME, JOB TITLE, AND USE THE LINES TO WRITE DOWN WHAT THEY DO

Name: ____________________________

Job Title: __________________________

Name: ____________________________

Job Title: __________________________

*EXTENSION* IF POSSIBLE, TRY AND INTERVIEW THE PERSON AND ASK THEM HOW THEY USE GEOGRAPHY! WRITE YOUR FINDINGS IN THE OPEN SPACES

# EXPAND
## Space

# TAKE IT GLOBAL
FIND EXAMPLES OF THESE CAREERS IN DIFFERENT REGIONS

Space

| | |
|---|---|
| **Latin America and Caribbean** | **Europe** |
| **Middle East and North Africa** | **Sub-Saharan Africa** |
| **Central Asia and Russia** | **East Asia** |
| **South Asia** | **Oceania** |

# EXPAND
## *Space*

# MAKING CONNECTIONS

HOW IS THIS CAREER IMPACTED BY THESE THEMES?
HOW DOES THIS CAREER IMPACT THESE THEMES?

*Space*

| | |
|---|---|
| **Physical Geography** | **Human Geography** |
| **Places and Region** | **Environment and Society** |

# EXPLORE Sciences

## CAREER EXAMPLES

### Life Science

- Biologist
- Zoologist
- Botanist
- Microbiologist
- Biochemist
- Geneticist
- Ecologist
- Marine Biologist
- Molecular Biologist
- Biostatistician
- Physiologist
- Entomologist
- Immunologist
- Biophysicist
- Neuroscientist
- Cell Biologist
- Pathologist
- Pharmacologist
- Virologist
- Paleontologist
- Epidemiologist
- Environmental Scientist
- Bioinformatician
- Biomedical Engineer
- Biotechnologist
- Horticulturist
- Mycologist
- Immunogeneticist
- Proteomics Scientist
- Genomics Researcher

### Earth/ Physical Science

- Physicist
- Chemist
- Materials Scientist
- Geologist
- Meteorologist
- Seismologist
- Oceanographer
- Astronomer
- Geochemist
- Geophysicist
- Volcanologist
- Climatologist
- Hydrologist
- Geomorphologist
- Nuclear Physicist
- Analytical Chemist
- Physical Chemist
- Planetary Scientist
- Atmospheric Scientist
- Petrologist
- Mineralogist
- Paleontologist
- Cosmologist
- Nuclear Technician
- Space Scientist
- Radiologist
- Environmental Scientist
- Optical Scientist
- Spectroscopist
- Geoscientist
- Glaciologist
- Energy Scientist
- Fluid Dynamicist
- Biophysicist
- Computational Physicist
- Crystallographer
- Field Geologist
- Planetary Geologist
- Environmental Health Scientist
- MRI Technologist
- Planetary GIS Data Specialist

### Social Science

- Sociologist
- Anthropologist
- Psychologist
- Economist
- Political Scientist
- Historian
- Geographer
- Archaeologist
- Criminologist
- Social Worker
- Urban Planner
- Demographer
- Policy Analyst
- Survey Researcher
- Market Research Analyst

# EXPLORE *Sciences*

## CAREER EXPLORATION

Pick 2-3 jobs that interest you from the list of career examples. Write them down.

- ○ ______________________________
- ○ ______________________________
- ○ ______________________________

Where (location) would you need to go to pursue (or get) these jobs?

What are some of the qualifications (for example: skills, degrees, knowledge) you need to have these jobs?

How could you make an impact in the world with these jobs?

# EXPLORE *Sciences*

## APPLYING GEOGRAPHY

### *Life Science*

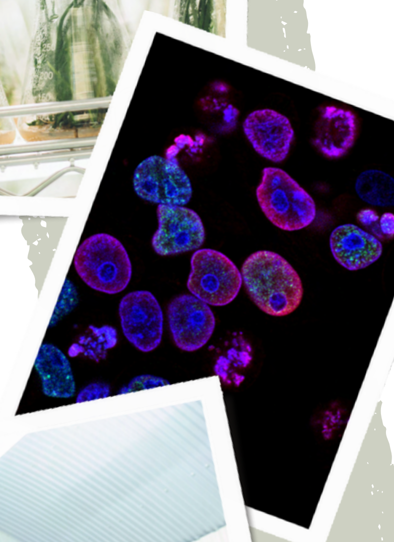
**Biogeographical studies-** Life scientists use geographic knowledge to study the distribution of species and ecosystems, helping them understand how geographical factors influence the evolution and diversity of life forms in different regions.

They utilize geographic information to **assess habitats and identify key areas for conservation**, focusing on protecting critical habitats and biodiversity hotspots to ensure the preservation of natural ecosystems.

Geographic knowledge helps in **understanding the spatial distribution of species' ecological niches**, aiding in the identification of the environmental factors that shape species' adaptations and their roles within their respective ecosystems.

Life scientists use geographic data to **monitor the status of natural resources** such as water bodies, forests, and wildlife populations, helping them **develop sustainable management strategies** to preserve these resources for future generations.

Geographic information aids in **tracking the migration and dispersal patterns** of various species, enabling life scientists to understand the factors influencing these movements and the implications for species conservation and ecosystem dynamics.



They utilize geographic knowledge to **assess the impact of environmental changes**, such as deforestation, climate change, and habitat fragmentation, on biodiversity and ecosystem functioning, guiding efforts to mitigate these impacts and promote ecological resilience.

Life scientists use geographic data to **map and model complex ecosystems**, enabling them to visualize the interactions between different species, environmental factors, and ecological processes, facilitating a comprehensive understanding of ecosystem dynamics.

**Evaluating ecosystem services-** Geographic knowledge is used to assess the various services that ecosystems provide, such as pollination, water purification, and carbon sequestration, helping in the development of policies and practices that promote the sustainable management of these services for the benefit of both nature and human societies.

**Biodiversity conservation planning-** Life scientists use geographic information to develop conservation plans that prioritize the protection of endangered species, sensitive habitats, and biodiversity-rich areas, aiming to maintain healthy and resilient ecosystems.

**Engaging in environmental education and outreach-** Geographic knowledge is utilized to communicate the importance of biodiversity and nature conservation to the public, promoting awareness and understanding of the interconnectedness between human activities and the natural world.

# EXPLORE *Sciences*

## APPLYING GEOGRAPHY

### *Earth/ Physical Science*

**Geological mapping-** Earth scientists use geographic data to **create detailed maps of the Earth's surface and subsurface**, helping to identify rock formations, mineral deposits, and geological structures for various research and exploration purposes.

They utilize geographic information to **assess and understand the occurrence and distribution of natural hazards** such as earthquakes, volcanic eruptions, landslides, and tsunamis, aiding in the development of strategies for hazard mitigation and risk management.

Geographic knowledge helps in **analyzing various landforms and terrain features**, such as mountains, valleys, and plains, aiding in the understanding of the processes that shape the Earth's surface and the impact of natural forces on landscape evolution.

Earth scientists use geographic data to **study climate and weather patterns**, including temperature variations, precipitation levels, and atmospheric conditions, aiding in the assessment of climate change impacts and the development of climate prediction models.

They utilize geographic knowledge to **assess and manage water resources**, including the study of rivers, lakes, aquifers, and groundwater systems, helping to ensure the sustainable use and conservation of water for various human and environmental needs.

Geographic information is used to **monitor and model environmental changes**, such as land degradation, deforestation, and desertification, aiding in the understanding of the impacts of human activities and natural processes on the Earth's ecosystems.

Earth scientists use geographic data to **explore and manage natural resources** such as minerals, fossil fuels, and renewable energy sources, aiding in the development of sustainable extraction practices and the identification of alternative energy options.

Geographic knowledge helps in **assessing soil and sediment composition**, aiding in the study of soil fertility, erosion, and sediment transport processes, as well as in the development of land management strategies for agriculture and environmental conservation.

Earth scientists use geographic information to **study the Earth's interior**, including its core, mantle, and crust, aiding in the understanding of plate tectonics, seismology, and the geological processes that shape the Earth's structure and geophysical phenomena.

Geographic knowledge is utilized to **inform environmental policy and advocacy efforts**, providing scientific evidence and spatial analysis to support initiatives related to sustainable development, natural resource conservation, and environmental protection.

# EXPLORE *Sciences*

## APPLYING GEOGRAPHY

### *Social Science*

Social scientists use geographic data to study the distribution of environmental risks and benefits among different communities, aiding in the analysis of environmental inequalities and the **development of policies that promote environmental justice**.

**Spatial analysis of environmental behavior-** They utilize geographic information to analyze human behaviors related to the environment, such as resource consumption, waste generation, and land use patterns, aiding in the understanding of the spatial dynamics of human-environment interactions.

Social scientists use geographic knowledge to **assess cultural landscapes** and the ways in which human societies shape and are shaped by their natural surroundings, aiding in the preservation of cultural heritage and traditional ecological knowledge.

They utilize geographic data to **study environmental governance structures and practices** at various scales, aiding in the analysis of policy effectiveness, institutional arrangements, and community engagement in natural resource management and conservation efforts.

Social scientists use geographic information to **analyze the spatial distribution of environmental attitudes and values**, aiding in the identification of factors influencing environmental awareness, activism, and participation in sustainability initiatives.

Geographic knowledge helps in **understanding the social impacts of environmental changes**, such as climate variability, natural disasters, and ecosystem degradation, aiding in the development of strategies for community resilience and adaptation to environmental challenges.

Social scientists use geographic data to **map and analyze community vulnerability to environmental risks**, aiding in the identification of vulnerable populations and the development of targeted interventions to enhance community resilience and disaster preparedness.

They utilize geographic information to **facilitate participatory environmental planning processes**, enabling communities to actively participate in decision-making processes related to land use, natural resource management, and sustainable development initiatives.

Social scientists use geographic knowledge to **assess the socio-environmental impacts of development projects**, aiding in the evaluation of potential trade-offs between economic development and environmental conservation, and in the identification of sustainable development pathways.

Geographic knowledge is utilized to **foster collaboration and partnerships with local communities**, enabling social scientists to work together with community members to address environmental challenges, promote sustainable practices, and foster community-based conservation efforts.




# EXPERIENCE Sciences

# MEET THE GEOGRAPHERS

## Sciences

"Geographic skills important to this work include the ability to use mixed data collection methods, to integrate qualitative and quantitative data, to analyze human-environment interactions, and to conceptualize processes through time and across space. More generally this work requires: the ability to develop and implement culturally appropriate research design; foreign language skills; the ability to lead and work as a team member; strong writing and presentation skills; and resourcefulness and adaptability in a challenging fieldwork environment. While I gained much practical knowledge as an applied researcher, it was not until I studied geography that I was able to understand and analyze important dimensions of development that are often ignored or understudied in professional research such as political economy, human-environment interactions, culture, and history."

Kate Bishop, PhD
Evaluation Consultant at Winrock International
Link to Interview


Tim Fullman, PhD
Senior Ecologist, The Wilderness Society
Link to Interview

"Our ability as geographers to think spatially about challenges and solutions is very important to enabling us to serve as problem solvers, especially when it comes to land management over broad spatial scales. In addition to the spatial perspective, the specific tools I honed during my geography degree continue to be critically important in both my research and other conservation activities. Whether it is analyzing spatial animal movement datasets or creating maps of areas where caribou calving habitat is expected to be lost under different development proposals, my geography training features strongly in my current work." Wildlife ecology is a rapidly changing field, with new tools and technologies being developed frequently. One of the most important things I took away from my geography Ph.D. is learning how to learn – the ability to teach myself new things. Now, I may need to learn a new statistical approach, or about a new remote sensing data source, or how to use a platform like Google Earth Engine, yet the baseline of skills I have built during my academic training and the wide array of resources available on the internet, along with the knowledge sets of colleagues who are willing to share their expertise, have been invaluable in allowing me to attain these things."

"Information about the global structure of agriculture and nutrient production and its diversity is essential to improve present understanding of national food production patterns, agricultural livelihoods, and food chains, and their linkages to land use and their associated ecosystems services. Here we provide a plausible breakdown of global agricultural and nutrient production by farm size, and also study the associations between farm size, agricultural diversity, and nutrient production. This analysis is crucial to design interventions that might be appropriately targeted to promote healthy diets and ecosystems in the face of population growth, urbanizsation, and climate change. [...] Agriculture, livestock, and fisheries provide the basis of production for edible nutrients used by mankind, whether directly through food manufacturing and consumption, or indirectly to feed animals and fish or for energy or fibre production. These sectors are part of the global food systems and are responsible for maintaining millions of livelihoods, from farmers, retailers, farm advisers, and scientists, all the way to the consumers. Their importance in regulating environmental services mainly through land and water use, nutrient cycles, and climate regulation is also undeniable. Our results show that farm size and diversity of agricultural production vary substantially across regions and are key structural determinants of food and nutrient production that need to be considered in plans to meet social, economic, and environmental targets. At the global level, both small and large farms have key roles in food and nutrition security. Efforts to maintain production diversity as farm sizes increase seem to be necessary to maintain the production of diverse nutrients and viable, multifunctional, sustainable landscapes."

- Mario Herrero, Philip K. Thornton, Brendan Power, Jessica Bogard, Roseline Remans, Steffen Fritz, et al. (2017). Farming and the geography of nutrient production for human use: a transdisciplinary analysis. Lancet Planet Health, 1(1), 33-42. Link to Article.

# EXPERIENCE
## Sciences

_______________

# FIND LOCAL GEOGRAPHERS

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Name: ____________________________

Job Title: __________________________

*EXTENSION* IF POSSIBLE, TRY AND INTERVIEW THE PERSON AND ASK THEM HOW THEY USE GEOGRAPHY! WRITE YOUR FINDINGS IN THE OPEN SPACES

# EXPAND
## Sciences

TAKE IT GLOBAL

FIND EXAMPLES OF THESE CAREERS IN DIFFERENT REGIONS

### Sciences

| | |
|---|---|
| **Latin America and Caribbean** | **Europe** |
| **Middle East and North Africa** | **Sub-Saharan Africa** |
| **Central Asia and Russia** | **East Asia** |
| **South Asia** | **Oceania** |

# EXPAND
## Sciences

## MAKING CONNECTIONS

HOW IS THIS CAREER IMPACTED BY THESE THEMES?
HOW DOES THIS CAREER IMPACT THESE THEMES?

Sciences

| | |
|---|---|
| **Physical Geography** | **Human Geography** |
| **Places and Region** | **Environment and Society** |

Powerful Geography

# EXPLORE
# *Technology*

## CAREER EXAMPLES

### *Technology*

- Environmental Data Analyst
- Environmental Software Developer
- Geographical Information Systems (GIS) Specialist
- Remote Sensing Analyst
- Environmental Sensor Engineer
- Environmental Monitoring Technician
- Renewable Energy Systems Engineer
- Sustainable Technology Consultant
- Environmental App Developer
- Agricultural Technology Specialist
- Conservation Technology Engineer
- Climate Change Technology Analyst
- Smart Agriculture Systems Developer
- Wildlife Monitoring Technology Specialist
- Green Building Technology Engineer
- Natural Resource Management Systems Developer
- Water Resource Management Technology Specialist
- Forestry Technology Engineer
- Clean Energy Technology Researcher
- Environmental Modeling Software Engineer

# EXPLORE
## Technology

### CAREER EXPLORATION

Pick 2-3 jobs that interest you from the list of career examples. Write them down.

Where (location) would you need to go to pursue (or get) these jobs?

What are some of the qualifications (for example: skills, degrees, knowledge) you need to have these jobs?

How could you make an impact in the world with these jobs?

# EXPLORE *Technology*

## APPLYING GEOGRAPHY

### *Technology*

Technology professionals **use geographic knowledge to develop and maintain GIS applications** that enable the collection, storage, analysis, and visualization of spatial data related to natural resources, habitats, and environmental processes.

They utilize geographic information to **develop and operate remote sensing technologies** such as satellite imagery, drones, and aerial surveys, which aid in monitoring changes in land use, ecosystems, and environmental conditions in remote or inaccessible areas.

Technology careers use geographic knowledge to **design and deploy environmental monitoring systems** that track various parameters such as air quality, water quality, and biodiversity, helping to assess the health of natural ecosystems and detect environmental changes in real-time.

They utilize geographic data to **develop location-based services and applications** that provide information about protected areas, wildlife habitats, and environmentally sensitive zones, helping to raise awareness and promote responsible behavior among users in natural environments.

They utilize geographic information to **design and operate robotics and automation systems for conservation tasks** such as habitat restoration, wildlife monitoring, and invasive species management, aiding in the efficient and effective execution of conservation activities.

Technology professionals use geographic data to **develop smart sensors and Internet of Things (IoT) devices that collect and transmit environmental data** from various natural environments, enabling real-time monitoring and early detection of environmental changes and risks.

Technology professionals use geographic knowledge to **develop software applications that support the management of natural resources**, including forestry, fisheries, and water resources, facilitating data-driven decision-making and sustainable resource utilization.

They utilize geographic information to **develop precision agriculture technologies** that optimize crop management practices, water usage, and soil health, aiding in the **promotion of sustainable farming methods** and the reduction of environmental impacts.

Technology careers use geographic knowledge to **develop climate modeling and prediction tools** that simulate and forecast climate patterns, aiding in the assessment of climate change impacts and the development of adaptation strategies for natural ecosystems and human communities.

They utilize geographic knowledge to **develop data analytics tools and algorithms that process and analyze large sets of environmental data**, aiding in the identification of trends, patterns, and correlations that inform scientific research and decision-making in the realm of nature.

# EXPERIENCE
## Technology

# MEET THE GEOGRAPHERS

Pete Chirico
Research Geographer & Associate Director of the Eastern Geology and Paleoclimate Science Center
U.S. Geological Survey
Link to Interview

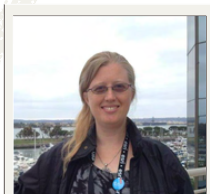
### Technology

"My coursework in GIS gave me the skillset to work as a GIS specialist, and I have been able to apply my general knowledge of geography to critical problem solving. But, since the geospatial field is rapidly advancing, it has been important to continually develop new technical skills and to be willing to learn about subject areas well outside of my initial scope of coursework and studies. I often use GIS and remote sensing methods in collecting geographic information, and also extract data from reports, maps, and articles, oftentimes only found in a library or archival collection. Some of the skills I use in field work include sediment sampling, field mapping, and qualitative/semi-quantitative interviews."

"My job tasks include acquiring, exploring, extracting, and transforming geospatial (and sometimes time series) data, including remotely sensed imagery, elevation, land cover, and utility assets as inputs for data science and modeling. In addition, I compile and aggregate the output risk in a geographic data format. tend to emphasize the absolute and relative geographic locations of a phenomenon, and then I shift my attention to the associated spatial distribution and temporal dynamics. The spatial-temporal process always attracts me, and I am interested in the background mechanisms of the process. From geography or computer science perspectives, some types of knowledge are important and useful to know like how to handle (read/write) geospatial data is necessary. Understanding approaches to analyze raster, vector, or point cloud data significantly contributes to the current utility consulting industry".

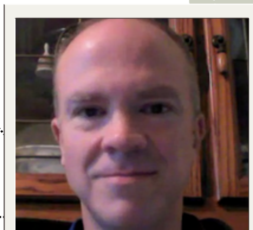
Hsiao-Chien Shih, PhD
Data Scientist
Link to Interview

"Geography provides a more flexible approach to integrating different disciplines of information into summary messages about health, the environment, international development, and other complex topics. Working in agriculture, especially around the world, addresses many of the interdisciplinary topics that interest me, including food security, sustainable development, and poverty alleviation. My education in geography and specifically remote sensing provided me with the necessary foundation to advance my skills for the specific analytical demands of my current workplace. In addition, my background in policy communication greatly supported me in creating well-received map products that simplified complex data into clear policy messages. I really loved doing that analytical work."



Lisa Colson
GIS & Imagery Specialist
USDA/Foreign Agricultural Service
Link to Interview

"With the drone you have to understand where you're going, where you're flying, understand restricted flight zones -- look on the FAA site and understand restrictions or approvals you may need. Before I get to a site I need to set up a flight plan, so if I am going to do a multispectral analysis of the field to determine the health of that crop I need to determine my flight pattern so I can best capture the data on that field. I am looking at the height of flying, angle that my camera is set at, the amount of overlap on my flight so that I can get a real good sample, so when I'm done I have a good amount of data on that field. And then depending on what software you're using, it stiches all those photos and images into an a single image, an orthomosaic. At the same time the sensors are taking shots of the crop health, that then determines factors such as the relative moisture level of those plants. At the end of the day it has produced an image of that field which you can then give to the farmer and show if there are any issues in the field. It also produces a 3D image. And can show other stressors in the crop which can then integrate with major agricultural manufacturers (like John Deere) and their machinery (which is precision agriculture)."



Christopher Anderson
Drone Pilot
Central New York State
Link to Interview

# EXPERIENCE
## Technology

# FIND LOCAL GEOGRAPHERS

*INSTRUCTIONS* CONDUCT AN ONLINE SEARCH TO FIND LOCAL INDIVIDUALS WHO DO THE JOB YOU ARE INTERESTED IN.

WRITE DOWN THEIR NAME, JOB TITLE, AND USE THE LINES TO WRITE DOWN WHAT THEY DO

Name: ____________________________

Job Title: __________________________

Name: ____________________________

Job Title: __________________________

*EXTENSION* IF POSSIBLE, TRY AND INTERVIEW THE PERSON AND ASK THEM HOW THEY USE GEOGRAPHY! WRITE YOUR FINDINGS IN THE OPEN SPACES

# EXPAND
## Technology

### TAKE IT GLOBAL
FIND EXAMPLES OF THESE CAREERS IN DIFFERENT REGIONS

### Technology

| | |
|---|---|
| **Latin America and Caribbean** | **Europe** |
| **Middle East and North Africa** | **Sub-Saharan Africa** |
| **Central Asia and Russia** | **East Asia** |
| **South Asia** | **Oceania** |

# EXPAND

## Technology

## MAKING CONNECTIONS

HOW IS THIS CAREER IMPACTED BY THESE THEMES?
HOW DOES THIS CAREER IMPACT THESE THEMES?

Technology

| | |
|---|---|
| **Physical Geography** | **Human Geography** |
| **Places and Region** | **Environment and Society** |

# EXPAND
## Nature Path

## REFLECTIONS
WHAT IS GEOGRAPHY'S ROLE IN THE CAREER THAT YOU ARE INTERESTED IN AND ASPIRE TO BECOME? WRITE A SUMMARY.