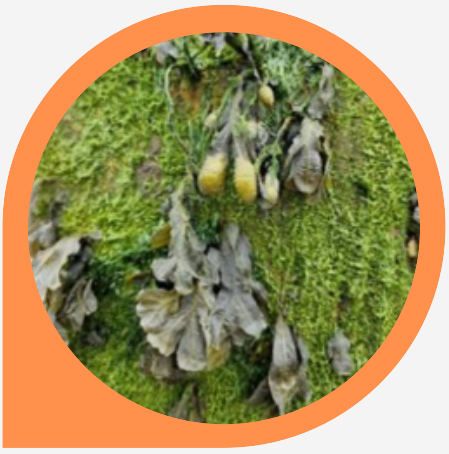
# COASTAL ENVIRONMENT: CHANGING COASTS

## Teacher Information Pack



Yorkshire Marine Nature Partnership
East Riding of Yorkshire Council
Environment Agency
LCB Education

# Teacher Information Pack

## What's included in this pack:

Summary of Sections Created:

- Section 1: Overview, Curriculum Mapping, Lesson Sequence at a Glance
- Section 2: Key Concepts, Vocabulary List, Common Misconceptions
- Section 3: Resources and Preparation
- Section 4: Detailed Lesson Guides for Lessons 1–3 (Cliff Landforms, Coastal Habitats, Natural versus Human-made Habitats)
- Section 5: Detailed Lesson Guides for Lessons 4–6 (Human Impacts on Coastal Environments, Climate Change and The Concrete Coast Solution, Practical Fieldwork and Citizen Science)
- Section 6: Fieldwork Guidance, Health & Safety, SEND & Accessibility
- Section 7: Exemplar Answer Sheets, Extension Activities

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# Section 1: Overview & Curriculum Mapping

**Purpose**
This teacher pack supports delivery of the "Coastal Environment: Changing Coasts" KS2 workbook for the Concrete Coast project. It’s designed to help pupils explore why coasts matter, how natural and human-made habitats form and change, and the importance of ecological enhancements for nature recovery. Through hands-on investigations, model-making, and real-world examples, learners discover how coastal environments work, why they are under threat, and how we can help monitor and restore them. The pack encourages observation, curiosity, and practical action, linking geography and science with citizenship and environmental responsibility.

**What Pupils Will Learn**
By completing this unit, pupils will:
- Identify and describe different coastal habitats (cliff, sandy beach, rockpool, saltmarsh)
- Understand how landforms and habitats form and change
- Explore the impact of humans and climate change on coasts
- Investigate ecological enhancements (like the Concrete Coast project)
- Collect, record, and interpret data as citizen scientists
- Reflect on nature recovery and their role in protecting wildlife

**Links to Concrete Coast**
The workbook embeds the Concrete Coast project's core theme and is linked to the national curriculum:
- Geography (locational knowledge, physical geography, human/environmental impact), Science (habitats, adaptation, living things, environmental change), Citizenship (care for the environment)

**Curriculum Mapping**
Extending the learning:
- GCSE/KS3 Links (for extension): AQA GCSE Geography—Coastal landscapes, ecosystems, human impact, climate change; AQA UAS Units—Habitats, environmental change, fieldwork, citizenship

A more comprehensive national curriculum mapping is provided at the end of this section in tabular form.

# Section 1: Overview & Curriculum Mapping

Chunked Lesson Sequence at a Glance:

| Lesson | Title | Key Outcomes |
|---|---|---|
| **1** | Coastal Habitats | Explore and compare cliff, sandy beach, rockpool, and saltmarsh habitats |
| **2** | Cliff Landforms | Identify and model caves, arches, stacks, stumps, and wave-cut platforms |
| **3** | Natural and Human-made Habitats | Compare natural and artificial coastal habitats |
| **4** | Human Impacts | Investigate pollution, overfishing, and coastal management |
| **5** | Climate Change & Concrete Coast | Discover how climate change affects coasts and how ecological enhancements help |
| **6** | Practical Fieldwork & Citizen Science | Collect data, model changes, and reflect on nature recovery |

Total: 2-6 hours (flexible; can be condensed or extended)

# National Curriculum Mapping

This Unit is also a part of AQA Unit Award Scheme:
**Coastal environments: changing coasts**
Use any AQA Approved centre to get a unit award certificate for this unit.

If you need a centre to do this for you, you can email a digital copy of the finished unit worksheets to **education@littlecraftersboxes.co.uk**

| | Unit Outcome | NC Links |
|---|---|---|
| 1 | Identify and name at least three different types of UK coastal habitat (such as sandy beach, rockpool, saltmarsh, or cliff) and describe one key feature of each. | **Geography Key Stage 2**<br>Name and locate counties and cities of the United Kingdom, geographical regions and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers), and land-use patterns; and understand how some of these aspects have changed over time<br>Understand geographical similarities and differences through the study of human and physical geography of a region of the United Kingdom, a region in a European country, and a region within North or South America<br>Describe and understand key aspects of physical geography, including: climate zones, biomes and vegetation belts, rivers, mountains, volcanoes and earthquakes, and the water cycle |
| 2 | Give one example of how people have changed the coast (positively or negatively), explain how this has affected wildlife or habitats. | **Geography Key Stage 2**<br>Name and locate counties and cities of the United Kingdom, geographical regions and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers), and land-use patterns; and understand how some of these aspects have changed over time<br>Describe and understand key aspects of human geography, including: types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water<br>Describe and understand key aspects of physical geography, including: climate zones, biomes and vegetation belts, rivers, mountains, volcanoes and earthquakes, and the water cycle<br>Understand geographical similarities and differences through the study of human and physical geography of a region of the United Kingdom, a region in a European country, and a region within North or South America |
| 3 | Describe differences between human-made and natural coastal habitats (e.g. human-made are often smooth and straight, whereas natural habitats are textured and have lots of different shapes) | **Geography Key Stage 2** Name and locate counties and cities of the United Kingdom, geographical regions and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers), and land-use patterns; and understand how some of these aspects have changed over time<br>Understand geographical similarities and differences through the study of human and physical geography of a region of the United Kingdom, a region in a European country, and a region within North or South America<br>Describe and understand key aspects of physical geography, including: climate zones, biomes and vegetation belts, rivers, mountains, volcanoes and earthquakes, and the water cycle<br>Describe and understand key aspects of human geography, including: types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water |
| 4 | Describe one way climate change or rising sea levels could affect the coast, and suggest one thing people can do to help look after coastal environments. | **Geography Key Stage 2**<br>Name and locate counties and cities of the United Kingdom, geographical regions and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers), and land-use patterns; and understand how some of these aspects have changed over time<br>Understand geographical similarities and differences through the study of human and physical geography of a region of the United Kingdom, a region in a European country, and a region within North or South America<br>Describe and understand key aspects of physical geography, including: climate zones, biomes and vegetation belts, rivers, mountains, volcanoes and earthquakes, and the water cycle<br>Describe and understand key aspects of human geography, including: types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water |

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| | Unit Outcome | NC Links (Cross-Curricular) |
|---|---|---|
| 1 | Identify and name at least three different types of UK coastal habitat (such as sandy beach, rockpool, saltmarsh, or cliff) and describe one key feature of each. | **Science Key Stage 2: Living things and their habitats**<br>Recognise that living things can be grouped in a variety of ways<br>Recognise that environments can change and that this can sometimes pose dangers to living things<br>**English Writing Composition**<br>Plan their writing by: identifying the audience for and purpose of the writing, selecting the appropriate form and using other similar writing as models for their own<br>**English Writing - Vocabulary, Grammar and Punctuation**<br>Use and understand the grammatical terminology in English Appendix 2 accurately and appropriately in discussing their writing and reading<br>**Art & Design Key Stage 2:**<br>To improve their mastery of art and design techniques, including drawing, painting and sculpture with a range of materials [for example, pencil, charcoal, paint, clay<br>**Design Technology Key Stage 2:**<br>Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities<br>**PSHE Key Stage 2: Living in the Wider World**<br>About the wider world and the interdependence of communities within it<br>About the environment and the responsibility to protect it<br>**Citizenship Education**<br>Developing skills of enquiry and communication<br>Learning about becoming informed citizens<br>**British Values**<br>Mutual Respect |
| 2 | Give one example of how people have changed the coast (positively or negatively), explain how this has affected wildlife or habitats. | **Science Key Stage 2: Living things and their habitats**<br>Recognise that living things can be grouped in a variety of ways<br>Recognise that environments can change and that this can sometimes pose dangers to living things<br>**Working Scientifically**<br>Asking relevant questions and using different types of scientific enquiries to answer them<br>**English Spoken Language**<br>Use spoken language to develop understanding through speculating, hypothesising, imagining and exploring ideas<br>**PSHE Key Stage 2: Living in the Wider World**<br>About the wider world and the interdependence of communities within it<br>About the environment and the responsibility to protect it<br>**Citizenship Education**<br>Developing skills of enquiry and communication<br>Developing skills of participation and responsible action<br>Learning about becoming informed citizens<br>**British Values**<br>Mutual Respect |

# National Curriculum Mapping

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| | Unit Outcome | NC Links (Cross-Curricular) |
|---|---|---|
| 3 | Describe differences between human-made and natural coastal habitats (e.g. human-made are often smooth and straight, whereas natural habitats are textured and have lots of different shapes) | **Science Key Stage 2: Living things and their habitats**<br>Recognise that living things can be grouped in a variety of ways<br>Recognise that environments can change and that this can sometimes pose dangers to living things.<br>**PSHE Key Stage 2: Living in the Wider World**<br>About the wider world and the interdependence of communities within it<br>About the environment and the responsibility to protect it<br>**Citizenship Education**<br>Developing skills of enquiry and communication<br>Developing skills of participation and responsible action<br>Learning about becoming informed citizens<br>**British Values**<br>Mutual Respect |
| 4 | Describe one way climate change or rising sea levels could affect the coast, and suggest one thing people can do to help look after coastal environments. | **Science Key Stage 2: Living things and their habitats**<br>Recognise that living things can be grouped in a variety of ways<br>Recognise that environments can change and that this can sometimes pose dangers to living things.<br>**Science Key Stage 2: Materials and Their Properties**<br>Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses<br>Explain how the shapes of objects made from some materials can be changed by squashing, bending, twisting and stretching<br>**Working Scientifically**<br>Making systematic and careful observations and, where appropriate, taking accurate measurements<br>Identifying differences, similarities or changes related to simple scientific ideas and processes<br>**PSHE Key Stage 2: Living in the Wider World**<br>About the wider world and the interdependence of communities within it<br>About the environment and the responsibility to protect it<br>**Citizenship Education**<br>Developing skills of enquiry and communication<br>Developing skills of participation and responsible action<br>Learning about becoming informed citizens<br>**British Values**<br>Mutual Respect |

# Section 2: Key Concepts and Vocabulary

Key Concepts covered:

**Coastal Habitat:** A place where the land meets the sea, where plants and animals live together. Different coastal habitats have different conditions (rocky, sandy, sheltered) so different creatures live there.

**Cliff:** A steep, tall rock face at the coast, formed when waves crash against hard rock for thousands of years. Cliffs can be made of chalk, sandstone, or granite, and they're home to seabirds and plants.

**Wave-Cut Platform:** A flat, rocky area at the base of a cliff, exposed at low tide. It forms when waves wear away soft rock at the bottom of the cliff, leaving a shelf behind.

**Arch:** A tunnel-shaped hole in a cliff, formed when waves wear away a line of weakness (like a crack) in the rock. Over time, an arch can collapse and become a stack.

**Stack:** A tall, isolated pillar of rock standing alone in the sea, left behind when an arch collapses. Stacks are home to seabirds and are important landmarks.

**Stump:** A short, stubby rock left in the sea after a stack has worn away even more. Eventually, stumps disappear completely under the water.

**Sandy Beach Habitat:** A sloping area of sand where the sea meets the land. Sandy beaches are home to creatures that burrow or hide, like lugworms, cockles, and sand hoppers. They're also important nesting sites for plovers and terns.

**Rockpool Habitat:** A shallow pool of seawater trapped between rocks at the shore. Rockpools are home to crabs, starfish, anemones, and seaweed. The water temperature and salt level change throughout the day, so creatures here are very tough!

**Saltmarsh Habitat:** A flat, muddy area at the coast that floods with seawater at high tide and drains at low tide. Saltmarshes are covered with special salt-tolerant plants and are nurseries for fish and feeding grounds for birds.

**Biodiversity:** The variety of different plants and animals living in one place. A habitat with high biodiversity has lots of different species; one with low biodiversity has only a few.

**Adaptation:** A special feature or behaviour that helps an animal or plant survive in its habitat. For example, crabs have hard shells to protect them in rockpools, and saltmarsh plants have special roots to cope with salty water.

**Erosion:** When rock, soil, or sand is worn away by wind, water, or waves. Coastal erosion happens when waves crash against cliffs and beaches, slowly wearing them down.

# Section 2: Key Concepts and Vocabulary

Key Concepts covered (continued):

**Deposition:** When sediment (sand, pebbles, mud) is dropped and settles in a new place. This happens when waves slow down and can't carry heavy material anymore.

**Human Impact:** The ways humans change the environment—both good and bad. Examples: pollution harms wildlife, but nature reserves protect it.

**Ecological Enhancement:** Actions taken to improve a habitat and help wildlife recover. Examples: planting native plants, creating rockpools, removing litter, or building structures that provide shelter.

**Nature Recovery:** The process of helping damaged habitats and wildlife populations bounce back and thrive again. The Concrete Coast project is an example of nature recovery.

**Citizen Science:** When ordinary people collect scientific data to help scientists understand the world. In this unit, pupils are citizen scientists when they monitor wildlife, record observations, and share data.

**Climate Change:** Long-term shifts in Earth's weather patterns, mainly caused by human activities like burning fossil fuels. Climate change is warming the planet, raising sea levels, and changing coastal habitats.

# Section 2: Key Concepts and Vocabulary

Core Vocabulary (Introduced during lessons)

| Word | Simple Definition | Pre-Teach Strategy |
|---|---|---|
| **Habitat** | A place where plants and animals live | Show pictures of different habitats (cliff, beach, rockpool, saltmarsh); ask pupils where they'd find different creatures |
| **Coast/Coastal** | The land where the sea meets the land | Point to a map; use a globe to show coastlines |
| **Cliff** | A steep, tall rock face by the sea | Show photos of famous cliffs (e.g., White Cliffs of Dover, Scarborough); compare to a steep hill |
| **Wave** | Moving water in the sea caused by wind | Demonstrate with a water tray or video; link to erosion |
| **Erosion** | When rock or soil is worn away by water or wind | Use sandpaper on sand or clay to show wearing away; watch a video of waves hitting cliffs |
| **Deposition** | When sand or pebbles settle in a new place | Show how sand settles in a jar of water; link to beach formation |
| **Rockpool** | A shallow pool of seawater trapped between rocks | Show photos or visit a rockpool; discuss creatures that live there |
| **Seaweed** | A plant that grows in the sea | Show real seaweed or pictures; discuss different types |
| **Creature/ Organism** | A living thing (animal or plant) | Use the word interchangeably with "animal" and "plant" |
| **Adapt/ Adaptation** | A special feature that helps something survive | Show examples: crabs have hard shells, plants have deep roots |
| **Pollution** | Harmful waste or dirt that damages the environment | Show pictures of litter on beaches, oil spills; discuss sources |
| **Biodiversity** | The variety of different plants and animals in one place | Compare a rockpool (lots of species) to a sandy beach (fewer species) |
| **Saltmarsh** | A muddy area by the coast that floods with seawater | Show photos; explain "salt" + "marsh" = salty wetland |
| **Climate Change** | Long-term changes in Earth's weather caused by humans | Use simple analogy: "Earth is getting warmer like a greenhouse" |

# Section 2: Key Concepts and Vocabulary

Core Vocabulary (Introduced during lessons)

| Word | Simple Definition | Pre-Teach Strategy |
|---|---|---|
| **Ecological Enhancement** | Actions to help wildlife and habitats recover | Show the Concrete Coast project as an example; discuss what "enhancement" means |
| **Nature Recovery** | Helping damaged habitats bounce back | Link to ecological enhancement; show before/after photos |
| **Citizen Science** | When ordinary people collect scientific data | Explain that pupils are scientists collecting real data |
| **Data** | Information collected through observation or measurement | Show examples: species counts, photos, measurements |

**Suggested Pre-Teach Words (introduce before each lesson):**

- Lesson 1: habitat, coast, creature, adapt
- Lesson 2: cliff, wave, erosion, deposition, arch, stack, stump
- Lesson 3: pollution, biodiversity, saltmarsh, seaweed
- Lesson 4: human impact, ecological enhancement, nature recovery
- Lesson 5: climate change, sea level, carbon
- Lesson 6: citizen science, data, monitoring

# Section 3: Resources and Preparation

**What's Included in This Pack**

- 6 lesson guides (starter, main, plenary, teacher prompts, differentiation, assessment)
- Preparation checklists for each lesson
- Answer sheets and model examples
- Fieldwork and citizen science guidance
- Health & safety risk assessment notes
- SEND and accessibility guidance
- Extension and enrichment ideas
- Home learning activities
- Troubleshooting guide

**What Teachers Need to Provide**

- Art & craft materials: Paper, card, pencils, colouring pencils, paint, paintbrushes, glue, scissors
- Model-making: Air-dry clay or modelling clay, sand, pebbles, shells, small stones, craft sticks
- Practical investigation: Water trays or large containers, measuring jugs, hand lenses, nets (for rockpool dipping)
- Fieldwork: Clipboards, notebooks, cameras or tablets, data recording sheets (printed), hand lenses, buckets, nets, identification guides
- ICT: Projector/interactive board, internet access, Google Earth or similar mapping tool
- Display: Large paper, markers, blu-tack, string for displaying pupil work

**Printing Notes**

- Print the workbook pages in colour if possible (photos and diagrams are clearer)
- Print identification guides (e.g., rockpool creatures, saltmarsh plants) in colour and laminate for durability
- Have spare copies of worksheets available for pupils who need them

# Section 3: Resources and Preparation

**Preparation Checklist**

Lesson 1: Coastal Habitats
Before the lesson:
- Have the workbook pages ready for pupils
- Lesson slide presentation
- For Activity 2: Trays, sand, shells, pebbles, soil, grass, twigs
- Pre-teach vocabulary: habitat, coast, creature, adapt

Lesson 2: Cliff Landforms
Before the lesson:
- Have the workbook pages ready for pupils
- Lesson slide presentation
- For Activity 2: Clay, clay tools/wooden sticks, water
- Pre-teach vocabulary: cliff, wave, erosion, deposition, arch, stack, stump

Lesson 3: Natural and Human-made Habitats
Before the lesson:
- Have the workbook pages ready for pupils
- Lesson slide presentation
- Print photos of natural rockpools and human-made rockpools
- Prepare comparison chart (printed or on board)
- Gather art materials for habitat design activity
- Pre-teach vocabulary: pollution, biodiversity, human-made, ecological enhancement

Lesson 4: Human Impacts on Coastal Environments
Before the lesson:
- Have the workbook pages ready for pupils
- Lesson slide presentation
- Gather materials for the pollution investigation: trays, sand, water, oil (vegetable oil works), feathers, rocks, shells, plastics, string
- Pre-teach vocabulary: pollution, human impact, overfishing, biodiversity

Lesson 5: Climate Change & The Concrete Coast Solution
Before the lesson:
- Have the workbook pages ready for pupils
- Lesson slide presentation
- Gather materials for coastal squeeze investigation: trays, water, sand, pebbles, shells, cardboard, jugs, foil, egg boxes, corrugated card
- Pre-teach vocabulary: climate change, sea level, carbon, ecological enhancement, nature recovery

Lesson 6: Practical Fieldwork & Citizen Science
Before the lesson:
- Arrange fieldwork location (local beach, rockpool, or virtual alternative)
- Have the workbook pages ready
- Gather fieldwork equipment: clipboards, hand lenses, nets, buckets, cameras/tablets
- Print identification guides (rockpool creatures, plants, birds)
- Brief pupils on health & safety procedures (see section below)
- Arrange transport and supervision if needed

# Section 4: Lesson Guides (lessons 1 through 3)

Lesson 1: Coastal Habitats

Learning Objective
Pupils can identify and describe different coastal habitats and the creatures that live there.
Success Criteria:

- I can name four different coastal habitats
- I can describe what makes each habitat special (e.g., rocky, sandy, sheltered)
- I can give examples of creatures that live in each habitat
- I can explain why different creatures live in different habitats

**Starter**
Show four photos (cliff, sandy beach, rockpool, saltmarsh) without labels. Ask pupils:

- "What do you notice about each place?"
- "Which one looks rocky? Sandy? Muddy? Sheltered?"
- "Where might you find crabs? puffins? "

Reveal the habitat names. Ask: "Why do you think different creatures live in different places?"

**Main**
**Activity 1**: Habitat Exploration " Pupils work in pairs or small groups. Each group is assigned one habitat. Using the workbook pages and photos, they:

- Describe the habitat (what it looks like, conditions like wet/dry, rocky/sandy)
- List creatures that live there
- Draw or label a simple diagram

**Activity 2**: Habitat Model" Using a water tray, sand, pebbles, and shells, pupils create a simple model of their assigned habitat. For example:

- Cliff: stack pebbles and shells vertically
- Sandy beach: spread sand and add shells/pebbles
- Rockpool: arrange rocks and add water
- Saltmarsh: mix mud/sand and add water, plant small twigs

As they build, ask: "What does your creature need to survive here? Where would it hide? What would it eat?"
Teacher Prompts & Key Questions

- "How is a rockpool different from a sandy beach?"
- "Why do you think a crab lives in a rockpool and not on a sandy beach?"
- "What makes each habitat special or unique?"
- "If we removed all the rocks from a rockpool, what would happen to the creatures?"

**Plenary**
Display the four habitat models. Ask pupils:

- "Which habitat do you think is the toughest place to live? Why?"
- "If you were a creature, which habitat would you choose? Why?"

Celebrate observations and creativity.

# Section 4: Lesson Guides (lessons 1 through 3)

**Misconceptions to Watch For**

- Misconception: All sea creatures live everywhere. Reality: Different creatures are adapted to specific habitats.
- Misconception: Habitats don't change. Reality: Habitats change with tides, seasons, and human impact.
- Misconception: Creatures choose where to live. Reality: Creatures are suited to their habitat through adaptation.

**Differentiation**

**Support:**

- Provide a word bank of habitat names and creatures
- Use simpler photos or diagrams
- Pair with a confident partner
- Reduce the number of habitats to explore (e.g., just cliff and rockpool)

**Challenge:**

- Ask pupils to research and add extra creatures to each habitat
- Ask: "What would happen if the climate warmed? How would habitats change?"
- Encourage pupils to create a more detailed model with labels and annotations

**Assessment Opportunities**

- Observe during model-building: Can pupils identify key features of each habitat?
- Listen to discussions: Are pupils using habitat vocabulary correctly?
- Quick check: Ask pupils to match creatures to habitats (verbal or visual)
- Exit ticket: "Name one creature and describe where it lives and why."

# Section 4: Lesson Guides (lessons 1 through 3)

Lesson 2: Cliff Landforms

Learning Objective
Pupils can identify and model how cliff landforms (caves, arches, stacks, stumps, wave-cut platforms) are created by erosion.
Success Criteria

- I can name five cliff landforms
- I can explain how each landform is created (by wave erosion)
- I can model a cliff and show how it changes over time
- I can predict what happens next to an arch or stack

**Starter**
Show photos showing an arch, then a stack, then a stump. Ask:

- "What's happening to this rock?"
- "Why is it changing shape?"
- "What do you think will happen next?"
- "Which one is the oldest? Which is the newest?"
- "Can you sequence them into an order?"

Introduce the idea: "Waves are like sandpaper—they slowly wear away rock."

**Main**
**Activity 1**: Cliff Landforms Exploration" Display descriptions for the children to match with the photo images.

- Cave: a tunnel in a cliff, formed where waves wear away a weakness
- Arch: a tunnel that's opened up, with rock on both sides
- Stack: a pillar of rock left standing alone after an arch collapses
- Stump: a short stub of rock left after a stack wears away
- Wave-cut platform: a flat shelf at the base of a cliff

**Activity 2:** Cliff Model: Pupils create a clay cliff model and simulate erosion:

1. Roll clay into a cliff shape
2. Use a stick or finger to create a weak line (like a crack in real rock)
3. Slowly "wear away" the clay with water or by rubbing with a stick

Teacher Prompts & Key Questions

- "Where do you think the arch will collapse first?"
- "Why do waves wear away rock faster at the bottom of the cliff?"
- "How long do you think it takes for a real arch to become a stack?"
- "What happens to the rock that's worn away? Where does it go?"

**Plenary**
Display all the cliff models or refer to photographs on the slides. Ask:

- "Which landform is the youngest? Which is the oldest?"
- "If we visited this cliff in 100 years, what would we see?"
- "Why is it important to understand how cliffs change?"

Celebrate observations and creativity.

# Section 4: Lesson Guides (lessons 1 through 3)

**Misconceptions to Watch For**

- Misconception: Cliffs are permanent and don't change. Reality: Cliffs erode constantly, though slowly.
- Misconception: Waves break rocks into pieces. Reality: Waves wear away rock gradually through erosion; they also carry sediment that acts like sandpaper.
- Misconception: All cliffs erode at the same speed. Reality: Hard rock (granite) erodes slowly; soft rock (chalk, sandstone) erodes faster.

**Differentiation**

**Support:**

- Provide a labelled diagram of each landform
- Use softer clay that's easier to model
- Pair with a confident partner
- Focus on just three landforms (cave, arch, stack)

**Challenge:**

- Ask pupils to research real examples (e.g., Old Harry Rocks in Dorset, Scarborough cliffs)
- Ask: "How fast do cliffs erode? Can you find out?"
- Encourage pupils to create a time-lapse sequence showing all five stages
- Ask: "What type of rock erodes fastest? Why?"

**Assessment Opportunities**

- Observe modelling: Can pupils create and label each landform?
- Listen to explanations: Do pupils understand the sequence (cave → arch → stack → stump)?
- Quick check: Show a photo of a landform; can pupils name it and explain how it formed?
- Exit ticket: "Draw and label an arch. What will happen to it next?"

# Section 4: Lesson Guides (lessons 1 through 3)

Lesson 3: Natural and Human-made Habitats

Learning Objective
Pupils can compare natural and human-made coastal habitats and understand how humans can help or harm wildlife.
Success Criteria

- I can describe a natural coastal habitat
- I can describe a human-made coastal habitat
- I can explain how human-made habitats can help or harm wildlife
- I can suggest ways to make human-made habitats better for wildlife

**Starter**
Show two photos side by side: a natural rockpool and an artificial rockpool (or sea wall).
Ask:

- "What's the same about these two places?"
- "What's different?"
- "Which one do you think has more creatures? Why?"
- "Did humans make one of these? How?"
- "Why do you think they have been made?"

**Main**
**Activity 1:** Create a comparison chart on the board or paper:

| Natural Habitat | Human-made Habitat |
|---|---|
| Formed by waves, weather, time | Built by humans |
| Rockpools, cliffs, saltmarsh | Sea walls, piers, groynes, artificial rockpools |
| Lots of biodiversity | Can have less biodiversity |
| Creatures are well-adapted | Creatures must adapt to new conditions |
| Changes slowly | Can change quickly |

Pupils discuss: "Can human-made habitats be good for wildlife? How?"

**Activity 2:** Design a Better Habitat. Show photos of ecological enhancements (e.g., Concrete Coast project: artificial rockpools, planted areas, wildlife-friendly structures).
Pupils design a human-made coastal structure that helps wildlife. They can:

- Draw a sea wall with rockpools and plants
- Design a pier with nesting boxes and seaweed habitat
- Sketch a groynes system with wildlife shelters

Ask: "What would make this a good home for creatures?"

# Section 4: Lesson Guides (lessons 1 through 3)

Teacher Prompts & Key Questions

- "Why do you think some creatures don't live on sea walls?"
- "How could we make a sea wall more like a natural cliff?"
- "What do creatures need to survive? (shelter, food, water, space)"
- "Can humans help nature? How?"
- "What's the difference between a sea wall and an ecological enhancement?"

**Plenary**

Display all the habitat designs. Ask:

- "Which design would help the most creatures? Why?"
- "What's the most important thing a habitat needs?"
- "Can humans and nature work together? How?"

Celebrate creativity and ideas.

**Misconceptions to Watch For**

- Misconception: All human-made structures are bad for wildlife. Reality: Some human-made habitats (like artificial rockpools or nesting boxes) can help wildlife.
- Misconception: Natural habitats are always better than human-made ones. Reality: Both can support wildlife if designed well.
- Misconception: Creatures can't adapt to human-made habitats. Reality: Some creatures are very adaptable; others struggle

**Differentiation**

**Support:**

- Provide a template for the habitat design (e.g., outline of a sea wall)
- Use simpler photos or diagrams
- Focus on one type of human-made habitat
- Pair with a confident partner

**Challenge**:

- Ask pupils to research real ecological enhancements (Concrete Coast, other projects)
- Ask: "How would you measure if a human-made habitat is successful?"
- Encourage detailed designs with labels, materials, and explanations
- Ask: "What problems might arise? How would you solve them?"

**Assessment Opportunities**

- Observe during design activity: Can pupils identify features that help wildlife?
- Listen to discussions: Do pupils understand the difference between natural and human-made habitats?
- Quick check: Show a photo; can pupils say if it's natural or human-made and explain why?
- Exit ticket: "Design one thing that would make a sea wall better for wildlife. Why would it help?"

# Section 5: Lesson Guides (lessons 4 through 6)

Lesson 4: Human Impacts on Coastal Environments

Learning Objective
Pupils can investigate how human activities harm coastal habitats and wildlife, and suggest solutions.
Success Criteria

- I can name three ways humans harm coastal environments
- I can explain how pollution, overfishing, and erosion affect wildlife
- I can collect and record data about human impacts
- I can suggest ways to reduce harm to coastal habitats

**Starter**
Show photos of a clean beach and a polluted beach. Ask:

- "What's different about these two beaches?"
- "Where does the litter come from?"
- "Have you seen litter on a beach? What was it and how did it make you feel?"
- "How would this affect the creatures living here?"

**Main**
**Activity** : Pollution Investigation. Set up a simple demonstration or hands-on activity:

- Fill a container with water (representing the sea)
- Add sand and rocks (habitat)
- Add toy creatures or pictures of creatures
- Introduce "pollution": vegetable oil, plastic pieces, or food waste

**Plenary:**
Ask pupils:

- "What has happened to the beach and sea?"
- "What will be affected the most?"
- "How can we clean it up?"
- "Do you think humans and nature can work together?"

Celebrate ideas and commitment to action.

# Section 5: Lesson Guides (lessons 4 through 6)

**Misconceptions to Watch For**

- Misconception: Humans only harm nature. Reality: Humans can also help nature through conservation and ecological enhancements.
- Misconception: One piece of litter doesn't matter. Reality: Millions of pieces add up; even small actions matter.
- Misconception: Nature can always bounce back. Reality: Some damage takes a very long time to repair; some species can't recover.

**Differentiation**

**Support:**

- Use simpler images or fewer impact categories
- Provide a word bank
- Pair with a confident partner
- Focus on one or two impacts (e.g., pollution and overfishing)

**Challenge:**

- Ask pupils to research real examples (e.g., plastic in the ocean, overfishing in UK waters)
- Ask: "How would you measure the impact of pollution?"
- Encourage pupils to design a campaign to reduce one type of pollution
- Ask: "What would happen if we banned fishing for five years?"

**Assessment Opportunities**

- Observe during investigation: Can pupils identify cause and effect?
- Listen to discussions: Do pupils understand human impacts?
- Quick check: Ask pupils to match impacts to effects (verbal or visual)
- Exit ticket: "Name one human impact on coasts. How does it harm wildlife? What could we do?"

# Section 5: Lesson Guides (lessons 4 through 6)

Lesson 5: Climate Change & The Concrete Coast Solution

Learning Objective
Pupils can explain how climate change affects coasts and how ecological enhancements like the Concrete Coast project help nature recover.
Success Criteria
- I can explain what climate change is and how it affects coasts
- I can describe the Concrete Coast project and what it does
- I can explain how ecological enhancements help wildlife
- I can suggest other ways to help coastal nature recover

**Starter**
Show a photo of a coastal area with rising water or flooding. Ask:
- "What's happening here?"
- "Why is the sea level rising?"
- "How does this affect the creatures living here?"

Introduce: "Climate change is warming the planet, and this is changing our coasts. But there are solutions!"

**Main**
**Activity 1**: Pair/class read information slides about Climate Change & Rising Sea Levels. Discuss:
- "Why is ice melting?"
- "How does warmer water affect creatures?"
- "What habitats are most at risk?"

**Activity 2**: The Coastal Squeeze Investigation (follow workbook to build a coastal squeeze model). Explain:
- The problem: Yorkshire coast is eroding; habitats are disappearing
- The solution: Create ecological enhancements (artificial rockpools, planted areas, wildlife-friendly structures)
- The benefit: Wildlife returns; habitats recover; nature bounces back

Teacher Prompts & Key Questions
- "Why is climate change happening?"
- "How does a warmer planet affect the sea?"
- "Why can't creatures just move to a cooler place?"
- "How do artificial rockpools help wildlife?"
- "Why is nature recovery important?"
- "What else could we do to help coasts?"

**Plenary**
Ask pupils:
- "If you could meet the people working on the Concrete Coast project, what would you ask them?”

Celebrate understanding and optimism.

# Section 5: Lesson Guides (lessons 4 through 6)

**Misconceptions to Watch For**

- Misconception: Climate change isn't real or isn't caused by humans. Reality: Climate change is real, measurable, and mainly caused by human activities (burning fossil fuels).
- Misconception: Climate change only affects distant places. Reality: It affects our local coasts, wildlife, and communities.
- Misconception: We can't do anything about climate change. Reality: Individuals, communities, and governments can take action.
- Misconception: Ecological enhancements are just cosmetic. Reality: They genuinely help wildlife recover and build resilience.

**Differentiation**
**Support:**

- Use simpler explanations of climate change (e.g., "The planet is getting warmer")
- Focus on local impacts rather than global ones
- Provide photos and diagrams rather than text
- Pair with a confident partner

**Challenge**:

- Ask pupils to research climate change data (e.g., temperature rise, sea level rise)
- Ask: "What's the difference between weather and climate?"
- Encourage pupils to design their own ecological enhancement project
- Ask: "How would you measure if the Concrete Coast project is successful?"

**Assessment Opportunities**

- Observe during demonstration: Can pupils understand cause and effect?
- Listen to discussions: Do pupils grasp the link between climate change and coastal impacts?
- Quick check: Ask pupils to explain the Concrete Coast project in their own words
- Exit ticket: "How does climate change affect coasts? How does the Concrete Coast project help?"

# Section 5: Lesson Guides (lessons 4 through 6)

Lesson 6: Practical Fieldwork & Citizen Science

Learning Objective:
Pupils can collect, record, and interpret real data about coastal habitats as citizen scientists.
Success Criteria
- I can collect accurate data about a coastal habitat
- I can record observations carefully and clearly
- I can identify creatures and plants using guides
- I can explain what the data tells us about the habitat

**Starter**
Explain the fieldwork task:
- "Today, you're real scientists collecting real data."
- "Your data will help us understand how our coast is changing."
- "You might even contribute to a citizen science project!"

Show the data recording sheet. Explain:
- What to observe (creatures, plants, litter, erosion)
- How to record it (sketches, counts, descriptions, photos)
- Why it matters (helps scientists, monitors nature recovery)

**Main**
If visiting a real coastal site:
1. Divide pupils into small groups
2. Assign each group a specific area (e.g., one rockpool, one section of beach, one cliff base)
3. Pupils observe and record:
    - Creatures (name, number, size, behaviour)
    - Plants (type, coverage, condition)
    - Abiotic factors (water temperature, salinity if possible, pH)
    - Evidence of human impact (litter, erosion, damage)
    - Signs of ecological enhancement (planted areas, artificial structures)
4. Use identification guides to name creatures and plants
5. Take photos to support observations
6. Collect data on the recording sheet

If unable to visit a real site:
- Use virtual fieldwork (Google Earth, online rockpool cameras, video clips)
- Analyse photos or video from the Concrete Coast project
- Conduct a "desktop fieldwork" activity using secondary data
- Visit a local park or garden and observe habitats there

Teacher Prompts & Key Questions
- "What creatures can you find? How many?"
- "What plants are growing here? Why?"
- "Is the water clear or cloudy? Why might that be?"
- "Can you see any signs of human impact?"
- "Can you see any ecological enhancements?"
- "How does this habitat compare to the others you've learned about?"

# Section 5: Lesson Guides (lessons 4 through 6)

**Plenary**
Back in the classroom, pupils share findings:
- "What creatures did you find?"
- "What was most interesting?"
- "What did you learn about this habitat?"
- "How does this habitat compare to others?"

Discuss:
- "Why is this data important?"
- "How could this data help protect coasts?"
- "Will you contribute to citizen science?"

Celebrate observations and scientific thinking.

**Misconceptions to Watch For**
- Misconception: Fieldwork is just a day out; it's not real science. Reality: Fieldwork is essential science; data collection is rigorous and valuable.
- Misconception: If you don't see many creatures, the habitat is dead. Reality: Many creatures are hidden; absence of visible creatures doesn't mean absence of life.
- Misconception: All data is equally useful. Reality: Careful, accurate recording is crucial; sloppy data is unreliable.

**Differentiation**
**Support:**
- Pair with a confident partner
- Provide a simplified data sheet with pictures
- Focus on one type of observation (e.g., just counting creatures)
- Use pre-identified photos rather than live identification

**Challenge:**
- Ask pupils to identify creatures to species level (not just common names)
- Ask: "Can you spot patterns in where creatures live?"
- Encourage pupils to submit data to a citizen science platform (iSpot, Nature Bureau)
- Ask: "How would you compare this habitat to another one?"

**Assessment Opportunities**
- Observe during fieldwork: Are pupils recording carefully and accurately?
- Check data sheets: Is the data clear, complete, and usable?
- Listen to explanations: Can pupils interpret their data?
- Exit ticket: "What did you find out about this habitat? What surprised you?"

# Section 6: Fieldwork Guidance

**Suggested Local Alternatives**
If a real coastal visit isn't possible, consider:

- Local park or garden: Observe habitats, creatures, and plants; compare to coastal habitats
- Local pond or stream: Observe freshwater habitats; compare to saltwater habitats
- Virtual fieldwork: Use Google Earth to explore coasts; watch online rockpool cameras; analyse photos from the Concrete Coast project
- School grounds: Create a mini habitat (e.g., a rockpool in a container); observe over time
- Community litter pick: Collect and categorise litter; discuss sources and impacts

**How to Run Fieldwork Without a Trip**

- Use high-quality photos or videos from the Concrete Coast project or other sources
- Analyse secondary data (e.g., species counts from previous years)
- Conduct a virtual tour using Google Earth or similar tools
- Invite a local expert (wildlife trust, ranger, scientist) to visit school and share fieldwork data
- Create a simulated habitat in school and observe it over time

**Data Collection Method**

1. Before fieldwork: Pupils learn to use identification guides, practise recording techniques, and understand the importance of accuracy
2. During fieldwork: Pupils work in small groups, each observing a specific area; they record observations on data sheets, take photos, and use hand lenses and nets carefully
3. After fieldwork: Pupils compile data, create graphs or charts, and discuss findings

**What "Good Data" Looks Like**

- Accurate: Observations are careful and precise; creatures are correctly identified
- Complete: All required fields on the data sheet are filled in; no guesses or blanks
- Clear: Handwriting is legible; sketches are labelled; photos are in focus
- Consistent: Recording method is the same for all observations (e.g., all counts are from the same area size)
- Useful: Data can be compared to other observations or datasets; it answers the research question

# Section 6: Health & Safety

**Classroom Practical's (Lessons 1–5)**
Hazards & Controls:

- Water trays: Spillage risk; slipping hazard. Control: Use non-slip mats; mop up spills immediately; supervise carefully
- Clay & modelling materials: Choking hazard for younger pupils. Control: Supervise; ensure materials are age-appropriate; wash hands after use
- Scissors & craft tools: Cut hazard. Control: Use child-safe scissors; supervise; teach safe handling
- Glue & paint: Skin irritant; eye hazard. Control: Use non-toxic materials; supervise; have eye wash available

First Aid: Keep a first aid kit nearby; know the location of the school's first aid station; report all incidents.

**Coastal Fieldwork (Lesson 6)**
Hazards & Controls:
Tides & Water:

- Risk: Drowning, cold water shock
- Control: Check tide times before visit; keep pupils away from deep water; use the "buddy system"; have a designated safe area; consider using a guided tour with a local expert; ensure adequate supervision (at least 1 adult per 10 pupils)

Rocks & Uneven Ground:

- Risk: Trips, falls, cuts
- Control: Wear appropriate footwear (sturdy, non-slip); watch for loose rocks; avoid steep slopes; check the site beforehand; brief pupils on safe movement

Weather:

- Risk: Hypothermia (cold), sunburn, dehydration
- Control: Check weather forecast; dress appropriately (layers, waterproof); bring sun cream and hats; ensure pupils have water; shorten the visit if weather worsens

Wildlife:

- Risk: Stings (jellyfish, sea urchins), cuts (shells, sea urchins), allergic reactions
- Control: Wear gloves; avoid touching unfamiliar creatures; teach safe handling; ask pupils about allergies beforehand; have a first aid kit with antihistamine and tweezers
- Jellyfish: If present, avoid; do not touch; rinse stings with vinegar if available; seek medical advice if severe
- Sea urchins: Wear shoes; avoid stepping on them; if a spine enters skin, soak in hot water and seek medical advice

Pollution & Contamination:

- Risk: Infection, poisoning (from contaminated water or litter)
- Control: Avoid touching litter; wear gloves; wash hands before eating; check water quality beforehand; avoid areas with visible pollution

Sun & Heat:

- Risk: Sunburn, dehydration, heat exhaustion
- Control: Apply sun cream; wear hats; bring water; take regular breaks in shade; shorten the visit if necessary

# Section 6: Health & Safety

Supervision & Ratios:

- Minimum 1 adult per 10 pupils (or as per school policy)
- At least one adult with first aid training
- Designated meeting point and emergency procedures
- Mobile phone and first aid kit on site
- Pupils wear high-visibility vests or armbands if near roads or water

Safeguarding:

- Brief pupils on appropriate behaviour and boundaries
- Ensure pupils stay in sight of adults at all times
- Have a system for reporting concerns (e.g., a pupil being left behind)
- Debrief after the visit; listen for any concerns

Allergies & Medical Conditions:

- Ask parents/carers beforehand about allergies, asthma, epilepsy, or other conditions
- Ensure pupils have necessary medication (inhalers, epipens, etc.)
- Brief all adults on how to recognise and respond to emergencies
- Have emergency contact numbers for all pupils

**Risk Assessment Form**: Complete a formal risk assessment before the visit, identifying hazards, assessing likelihood and severity, and documenting control measures. Share with school leadership and parents/carers.

# Section 6: SEND and Accessibility Guidance

L**ow-Demand Language Options**

- Instead of: "Identify and describe the key features of a coastal habitat." Use: "Look at this place. What do you see? Tell me about it."
- Instead of: "Analyse the impact of human activities on biodiversity." Use: "How do people change this place? What happens to the animals?"
- Instead of: "Evaluate the effectiveness of ecological enhancements." Use: "Is this helping the animals? How do you know?"
- Use short sentences, simple words, and concrete examples. Avoid abstract language, passive voice, and complex instructions.

**Visual Supports**

- Use photos, diagrams, and real objects rather than text
- Create visual timetables showing the lesson sequence (starter → main → plenary)
- Use colour-coded labels and key vocabulary cards
- Provide visual data recording sheets with pictures and symbols
- Use real photos of creatures and habitats (not illustrations, which can be confusing)
- Create a visual "fieldwork checklist" with pictures (e.g., "Find a crab," "Count the shells," "Take a photo")

**Chunking & Scaffolding**

- Break lessons into smaller chunks (5–10 minutes each)
- Use visual timers to show how long each activity lasts
- Provide step-by-step instructions with pictures
- Offer frequent breaks and movement opportunities
- Use a "now and next" board to show what's happening now and what's next

**Alternatives to Writing**

- Use drawing, sketching, or collage instead of written descriptions
- Record observations verbally (voice notes, video)
- Use symbol-based communication systems (e.g., Makaton signs, visual supports)
- Offer multiple-choice or matching activities instead of open-ended questions
- Allow pupils to show understanding through play, model-making, or demonstration

**Sensory Considerations**

- Tactile: Provide real objects to touch (shells, seaweed, rocks, sand). Some pupils may be sensitive to textures; offer alternatives (e.g., smooth vs. rough objects)
- Auditory: Use calm, clear speech; minimize background noise; provide written instructions as well as verbal; use visual signals (e.g., hand raise) to get attention
- Visual: Use high contrast (black on white); avoid cluttered images; provide descriptions of photos; consider colour-blindness (avoid red/green combinations)
- Proprioceptive: Provide heavy work activities (carrying buckets, squeezing clay) to help with body awareness and regulation
- Vestibular: Be mindful of uneven ground during fieldwork; offer a stable hand to hold; allow pupils to sit if needed

# Section 6: SEND and Accessibility Guidance

**Regulation & Co-Regulation**

- Offer a quiet space or "calm corner" for pupils who need to regulate
- Use sensory tools (fidgets, stress balls, weighted blankets) if available
- Co-regulate with pupils: sit nearby, use calm language, offer reassurance
- Recognize signs of dysregulation (stimming, withdrawal, agitation) and respond with empathy
- Allow movement breaks and physical activities between seated tasks

**Anxiety & Avoidance**

- Prepare pupils for changes or new experiences (e.g., show photos of the fieldwork site beforehand)
- Use predictable routines and visual timetables
- Offer choices within activities (e.g., "Do you want to draw or write?")
- Celebrate effort, not just accuracy
- Avoid pressure or time limits; work at the pupil's pace
- Offer a "safe person" or peer buddy for support

**Neurodivergent-Friendly Approaches**

- For PDA learners: Offer choices and autonomy; avoid demands; use collaborative language ("Shall we...?" rather than "You must...")
- For autistic learners: Provide clear, literal instructions; minimize sensory overload; offer predictability and routine; respect special interests
- For ADHD learners: Use movement breaks; offer fidgets; use timers; provide novelty and variety; give frequent positive feedback
- For dyslexic learners: Use dyslexia-friendly fonts (e.g., Arial, Comic Sans); provide audio versions; use colour overlays if helpful; avoid time pressure

**Differentiation for SEND**

- Simplified version: Focus on one habitat, one creature, one impact
- Extended version: Add research, comparisons, predictions, design tasks
- Practical version: Use hands-on activities, real objects, movement
- Visual version: Use photos, diagrams, videos, real images
- Verbal version: Use storytelling, discussion, role-play
- Kinesthetic version: Use model-making, fieldwork, outdoor activities

**Communication Strategies**

- Use Makaton signs or other visual communication systems if pupils use them
- Speak clearly and at a natural pace; avoid rushing
- Give pupils time to process and respond (wait at least 10 seconds)
- Use visual supports alongside speech
- Repeat key information; check understanding
- Use concrete examples and real objects
- Celebrate communication attempts, however they're expressed

# Section 7: Example Answer Sheet and Extensions

**Lesson 1: Coastal Habitats** – Model Answers
Question: Describe what makes each habitat special.

- Cliff Habitat: A cliff is a steep, tall rock face by the sea. It's made of hard rock (like granite or chalk). Cliffs are home to seabirds (like puffins and kittiwakes) and plants that can survive on rocky slopes. The waves crash against the cliff and slowly wear it away. Creatures that live on cliffs need to be able to hold on and survive strong winds.
- Sandy Beach Habitat: A sandy beach is a sloping area of sand where the sea meets the land. It's soft and moves around with the tides. Sandy beaches are home to creatures that burrow or hide, like lugworms, cockles, and sand hoppers. Birds like plovers and terns nest on sandy beaches. Creatures here need to be able to dig and hide quickly.
- Rockpool Habitat: A rockpool is a shallow pool of seawater trapped between rocks at the shore. It's exposed at low tide and covered at high tide. Rockpools are home to tough creatures like crabs, starfish, anemones, and seaweed. The water temperature and salt level change throughout the day, so creatures here are very hardy. They need to be able to survive in changing conditions.
- Saltmarsh Habitat: A saltmarsh is a flat, muddy area at the coast that floods with seawater at high tide and drains at low tide. It's covered with special salt-tolerant plants (like glasswort and sea lavender). Saltmarshes are nurseries for fish and feeding grounds for birds. Creatures here need to cope with salty water and muddy ground.

Question: Why do different creatures live in different habitats?

- Different creatures are adapted to different habitats. Each habitat has different conditions (rocky, sandy, wet, dry, salty, etc.), and creatures have special features that help them survive there. For example, crabs have hard shells to protect them in rocky rockpools, but lugworms have soft bodies that are good for burrowing in sand. If a crab tried to live on a sandy beach, it wouldn't be able to hide or find food. If a lugworm tried to live in a rockpool, it would be exposed and eaten. So each creature lives where it's best suited.

**Lesson 2: Cliff Landforms** – Model Answers
Question: Explain how each landform is created.

- Cave: A cave forms when waves wear away a line of weakness (like a crack or fault) in the cliff rock. The waves crash against the rock again and again, slowly wearing it away. Over thousands of years, a tunnel forms in the cliff.
- Arch: An arch forms when a cave gets bigger and bigger. Eventually, the roof of the cave collapses, leaving a tunnel that's open on both sides. The arch looks like a bridge made of rock.
- Stack: A stack forms when an arch collapses. The rock on either side of the arch falls away, leaving a tall pillar of rock standing alone in the sea. Stacks are home to seabirds.
- Stump: A stump forms when a stack wears away even more. The waves continue to wear away the rock at the base of the stack, making it shorter and shorter. Eventually, the stump disappears completely under the water.
- Wave-Cut Platform: A wave-cut platform forms at the base of a cliff. Waves wear away the soft rock at the bottom of the cliff faster than the rock higher up. This leaves a flat, rocky shelf exposed at low tide. The platform gets bigger and bigger as the cliff retreats.

# Section 7: Example Answer Sheet and Extensions

Question: Which landform is the youngest? Which is the oldest?

- The youngest landform is the cave (it's just starting to form). The oldest is the stump (it's almost gone). The sequence is: cave → arch → stack → stump → disappears.

**Lesson 3: Natural vs Human-made Habitats** – Model Answers
Question: Design one thing that would make a sea wall better for wildlife. Why would it help?

- Example 1: Artificial Rockpools I would add artificial rockpools to the sea wall. These are shallow pools carved into the concrete that trap seawater at low tide. Creatures like crabs, starfish, and anemones can live in them. This helps because sea walls are smooth and empty, but rockpools provide shelter, food, and water for wildlife.
- Example 2: Planted Areas I would add planted areas with native plants (like sea thrift and samphire) to the sea wall. Plants provide food and shelter for insects and birds. They also help stabilize the wall and prevent erosion. This helps because bare concrete doesn't support any wildlife, but plants create a mini habitat.
- Example 3: Nesting Boxes I would add nesting boxes and ledges to the sea wall for seabirds. Birds need safe places to nest and raise their chicks. This helps because seabirds used to nest on natural cliffs, but sea walls are too smooth. Nesting boxes give them an alternative home.

**Lesson 4: Human Impacts** – Model Answers
Question: Name one human impact on coasts. How does it harm wildlife? What could we do?

- Example 1: Pollution Human impact: Litter and pollution on beaches How it harms wildlife: Creatures can get tangled in plastic, eat plastic by mistake, or get poisoned by chemicals. Pollution makes the water dirty and kills plants and fish. What we could do: Pick up litter, use less plastic, recycle, support clean-up campaigns, ask companies to reduce plastic packaging
- Example 2: Overfishing Human impact: Removing too many fish from the sea How it harms wildlife: If we catch too many fish, there aren't enough left to breed. Fish populations get smaller, and seabirds and other predators don't have enough food. What we could do: Eat less fish, support sustainable fishing, protect fishing areas, create marine reserves where fishing is banned
- Example 3: Climate Change Human impact: Burning fossil fuels, which warms the planet How it harms wildlife: Warmer water harms creatures that need cold water. Rising sea levels flood habitats. Storms become more severe and destroy habitats. What we could do: Use renewable energy, reduce carbon emissions, plant trees, support nature recovery projects

**Lesson 5: Climate Change & The Concrete Coast** – Model Answers
Question: How does climate change affect coasts? How does the Concrete Coast project help?
Climate change is warming the planet. This causes:

- Ice to melt, raising sea levels
- Water to warm up, harming creatures that need cold water
- Storms to become more severe, causing erosion
- Habitats to disappear

# Section 7: Example Answer Sheet and Extensions

The Concrete Coast project helps by:

- Creating artificial rockpools where creatures can live
- Planting native plants to stabilize the coast
- Building wildlife-friendly structures
- Monitoring nature recovery
- Showing that humans can help nature bounce back

**Lesson 6: Fieldwork & Citizen Science** – Model Data Sheet
Fieldwork Recording Sheet: Coastal Habitat Survey

| Observation | What We Found | Notes |
|---|---|---|
| **Location** | Rockpool at Scarborough North Bay | Near the café, low tide |
| **Date & Time** | 15 Feb 2026, 10:30 am | Sunny, calm |
| **Creatures Found** | Crabs (5), starfish (3), anemones (8), snails (12) | Crabs were under rocks; starfish on rocks; anemones on rock faces |
| **Plants Found** | Seaweed (kelp, bladder wrack), sea lettuce | Lots of green seaweed; some brown kelp |
| **Water Temperature** | 8°C | Cold! |
| **Water Clarity** | Clear | Could see the bottom |
| **Evidence of Human Impact** | 3 pieces of litter (plastic bag, bottle cap, fishing line) | Litter was trapped in seaweed |
| **Signs of Ecological Enhancement** | None visible | But the rockpool itself is a natural enhancement |
| **Biodiversity Rating** | High (lots of different species) | This is a healthy habitat |
| **Comparison to Other Habitats** | More creatures than sandy beach; fewer than saltmarsh | Rockpools are very productive |
| **Questions for Next Time** | Why are there more crabs than starfish? Do creatures move between rockpools? | Could count creatures over time to see if numbers change |

# Section 7: Extension and Enrichment Activities

**Cross-Curricular Links**
**Design & Technology**
Challenge 1: Design a Wildlife-Friendly Sea Wall Pupils design and build a model sea wall that helps wildlife. They consider:

- Materials (what's safe for wildlife?)
- Features (rockpools, plants, nesting boxes, shelter)
- Durability (will it last? Will it protect the coast?)
- Cost (is it affordable?)

Pupils sketch their design, label features, and explain how each feature helps wildlife.
Challenge 2: Design a Litter-Trap Device Pupils design a device to catch litter before it enters the sea. They consider:

- Where to place it (beach, river mouth, sea wall?)
- How it works (filter, net, trap?)
- What materials to use (eco-friendly, durable?)
- How to empty and recycle the litter

Pupils sketch their design and test a prototype.
Challenge 3: Design a Rockpool in a Container Pupils create an artificial rockpool in a large container. They:

- Add layers (sand, rocks, shells)
- Fill with seawater (or salt water)
- Add plants and creatures (if available)
- Observe and record changes over time
- Predict what will happen next

**Maths: Data Handling & Measurement**
Challenge 1: Analyse Fieldwork Data Pupils create graphs and charts from their fieldwork data:

- Bar chart: Number of each creature type
- Pie chart: Proportion of different habitats
- Line graph: Water temperature over time
- Scatter plot: Relationship between water temperature and creature numbers

Pupils interpret the graphs and draw conclusions.
Challenge 2: Measure Cliff Erosion Pupils research how fast cliffs are eroding:

- Find data on cliff erosion rates (e.g., Scarborough cliffs erode at ~1 metre per year)
- Calculate: If a cliff erodes at 1 metre per year, how much will it erode in 10 years? 100 years?
- Estimate: How long until a particular cliff disappears?
- Compare: Which cliffs erode fastest? Why?

Challenge 3: Calculate Habitat Size Pupils measure and calculate the area of habitats:

- Measure a rockpool: length × width = area
- Estimate: How many creatures per square metre?
- Calculate: Total number of creatures in the rockpool
- Compare: Which habitat has the most creatures per square metre?

Challenge 4: Model Rising Sea Levels Pupils use data on sea level rise to create predictions:

- Current sea level rise: ~3.3 mm per year
- Calculate: How much will sea level rise in 10, 50, 100 years?
- Estimate: How many homes will be flooded?
- Predict: When will a particular beach disappear?

# Section 7: Extension and Enrichment Activities

**English: Writing & Communication**
Challenge 1: Write a Creature's Diary Pupils write from the perspective of a coastal creature (e.g., a crab, starfish, seagull):
- What's my day like?
- What do I eat?
- What dangers do I face?
- How am I affected by climate change?
- What would help me survive?

Example: "Dear Diary, Today I hid under a rock because a seagull was hunting. I found some tasty algae for lunch. But I'm worried—the water is getting warmer, and I've heard that some of my cousins have moved north to find cooler water. What will happen to me?"
Challenge 2: Write a Persuasive Letter Pupils write a letter to persuade someone to help protect coasts:
- To a local councillor: "Please protect our coast from pollution"
- To a company: "Please use less plastic packaging"
- To a friend: "Please join me in a beach clean-up"
- To a government minister: "Please take action on climate change"

Challenge 3: Write a News Report Pupils write a news report about coastal issues:
- Headline: "Scarborough Cliffs Eroding Faster Than Expected"
- What happened? Why? Who's affected? What's being done?
- Include quotes from experts, residents, or creatures!

Challenge 4: Create an Information Leaflet Pupils create a leaflet about a coastal habitat or issue:
- Topic: "How to Help Rockpools," "Pollution and Our Coast," "The Concrete Coast Project"
- Include: Facts, diagrams, tips, and a call to action
- Design: Colourful, clear, easy to read

**Citizenship & PSHE**
Challenge 1: Investigate Local Coastal Issues Pupils research coastal issues affecting their local area:
- What's the biggest problem? (erosion, pollution, overfishing, climate change?)
- Who's affected? (people, wildlife, businesses?)
- What's being done? (projects, campaigns, policies?)
- What could you do? (join a campaign, volunteer, reduce your impact?)

Challenge 2: Plan a Beach Clean-Up Campaign Pupils plan and organize a beach clean-up:
- When and where? (choose a date and location)
- Who will help? (friends, family, school, community?)
- What will you need? (bags, gloves, transport?)
- What will you do with the litter? (sort, recycle, display to raise awareness?)
- How will you measure success? (amount of litter collected, people involved, awareness raised?)

Challenge 3: Debate: Humans vs. Nature Pupils debate: "Can humans and nature work together?"
- For: Ecological enhancements, conservation, sustainable practices
- Against: Humans always cause damage, nature is better left alone
- Resolution: Humans and nature can work together if we're careful and thoughtful

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Challenge 4: Design a Nature Recovery Project Pupils design their own ecological enhancement project:

- Problem: What's the issue? (habitat loss, pollution, erosion?)
- Solution: What would you do? (plant trees, create rockpools, remove litter?)
- Benefits: How would it help wildlife? People? The environment?
- Challenges: What problems might arise? How would you solve them?
- Cost & Timeline: How much would it cost? How long would it take?

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**Home Learning & Family Engagement**
Activity 1: Coastal Habitat Hunt
For families visiting a coast or beach:
- Find evidence of each habitat (cliff, sandy beach, rockpool, saltmarsh)
- Sketch or photograph each one
- List creatures you see or evidence of creatures (shells, burrows, droppings)
- Describe what makes each habitat special
- Compare to what you learned in school

Reflection: Which habitat was most interesting? Why? What surprised you?

Activity 2: Litter Investigation
For families on a beach or park:
- Collect litter (with gloves and adult supervision)
- Sort it by type (plastic, metal, paper, glass, etc.)
- Count how many pieces of each type
- Discuss: Where did it come from? How did it get here? How does it harm wildlife?
- Take photos to bring to school

Challenge: Can you reduce your own plastic use? Track it for a week.

Activity 3: Creature Spotting
For families in any outdoor space:
- Look for small creatures (insects, spiders, snails, worms, birds)
- Sketch or photograph them
- Try to identify them using a guide or app (e.g., iSpot)
- Note where you found them and what they were doing
- Discuss: What do they need to survive? How are they adapted?

Reflection: How many different creatures did you find? What was most interesting?

Activity 4: Climate Change Conversation
For families at home:
- Watch a short video about climate change or sea level rise (e.g., BBC Bitesize, National Geographic Kids)
- Discuss: What's happening? Why? How does it affect coasts? What can we do?
- Make a list of actions your family could take (use less energy, recycle, support nature recovery)
- Choose one action and try it for a week

Reflection: What was easiest? What was hardest? Will you keep doing it?

Activity 5: Design a Solution
For families at home:
- Choose a coastal problem (pollution, erosion, climate change, overfishing)
- Design a solution (like the Concrete Coast project)
- Sketch your design and label the features
- Explain how it would help
- Bring it to school to share

Challenge: How would you measure if your solution works?

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Activity 6: Citizen Science Contribution
For families interested in real science:

- Visit iSpot.org.uk or naturebureau.org.uk
- Record wildlife sightings from your garden, park, or beach
- Submit photos and observations
- Your data contributes to real scientific research!

Reflection: What did you discover? How does it feel to be a citizen scientist?

Activity 7: Create a Coastal Fact File
For families at home:

- Choose a coastal creature or habitat
- Research it (books, websites, videos)
- Create a fact file or poster with:
  - Name and photo
  - Habitat and location
  - What it eats
  - Adaptations (special features that help it survive)
  - Threats (what harms it)
  - How to help
- Bring it to school to display

Activity 8: "Take It to Your Local Coast" Mini-Challenges
For families visiting a coast:

- Challenge 1: Habitat Comparison Visit a coastal habitat you learned about in school. Compare it to the photos in the workbook. What's the same? What's different? What surprised you?
- Challenge 2: Creature Hunt Find as many different creatures as you can. Sketch or photograph them. Try to identify them. How many did you find?
- Challenge 3: Evidence of Change Look for evidence of erosion, pollution, or ecological enhancement. Take photos. Discuss: What's changing? Why? What could help?
- Challenge 4: Interview a Local Expert If possible, talk to a local ranger, fisherman, or resident. Ask: What's changed about this coast? What's the biggest challenge? What gives you hope?