BLUE MARINE FOUNDATION

Journey to a Healthy Ocean

FACILITATION GUIDEBOOK

Why Guide Students on This Journey?

An immersive underwater experience that matters

Learning Outcomes

By the end of Journey to a Healthy Ocean, students will be able to:

- ☐ Understand why a healthy ocean is necessary for a healthy climate
- ☐ Communicate the importance of blue carbon habitats to inspire change
- ☐ Apply scientific survey techniques to collect data and make conclusions about the effectiveness of Marine Protected Areas
- ☐ Make informed decisions regarding the ocean and its resources in a fisheries management simulation

Background

We are moving into a critical decade for ocean conservation, where highlighting and acting on the link between the ocean and climate change has never been more pressing. In addition to encouraging local support for conservation initiatives, there is an urgent need for young people to understand the key principles of climate change and how this is impacting the ocean. It is equally important for them to feel empowered and hopeful about securing a more sustainable future considering this immense global challenge.

Marine climate change issues are poorly communicated despite the central role of the ocean in the carbon cycle, where it dissolves more than 1 million tonnes of man-made CO_2 every hour. Young people are demanding more climate action, and so they deserve more high-quality climate education that will encourage critical thinking and improve their scientific skills.

Climate education must be appropriate for various age groups with a strong focus on action-based learning rather than just knowledge building. BLUE believes that now is the time to deliver climate content that is more likely to encourage behaviour change, which includes topics around mitigation, adaptation and solutions.

Science Curriculum Links

	UK National Curriculum	**US** NGSS	**Canada** Ontario Curriculum	**Australia** Australian Curriculum
Primary School	**Key Stage 2** Working scientifically: - Taking measurements - Recording data - Using results to draw conclusions Year 4: - Living things and their habitats - Animals, including humans Year 5: - Living things and their habitats Year 6: - Living things and their habitats - Evolution and inheritance	**Grades 3-5** Third Grade: - 3.Interdependent relationships in ecosystems - 3.Inheritance and variation of traits: life cycles and traits - 3.Weather and climate Fifth Grade: - 5.Matter and energy in organisms and ecosystems - 5.Earth's systems	**Grades 3-6** Grade 4: ULS - Habitats and communities - Overall expectations 1, 2, 3 Grade 5: UESS - Conservation of energy and resources - Overall expectation 1 Grade 6: ULS - Biodiversity - Overall expectations 1 and 3	**Years 3-6** Year 3: Biological sciences - ACSSU044 Year 4: Biological sciences - ACSSU072 - ACSSU073 Year 5: Biological sciences - ACSSU043 Year 6: Biological sciences - ACSSU094
Middle School	**Key Stage 3** Working scientifically: - Experimental skills and investigations - Analysis and evaluation Biology: - Relationships in an ecosystem - Genetics and evolution 	**Grades 6-8** - MS.Matter and energy in organisms and ecosystems - MS.Interdependent relationships in ecosystems -MS.Weather and climate -MS.Human impacts - Analyzing and interpreting data	**Grades 7-8** Grade 7: ULS - Interactions in the Environment - Overall expectations 1, 2, 3 Grade 8: UESS - Water Systems - Overall expectations 1 and 3 	**Years 7-9** Year 7: Biological sciences - ACSSU111 - ACSSU112 Year 8: Science inquiry skills - ACSIS144 - ACSIS145 - ACSIS146 - ACSIS148 Year 9: Biological sciences - ACSSU176

	UK National Curriculum	**US** NGSS	**Canada** Ontario Curriculum	**Australia** Australian Curriculum
High School	**Key Stage 4** Working scientifically: - Experimental skills and strategies - Analysis and evaluation Biology: - Ecosystems - Evolution, inheritance and variation	**Grades 9-12** -HS.Interdependent relationships in ecosystems -HS.Natural selection and evolution -HS.Earth's systems -HS.Weather and climate -HS.Human sustainability	**Grades 9-10** Grade 9: Biology: Sustainable ecosystems - Overall expectations B1, B2, B3 Grade 10: Earth and space science: Climate change - Overall expectations D1, D2, D3	**Year 10** Year 10: Biological sciences - ACSSU185 Earth and space sciences - ACSSU189 
Sr. High School	**GCSE Biology** 4.6 Inheritance, variation and evolution - 4.6.2 Variation and evolution 4.7 Ecology - 4.7.1 Adaptations, interdependence and competition - 4.7.2 Organisation of an ecosystem - 4.7.3 Biodiversity and the effect of human interaction on ecosystems - 4.7.5 Food production 	**N/A**	**Biology** Grade 11: Diversity of Living Things: - Overall Expectations B1, B2, B3 Evolution: - Overall Expectations C1, C2, C3 Grade 12: Population Dynamics: - Overall expectations F1 and F3 Environmental Science Grade 11: Scientific solutions to contemporary environmental challenges - Overall expectations B1 and B3	**Biology** Unit 1 - Biodiversity targets - Marine reserves - Keystone species and conservation Unit 3: - Sustainable population size and reserve area Earth Science Unit 3: - Maximum sustainable yield models and fisheries - Food security and protecting agricultural biodiversity Unit 4: - Predicting future climate change and identifying action

Plan Their Journey

Design your own itinerary

RESOURCES

1

This guide: START HERE
Like a destination guidebook, use this guide to "plan your trip". Learn the background information you need to support your students and discover how to tailor the resources to your time allocation and learning context.

2

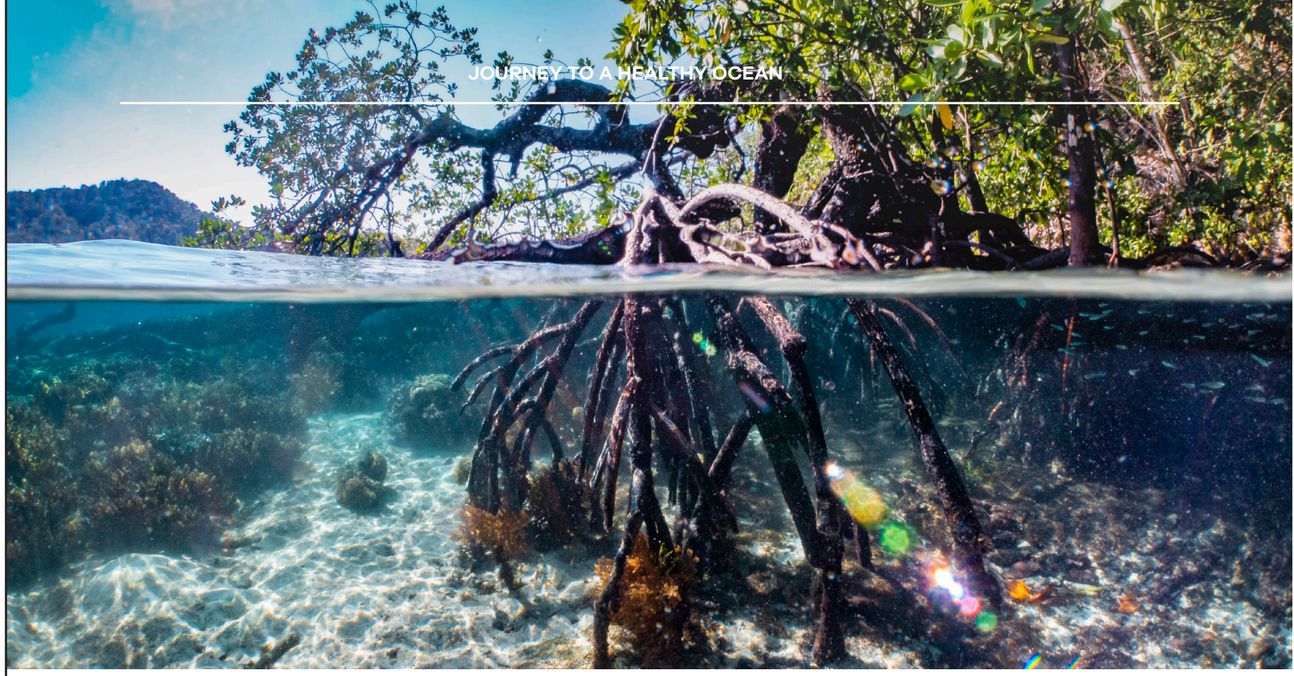
Web experience:
3 separate journeys with immersive, interactive content.
Each will take approximately 10 minutes to explore. Experience the underwater world while learning what is needed for a healthy ocean and healthy climate.

3

Student Activity Journal:
This document is the student's resource for activities. Activity Journals contain background information and the steps to guide students through each activity. Print these or have students complete them digitally (we recommend this to save paper and ink, if possible).

4

Content Slides:
This deck is a presentation aid to support you with guiding content, discussions and activities. Notes are provided for you with additional content. Tailor it by hiding any slides you don't wish to show. Slides are grouped in sections (like chapters) by the journey topic to help you organise content.



ITINERARIES

In 3 classes: This is the recommended length. Complete one journey per class by briefly overviewing the content slides, completing the web experience, and then guiding the students in the activity for each journey.

Homeschool or self-directed: Read through the content slides to support the learning. Use the discussion prompts as journal prompts. Work through the Student Activity Journal independently.

In 5-6 classes: Do you have more time for an even deeper dive? Follow the 3-class plan, taking your time with the discussion prompts in the slide notes and adding in the activity elaborations. Explore some of the resources at the end of this guide for additional discussion and extension.

Hybrid: Assign students web experiences to complete asynchronously, then come together for content and activities. Students may complete and submit the Student Activity Journal digitally.

In 60 mins: Only have one class? That's ok! Assign web experiences for students to complete prior to class. Then, select some content to discuss together and choose 1-2 activities to complete in class. Alternatively, explore the web experiences in class and assign an activity or a reflection task for homework (the Media Campaign and MPA Survey activities work best for this).

Tech-minimal: Complete the web experiences together as a class or book a computer lab and let students explore them all at once, giving them prompts to discuss later in class (the content slides have suggestions for this). Print out slides as presentation notes for yourself and make hard copies of the student activity journal.

RAINFORESTS OF THE SEA

Underwater coastal ecosystems teeming with marine life

Journey Overview

RAINFORESTS OF THE SEA introduces students to the importance of blue carbon habitats for the Earth's climate.

We recommend that this is the first journey you complete and that you explore it in the following order:

- ☐ Introduction and RAINFORESTS content slides
- ☐ RAINFORESTS web experience
- ☐ Media Campaign activity

Learning Objectives

By the end of this journey, students will:

- ☐ Understand that blue carbon habitats are coastal ecosystems that store carbon, reducing the impacts of global warming
- ☐ Communicate the importance of blue carbon habitats through media to inspire change

Activity: MEDIA CAMPAIGN

Overview
In 2019, Blue Marine launched the #ProtectMaldivesSeagrass social media campaign to persuade resorts to stop removing seagrass to make clear lagoons for their guests. In 3 months, the campaign protected 830,000m² of seagrass!

In this activity, students will plan and create visual media to educate and persuade people to protect blue carbon habitats.

In 15 mins
Use the Instagram posts provided in the student resources to discuss the positive impact (social) media campaigns can have. Then, students plan their own campaigns.

In 30 mins
As above. Then, create a poster or digital social graphic with Adobe Spark or Canva. Students may need to complete the activity at home.

In 60+ mins
As a class, explore the Twitter and Instagram campaign #ProtectMaldivesSeagrass. Then, follow the 30 min plan. Complete in class.

Elaborations and Extensions

- ☐ Get social! Create a class hashtag and share on a class (or the school's) social media page as a campaign.
- ☐ Share with just your peers on a Padlet, or a class webpage or blog.
- ☐ Create a class gallery wall in a school hallway to share posters.

PROTECTING THE UNDERWATER WORLD

Areas of ocean safe from human impact

Journey Overview

PROTECTING THE UNDERWATER WORLD introduces students to Marine Protected Areas (MPAs) as a way of improving the resilience of marine ecosystems under pressure.

We recommend that this is the second journey you complete and that you explore it in the following order:

- ☐ PROTECTING content slides
- ☐ PROTECTING web experinece
- ☐ MPA Survey activity

Learning Objectives

By the end of this journey, students will:

- ☐ Understand what MPAs are and why they are needed
- ☐ Apply scientific survey techniques to collect data and make conclusions about the effectiveness of MPAs

Activity: MPA SURVEY

Overview
MPAs provide safe havens for marine ecosystems to recover from the pressure of human activities. Scientists monitor MPAs with underwater surveys to measure the impacts of protected areas.

In this activity, students will learn scientific survey methods and apply them to collect data on the health of marine ecosystems.

In 15 mins
Complete the quadrat survey in the Student Activity Journal

In 30 mins
Have the students explore the RAINFORESTS OF THE SEA journey again. This time, they will imagine they are swimming a transect and recording the marine life they see. All instructions and data sheets are in the Student Activity Journal

In 60+ mins
Complete both of the activities listed above.

Elaborations and Extensions

- ☐ Challenge students with collecting data from a video recording of an actual MPA! Check out https://vimeo.com/user17565480
- ☐ Ask students to compare data? How do their data compare? Discuss error.

THE OCEAN'S WEB OF LIFE

Everything is interconnected

Journey Overview

THE OCEAN'S WEB OF LIFE introduces students to the pressures put on marine ecosystems by overfishing.

We recommend that this is the final journey you complete and that you explore it in the following order:

- ☐ WEB OF LIFE content slides
- ☐ WEB OF LIFE web experience
- ☐ MPA Survey activity
- ☐ Conclude & Reflect content slides to wrap-up the entire experience

Learning Objectives

By the end of this journey, students will:

- ☐ Understand that a healthy ocean is more resilient to the impacts of climate change and that overfishing threatens ocean health
- ☐ Make informed decisions regarding the ocean and its resources in a fisheries management simulation

Activity: MANAGE A FISHERY

Overview
When fish populations are decimated by overfishing, it makes the population less genetically resilient to environmental changes. This is especially problematic in the face of climate change.

In this activity, students will take part in a fishing simulation to observe the effects of overfishing on population genetics.

In 15 mins
Complete Part 1 of the fishing simulation and make suggestions for sustainable management.

In 30 mins
Test sustainable management techniques in Part 2 of the fishing simulation.

In 60+ mins
Complete both rounds of the fishing and the management case study in small groups.

Elaborations and Extensions

- ☐ Research different fishing gear types and their impacts on the marine environment.
- ☐ Learn about indigenous and traditional fishing methods and gear.
- ☐ For Senior Biology & Environmental Science, dig deeper with the extension options.

Resources

Keep exploring

BLUE CARBON HABITATS

Blue Marine Foundation's **#ProtectMaldivesSeagrass** Campaign
http://www.maldivesresilientreefs.com/seagrass/

McKinsey for Kids' "A Tiger's Tale About What Nature is Really Worth"
https://www.mckinsey.com/featured-insights/mckinsey-for-kids/a-tigers-tale-about-what-nature-is-really-worth#

MARINE PROTECTED AREAS

Protected Planet - Explore global Marine Protected Area coverage
https://www.protectedplanet.net/en/thematic-areas/marine-protected-areas

Campaign for Nature - 30x30
https://www.campaignfornature.org/why-30-1

SUSTAINABLE FISHING

PBS - Marine Fisheries & Aquaculture Series Classroom Activities
https://www.pbs.org/emptyoceans/educators/activities.html

VIDEO

Sylvia Earle's (2009) TED Prize winning talk: "My Wish: Protect Our Oceans" (17:55)
https://www.ted.com/talks/sylvia_earle_my_wish_protect_our_oceans?language=en

IUCN - Mediterranean Marine Protected Areas as nature-based solutions to climate change (4:06)
https://youtu.be/fnz-JszBVNM

TED-Ed - What is the tragedy of the commons? (4:15)
https://youtu.be/CxC161GvMPc

OCEAN & CLIMATE

Ocean & Climate Platform
https://ocean-climate.org/en/home-2/

TAKE ACTION

Blue Marine Foundation

Ocean Networks - Citizen science activities for students
https://www.oceannetworks.ca/learning/get-involved/citizen-science

Glossary

Define your journey

Acidification - as the ocean absorbs carbon dioxide (CO_2) it causes the pH to drop, becoming more acidic over time

Blue carbon - the carbon that is captured and locked away by ocean habitats such as mangroves, coastal salt marshes and seagrass meadows

Bottleneck effect - when a population's size is reduced there is less genetic variation and ability to adapt to environmental pressures

Carbon cycle - the process of carbon travelling between the atmosphere and Earth

Carbon sink - a natural or artificial reservoir that absorbs more carbon from the atmosphere than it releases

Climate change - the long-term shift of the Earth's temperature and weather patterns

Exclusive Economic Zone (EEZ) - the coastal region within 200 nautical miles where a nation has sole rights for exploring, exploiting, conserving and managing natural resources

Gear type - The tools used to catch fish; include pole and line, longline, trawling, bottom trawling, and purse seine

Genetic drift - the shift in the genetic makeup of a population over generations; its effect is strongest in small populations

Greenhouse gas - gases in the Earth's atmosphere that trap heat; they include water vapor, carbon dioxide, methane, oxone, nitrous oxide, and chlorofluorocarbons

Invasive species - species that have inhabited a new environment outside of their normal ranges. They are often better suited to the new environment and face less predation which can lead to overpopulation and have negative impacts on other organisms and the environment

Marine Protected Area (MPA) - a geographic area of the ocean that limit human activities in order to protect marine ecosystems

Overfishing - when fish are caught faster than they can be replaced by reproduction

Phytoplankton - photosynthetic organisms that drift with the current

Quadrat sampling - a method of estimating the abundance of slow moving or non-moving organisms by taking square metre samples (quadrats)

Spillover effect - a benefit of MPAs where protected marine life is able to grow and multiply before 'spilling over' into the surrounding area

Tragedy of the Commons- fisheries provide the classic example of the tragedy of the commons, which occurs when property rights are incomplete and access to a resource is open. The migratory nature of most fish species makes it difficult to establish and protect rights to fish in the sea, so the rule of capture prevails at the expense of other individuals

Transect survey - a method of estimating the abundance of organisms by surveying along a line that is laid through the habitat

Trophic cascade - an ecosystem-wide effect triggered by the addition or removal of a top predator, causing changes in abundance down the food chain

Educational resources designed by
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