CAREER PATHS

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ENVIRONMENTAL ENGINEERING

Express Publishing

CAREER PATHS

ENVIRONMENTAL ENGINEERING

Book 1

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Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	The Environmental Engineer	Article	advise, apply, conservation, environment, environmental engineer, evaluate, impact, monitor, pollution, prevent, resources	Asking about interests
2	The Earth	Course description	atmosphere, biosphere, core, crust, geosphere, hydrosphere, lithosphere, mantle, stratosphere, troposphere	Describing order
3	Ecosystems	Letter	abiotic, biotic, community, component, ecosystem, genetic diversity, habitat, organism, population, species	Describing positive changes
4	Biomes and Aquatic Systems	Webpage	aquatic life zone, biome, coastal zone, coral reef, desert, grassland, inter-tidal zone, ocean, open sea, rainforest, saltwater, savanna, tundra	Expressing excitement
5	Weather	Blog	cloud cover, humidity, meteorology, moisture, precipitation, pressure, short-term, temperature, weather, wind speed	Asking for repetition
6	Climate	Textbook	average, climate, current, elevation, Equator, latitude, pattern, pole, prevailing wind, range, rotation, terrain	Talking about averages
7	Basic Units of Life	Textbook	cell, chromosome, DNA, eukaryotic, gene, genetic information, multicellular, nucleus, prokaryotic, unicellular	Making a comparison
8	Measurements 1	Chart	acre, Celsius, Fahrenheit, gallon, hectare, imperial, kilogram, kilometer, liter, meter, metric, mile, pound, yard	Making a request
9	Basic Numbers and Math	Chart	add, divide by, equal, hundred, less, minus, multiply by, over, plus, subtract, times	Giving a reminder
10	Measurements 2	Employee guide	amount, area, base unit, concentration, cubic meter, derived unit, Kelvin, mole, SI, square meter, thermodynamic temperature, volume	Asking for clarification
11	Tables and Graphs	Email	bar graph, column, legend, line graph, pie chart, row, scatter diagram, table, x-axis, y-axis	Correcting an error
12	Describing Change	Article	decline, decrease, expand, fluctuate, increase, plummet, rise, shrink, skyrocket, stabilize	Describing changes
13	Presentations	Letter	body language, cue card, eye contact, handout, presentation, project, review, signpost, summarize, visual aid	Giving a compliment
14	Properties of Matter	Textbook	atom, atomic number, compound, electron, element, ion, mass number, matter, molecule, neutron, proton	Correcting yourself
15	Energy	Information excerpt	conserve, electromagnetic radiation, energy, energy efficiency, energy quality, heat, kinetic energy, potential energy, transfer, work	Giving a summary

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ENVIRONMENTAL ENGINEERING

Book 2

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Express Publishing

Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Traits of an Environmental Engineer	Job posting	ability, commitment, critical thinking, curious, dedicated, expertise, focus, goal-oriented, innovative, logical, outside the box, team player	Giving an example
2	Education	Webpage	ABET, accredited, bachelor's degree, doctorate, EAB, master's degree, PhD, postgraduate degree, prerequisite, undergraduate degree	Asking for advice
3	The Scientific Method	Journal article	conclusion, control group, evaluate, experiment, experimental group, hypothesis, independent variable, observation, problem, result, scientific method, testable	Requesting more information
4	Problem Solving	Employee guidelines	analysis, approach, attack, iteration, iterative procedure, problem identification, problem solving, redefine, solution, solve, synthesis	Talking about future events
5	Working with Numbers	Employee manual	cubed, exponent, hundredths, leading zero, order of magnitude, rounding error, scientific notation, significant figure, squared, tenths, thousandths, to the nth power, trailing zero	Checking for correctness
6	Analyzing Quantities	Textbook excerpt	convert, decimal number, denominator, fraction, mixed number, numerator, -out of-, percent, percentage, point, ppm, quantity, reduce, whole number	Describing quantities
7	Accounting	Email	closed system, consumption, extensive quantity, final, generation, initial, input, intensive quantity, open system, output, system, universal accounting equation	Giving advice
8	Water Cycle	Report	advection, aquifer, condensation, evaporation, hydrologic cycle, infiltration, liquid, residence time, sublimation, transpiration, vapor, water cycle	Defining a term
9	Carbon Cycle	Pamphlet	aerobic respiration, break down, carbohydrates, carbon, carbon cycle, circulate, CO_2, convert, diffuse, dissolve, oxygen, photosynthesis	Redirecting a conversation
10	Energy Cycle	Report	biomass, consumer, ecological efficiency, endangered species, energy flow, food chain, food web, primary consumer, producer, secondary consumer, solar energy, trophic level, trophic transfer	Delivering bad news
11	Biodiversity and Extinctions	Webpage	background extinction, biodiversity, biological extinction, ecological extinction, ecosystem diversity, extinct, extinction, Holocene extinction, local extinction, mass extinction, species diversity, variation	Stating a concern
12	Environmental Chemistry	Course description	acid, balance, base, chemistry, endothermic, enthalpy, equation, exothermic, organic chemistry, Periodic Table, pH scale, solubility, stoichiometry	Expressing doubt
13	Resources	Webpage	coal, extract, fishery, hydrogen, log, mine, natural gas, oil, ore, petroleum, potential resource, stock resource, sustainable yield, timber, uranium	Talking about capabilities
14	Resource Recovery	Newspaper article	combustion, compost, discard, energy recovery, fly ash, municipal solid waste, postconsumer, preconsumer, primary recycling, recycle, remanufacturing, secondary recycling, waste-to-energy combustion	Describing mixed results
15	Atmospheric Change	Journal article	carbon dioxide, CFC, climate change, Copenhagen Protocol, Freon, glacial, greenhouse effect, Kyoto Protocol, methane, ozone thinning, permafrost, sea level, thermohaline circulation, tipping point, ultraviolet radiation	Disagreeing with an opinion

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CAREER PATHS

ENVIRONMENTAL ENGINEERING

Book 3

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Express Publishing

Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Risk Assessment	Textbook excerpt	bioconcentration, carcinogen, dose-response assessment, exposure assessment, hazard identification, hazard index, hazard quotient, LOEL, NOAEL, perception, RfD, risk assessment, risk characterization, risk management, uncertainty factor	Describing necessity
2	Population, Environment, and Resources 1	Journal article	birth control, carrying capacity, collapse, consumption, demand, developing country, doubling time, exceed, exponential, family planning, import, overpopulation, population growth, strain, support	Making a prediction
3	Population, Environment, and Resources 2	Pamphlet	clear cutting, deforestation, developing nation, logging, mitigate, nutrient depletion, overfishing, renewable resource, replenish, selective cutting, slash and burn, soil degradation, strip cutting, strip mining, sustainability, tree plantation	Reacting to bad news
4	Urbanization	Newspaper article	light pollution, malnutrition, migrate, noise pollution, open space, overcrowded, poverty, rooftop garden, rural, rural flight, unsanitary, urban agriculture, urban heat island, urban sprawl, urbanization	Bringing up a positive
5	Water Use and Pollution 1	Magazine article	agriculture, drought, fertilizer, groundwater, heavy metals, irrigation, nonpoint source, pathogen, pesticide, point source, runoff, salinity, shortage, VOCs, waste water, water pollution	Talking about priorities
6	Water Use and Pollution 2	Textbook	algae, anaerobic, contaminant, cultural eutrophication, deoxygenation, diffusion, dispersion, dissolved oxygen (DO), eutrophication, flowing, oxygen-demanding waste, plume, standing	Making a recommendation
7	Water Quality Control	Webpage	activated sludge, aeration, bioreactor, BOD, coagulation, disinfection contact, filtration, flocculation, primary treatment, recarbonation, screening, secondary treatment, sedimentation, settle, sludge processing, treatment plant	Making comparisons
8	Air Pollution 1	Webpage	air pollution, air quality standard, ambient air, AQI, carbon monoxide, criteria pollutant, emission offsets, emission standard, ground-level, lead, nitrogen dioxide, ozone, PM, primary pollutant, secondary pollutant, sulfur dioxide	Expressing surprise
9	Air Pollution 2	Report	baghouse, coal-fired power plant, combustion controls, cyclone collector, electrostatic precipitator, emission potential, FBC, flue gas desulfurization, IGGC, particulate control, postcombustion controls, precombustion controls, scrubber	Stating a preference
10	Waste Management 1	Magazine article	carbon storage, cell, composite liner, daily cover, decompose, deep-well disposal, disposal capacity, hazardous, industrial solid waste, lift, methane recovery, open dump, solid waste landfill, surface impoundment, toxic	Correcting a misconception
11	Waste Management 2	Announcement	acquisition, design strategy, green, lifecycle assessment, material intensiveness, material life extension, material selection, packaging, planned obsolescence, product system life extension, raw, source reduction, substitute, virgin material	Providing options
12	Evaluating Impact	Report	assumption, biodiesel, compare, ethanol, fossil fuel, fuel cell, gas emissions, generate, hybrid, methanol, net metering, photovoltaics, rate, ratio, vehicle, wells-to-wheels	Making comparisons
13	Disaster Response	Webpage	absorb, break down, containment, countermeasure, decontamination, derailment, disaster, dispersant, HAZMAT, marine, natural disaster, skimming, oil slick, oil spill, vehicular accident	Offering criticism
14	Land Reclamation and Restoration	Newspaper article	abandoned, brownfield, chlorinated, clean-up, direct push drilling, gasoline, hydraulic fracturing, industrial, injection probe, ISCO, ISCR, reclamation, restoration, soil mixing, solvent	Asking for clarification
15	Water Reclamation and Restoration	Webpage	bioremediation, extraction well, impermeable barrier, injection well, isolation, permeable, phytoremediation, PRB, pump-and-treat, soil solidification, SVE, UV light, vitrification	Listing pros and cons

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10 Waste Management 1

WASTE MANAGEMENT
The Good and the Bad

Waste management is critical for human and environmental health. Without proper waste management, people would just throw garbage in **open dumps**. Fortunately, many places have better ways to handle waste. However, even the best facilities face challenges.

Liquid **hazardous** waste is often stored in **surface impoundments**. However, these can leak and contaminate groundwater. Fumes may also add to air pollution. A better solution is **deep-well disposal**. This method is permanent and environmentally sound if managed properly.

Solid waste landfills are sites that handle municipal and **industrial solid waste**. A **composite liner** is placed under the landfill. The intention is to prevent water pollution. However, environmental agencies suggest that this is only a temporary barrier. On top of the liners is a series of **cells** which have **daily cover** over them. **Lifts** lead to multiple layers of cells.

Solid waste landfills are extremely common. But they are not without problems. Many of them have reached or are close to **disposal capacity**. As the population grows, this will become a bigger problem. In addition, landfills release flammable **toxic** gases as waste **decomposes**. **Methane recovery** can be accomplished with a series of pipes that suck the gas out. Meanwhile, underground **carbon storage** can prevent CO_2 from entering the atmosphere.

WASTE MANAGEMENT

Get ready!

1 Before you read the passage, talk about these questions.

1 Why is waste management important?

2 How do solid waste landfills handle waste?

Reading

2 Read the magazine article. Then, choose the correct answers.

1 What is the purpose of the article?

A to compare types of waste management facilities

B to describe waste management problems and solutions

C to explain how solid waste landfills are created

D to highlight the harmful effects of open dumps

2 What can be inferred about solid waste landfills?

A They can be difficult to operate.

B They often have hazardous liquids.

C They may eventually pollute water.

D They have too many cell layers.

3 Which of the following is NOT a problem with waste facilities?

A They are quickly filling up.

B They emit hazardous gases.

C They are not compacted well.

D They can catch fire.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

1 __ toxic
2 __ cell
3 __ lift
4 __ carbon storage
5 __ composite liner
6 __ methane recovery
7 __ disposal capacity
8 __ surface impoundment

A the collection of a gas so that it can be used for another purpose

B an area of compacted waste

C a hole that holds liquid waste

D a synthetic material placed over compacted soil

E poisonous

F the largest amount of waste a facility can hold

G a layer put over cells when they are full

H the capture and storage of CO_2 so that it doesn't pollute the atmosphere

4 **Write a word or phrase that is similar in meaning to the underlined part.**

1 Injecting liquid into underground rock is one way to get rid of waste permanently.
_ _ _ p - _ e _ _ _ _ s p _ _ a _

2 The manufacturing process creates a lot of garbage from industrial facilities.
_ _ d u _ _ _ _ a _ s _ _ _ d _ a _ _ _

3 Many poor countries have lots of large, unregulated areas where people throw trash.
_ _ e _ _ u _ _ s

4 Methane is an extremely dangerous greenhouse gas.
_ _ _ a r _ _ _ s

5 Some items in landfills may never break down.
_ _ c _ _ _ o _ _

6 The layer of soil put over cells prevents the wind from blowing waste around.
d _ _ _ _ _ o _ _ r

7 Most of the city's waste goes to a(n) place where waste is dumped and buried.
_ o _ _ _ _ _ s _ _ l _ _ _ _ _ l _

5 **Listen and read the magazine article again. What are some ways to manage hazardous liquid waste?**

Listening

6 **Listen to a conversation between an environmental engineer and a city planner. Mark the following statements as true (T) or false (F).**

1 __ The city's solid waste landfill already has a methane recovery system.

2 __ The landfill's daily covers keep garbage in place and control odors.

3 __ The engineer will make plans for a carbon storage system.

7 **Listen again and complete the conversation.**

Engineer: Okay. I think that a system for **1** _____ _____ would be very beneficial.

City Planner: I was under the **2** _____ that we had a system to do that.

Engineer: No, not **3** _____ _____ _____.

City Planner: I can't believe that. What safety features do we have in place?

Engineer: There's an impermeable **4** _____ _____ to protect the groundwater supply.

City Planner: Okay, but that's pretty standard with solid waste landfills. What else do we have?

Engineer: There's a system of applying **5** _____ _____.

City Planner: I'm not **6** _____ with that.

Speaking

8 **With a partner, act out the roles below based on Task 7. Then, switch roles.**

USE LANGUAGE SUCH AS:

I was under the impression that ...
Yes, that's right. / No, not at this time.
Let's get going on ...

Student A: You are an environmental engineer. Talk to Student B about:

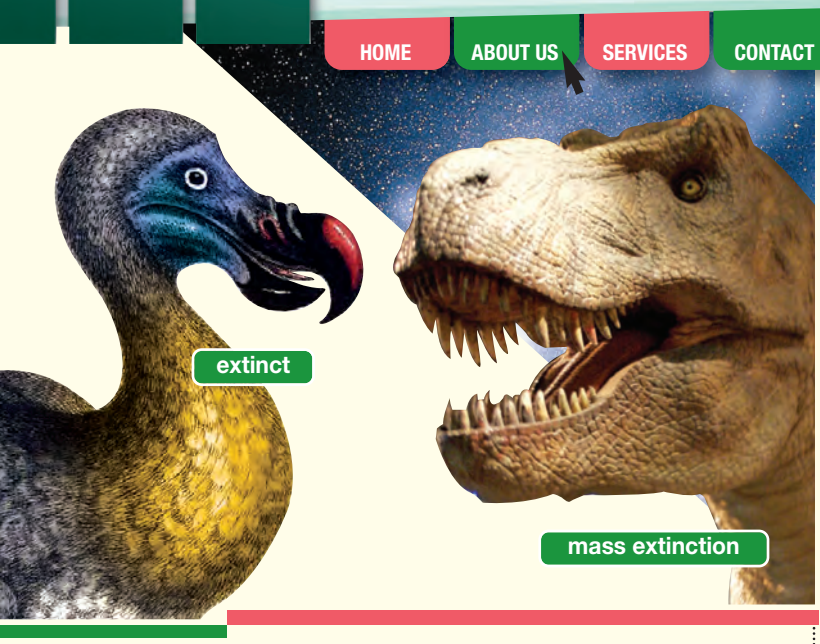
- what waste disposal methods your city currently uses
- what safety features the facilities have

Student B: You are a city planner. Talk to Student A about your city's waste management methods.

Writing

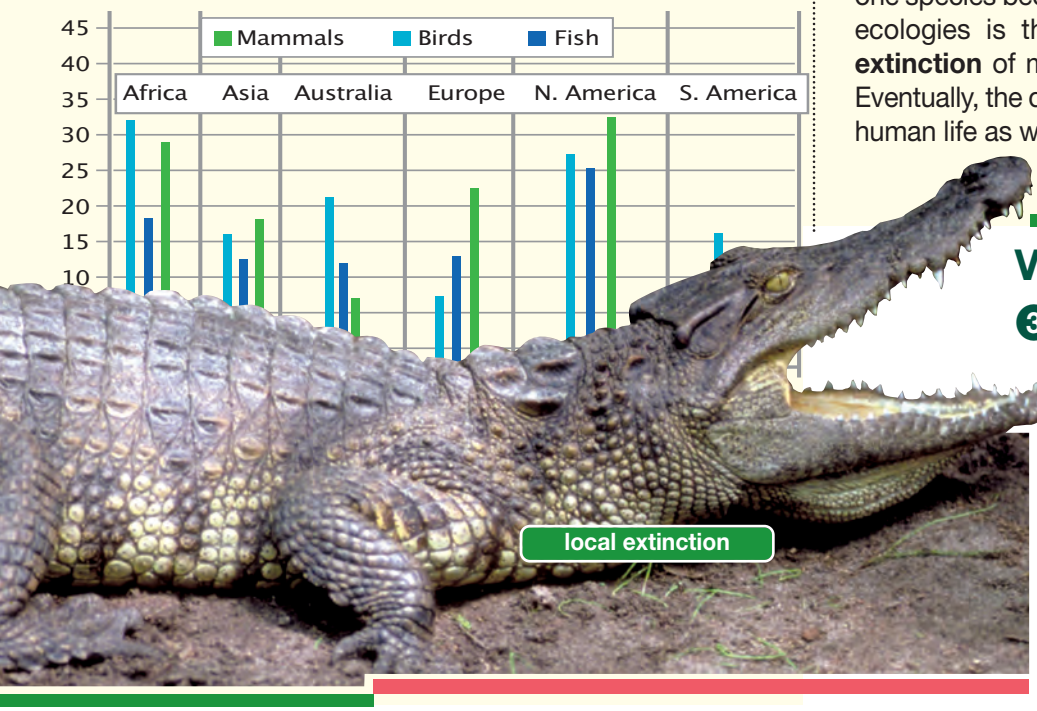
9 **Use the magazine article and the conversation from Task 8 to complete an informational flyer about your city's waste management programs. Include: the methods the city uses, their benefits, and their safety features.**

11 Biodiversity and Extinctions



At Jarman Environmental Planning, we are committed to maintaining **biodiversity**. There are many threats to biodiversity. Sometimes species die out for entirely natural reasons, which is called **background extinction**. But human beings cause a significant portion of the damage to biodiversity. In fact, many scientists argue that much of the **Holocene extinction** can be attributed to the spread of humans.

Human action threatens genetic **variation** and **species diversity**. We build highways through fragile habitats. We pollute the air and water. This can cause **local extinction** of important species. From there, the problem spreads. What begins as a small problem may become **ecological extinction** or even **biological extinction**. This, in turn, threatens **ecosystem diversity**. Biodiversity is not just important for the species facing **extinction**. When one species becomes **extinct**, the balance of various ecologies is threatened. This can lead to **mass extinction** of more than just a few exotic species. Eventually, the decrease in biodiversity could threaten human life as we know it.



Get ready!

1 Before you read the passage, talk about these questions.

1 Why is it important to maintain biodiversity?
2 What are some of the negative effects of extinction?

Reading

2 Read the webpage. Then, mark the following statements as true (T) or false (F).

1 __ Background extinction is the direct result of human action.
2 __ Biological extinction leads to local extinction.
3 __ Genetic variation and species diversity are threatened by human activities.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

1 __ extinct
2 __ variation
3 __ species diversity
4 __ mass extinction
5 __ local extinction
6 __ ecosystem diversity
7 __ Holocene extinction
8 __ background extinction

A differentiation among individuals
B a dramatic rise in the dying off of species
C no longer existing as a species
D the slow disappearance of a species for natural reasons
E the complete disappearance of a species from one area
F the variety of species in an area
G the disappearance of species during the current geological era
H the variety of ecosystems in an area

4 **Read the sentence pairs. Choose which word or phrase best fits each blank.**

1 **biological extinction / ecological extinction**

A If a species undergoes _____, an isolated few members remain.

B Species that face _____ disappear entirely from the earth.

2 **biodiversity / extinction**

A _____ is an important part of a successful ecology.

B Volunteers work hard to prevent endangered species' _____.

5 🎧 **Listen and read the webpage again. How do local extinctions affect larger ecosystems?**

Listening

6 🎧 **Listen to a conversation between two environmental engineers. Choose the correct answers.**

1 How did industrial development affect biodiversity?

A It destroyed the leopard frog's habitat.

B It caused the ecological extinction of the leopard frog.

C It disrupted leopard frog mating habits.

D It killed off the leopard frog's predators.

2 What solution does the man offer?

A introducing another frog species

B crossbreeding leopard frogs with a hardier species

C removing the leopard frog's predators

D improving the leopard frog's habitat

7 🎧 **Listen again and complete the conversation.**

Engineer: I just got **1** _____ _____ _____ the wildlife survey from the Clinton Industrial Park.

Coworker: How does it look?

Engineer: Unfortunately, **2** _____ _____ the local species of leopard frog has suffered local extinction.

Coworker: What happened?

Engineer: It's the industrial development. It's affected **3** _____ _____ more than we expected.

Coworker: **4** _____ _____ that affect biodiversity in the area?

Engineer: I'm **5** _____ _____ the leopard frog's disappearance. It may cause predators to deplete the numbers of other frog species.

Coworker: What can we do?

Engineer: I'm considering **6** _____ _____ introduce a hardier species of frog to replace the leopard frog.

Speaking

8 **With a partner, act out the roles below based on Task 7. Then, switch roles.**

USE LANGUAGE SUCH AS:

I just got the results of ...

How will ...?

I'm concerned that ...

Student A: You are an environmental engineer. Talk to Student B about:

- biodiversity at a development site
- a local extinction
- the effects of that extinction

Student B: You are an environmental engineer. Talk to Student A about an extinction.

Writing

9 **Use the conversation from Task 8 to write a wildlife survey report.**

Jarman Environmental Planning

Wildlife Survey Report

How has biodiversity been affected by development in the region?

_____

_____

_____

How do you plan to improve biodiversity in the region?

_____

_____

_____

Glossary

abiotic [ADJ-U3] If something is **abiotic**, it is not a living thing.

acre [N-COUNT-U8] An **acre** is an imperial unit of area equal to about 0.002 square miles or about 0.40 hectares.

add [V-T-U9] To **add** a number to another number is to increase it by that amount.

advise [V-T-U1] To **advise** is to give an expert opinion about something.

amount [N-COUNT-U10] An **amount** is a quantity of something.

apply [V-T-U1] To **apply** something is to use it for a particular purpose.

aquatic life zone [N-COUNT-U4] An **aquatic life zone** is an area in a body of water with a particular set of characteristics.

area [N-COUNT-U10] An **area** is a measure of how much two-dimensional space something occupies.

atmosphere [N-COUNT-U2] The **atmosphere** is the thin layer of air around the Earth.

atom [N-COUNT-U14] An **atom** is the smallest piece of matter that can exist by itself.

atomic number [N-COUNT-U14] An **atomic number** is a measure of the number of protons in an atom, and is used to identify atoms from different elements.

average [ADJ-U6] If something is **average**, it has qualities that are typical or most common in a particular group or category.

bar graph [N-COUNT-U11] A **bar graph** is a graph in which the heights of different bars represent differing frequencies of particular variables.

base unit [N-COUNT-U10] A **base unit** is a basic unit of measurement from which all other units are obtained.

biome [N-COUNT-U4] A **biome** is an area of the planet with a particular set of characteristics, including levels of temperature and precipitation.

biosphere [N-COUNT-U2] The **biosphere** is all of the living organisms on the Earth.

biotic [ADJ-U3] If something is **biotic**, it is a living thing.

body language [N-UNCOUNT-U13] **Body language** is any kind of communication that is not expressed verbally, including posture, eye contact, and hand gestures.

cell [N-COUNT-U7] A **cell** is the smallest unit of organization and function in an organism.

Celsius [N-UNCOUNT-U8] **Celsius** is a scale for measuring temperatures and establishes the freezing point of water at 0°C.

chromosome [N-COUNT-U7] A **chromosome** is a thread-like strand of DNA.

climate [N-COUNT-U6] A **climate** is the pattern of weather conditions over a long period of time.

cloud cover [N-COUNT-U5] **Cloud cover** is a measure of how dense the clouds are in a particular area.

coastal zone [N-COUNT-U4] A **coastal zone** is a warm, shallow area in an ocean that is along the edge of land.

column [N-COUNT-U11] A **column** is a vertical section of data in a table.

community [N-COUNT-U3] A **community** is a group of all the living things in a particular area.

component [N-COUNT-U3] A **component** is an important piece or part of something.

compound [N-COUNT-U14] A **compound** is a combination of two or more elements.

concentration [N-COUNT-U10] A **concentration** is a measure of the amount of some substance in a solution.

conservation [N-UNCOUNT-U1] **Conservation** refers to efforts made to reduce the amount of resources consumed by a person or population.

conserve [V-T-U15] To **conserve** something is to use little or none of something so that it will be available at a later time.

coral reef [N-COUNT-U4] A **coral reef** is an area in an ocean that is made up of a network of mineral structures and supports various types of marine life.

core [N-COUNT-U2] The **core** is the center part of the Earth that is very hot.

crust [N-COUNT-U2] The **crust** is the surface of the Earth, made up of rock and soil.

CAREER PATHS

ENVIRONMENTAL ENGINEERING

Career Paths: Environmental Engineering is a new educational resource for environmental engineering professionals who want to improve their English communication in a work environment. Incorporating career-specific vocabulary and contexts, each unit offers step-by-step instruction that immerses students in the four key language components: reading, listening, speaking, and writing. ***Career Paths: Environmental Engineering*** addresses topics including aspects of environmental engineering, such as ecosystems, irrigation, water treatment, air pollutants, and career options.

The series is organized into three levels of difficulty and offers a minimum of 400 vocabulary terms and phrases. Every unit includes a test of reading comprehension, vocabulary, and listening skills, and leads students through written and oral production.

Included Features:

- A variety of realistic reading passages
- Career-specific dialogues
- 45 reading and listening comprehension checks
- Over 400 vocabulary terms and phrases
- Guided speaking and writing exercises
- Complete glossary of terms and phrases

The **Teacher's Book** contains a full answer key and audio scripts.

The **Teacher's Guide** contains detailed lesson plans, a full answer key and audio scripts.

The **audio CDs** contain all recorded material.

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