

OCEAN: LIFE, FLOW, CHANGE

CANADIAN
Geographic
EDUCATION

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OCEAN: LIFE, FLOW, CHANGE

Introduction

The ocean is an ever-changing underwater landscape. When it comes to mapping our world, political boundaries and topographic lines are a familiar sight. However, despite the fact that the ocean covers more than two-thirds of our planet, it is often relegated to the background of these maps.

This education resource places the focus on the life, flow, and change found within the ocean. Going beyond just bathymetry, the accompanying Ocean Tiled Map combines different elements to capture ocean patterns and present a meaningful and cohesive view of the world ocean. The five learning activities included in this resource encourage students to explore the map and engage with the themes of life, flow, and change. In order to protect the ocean for future generations, it is important to see the ocean as a living space.

When you piece together and explore the Ocean Tiled Map, you will see that green saturates the map, revealing something that isn't visible to the human eye but is essential to a living and thriving marine ecosystem. The fundamental building blocks of life in the ocean are phytoplankton — tiny creatures that absorb carbon dioxide and sunlight to produce energy. Phytoplankton accounts for primary ocean productivity and are the best representation of life in the ocean. This ocean map shows where they live and grow, revealing biodiversity hot spots.

Life doesn't exist in a vacuum, and that is as true for marine ecosystems as everywhere else on the planet. To illustrate how life is affected by the dynamic movement of water, this map features the flow and temperature of surface ocean currents. The red and blue swirls simplify the patterns of ocean currents, allowing for a glimpse into this profoundly complex global system.

All life is in a constant state of change, shifting over seasons and years, but human actions have severely altered these natural rhythms. Like much of the planet, the ocean has not escaped the effects of climate change. Looking toward the poles, this map highlights just how much change the ocean has undergone with the loss of sea ice over recent decades.

Canadian Geographic Education is excited to offer this learning resource to teachers and students across Canada through the support of the National Geographic Society. We encourage teachers to share their experiences using these resources and connect with us at info@cangeoeducation.ca or on social media @CanGeoEdu.



OCEAN: LIFE, FLOW, CHANGE

Table of contents

■ USING A TILED MAP

Learn tips and tricks about how to use a Tiled Map in your classroom.

■ 1: MAKING CONNECTIONS

This learning activity will introduce the Ocean Tiled Map and highlight the many layers depicted on the map. Students will explore each layer and discuss how each layer plays a role in the flow, life and change of the ocean.

■ 2: OCEAN LIFE

This learning activity will help students discuss, investigate and explore life in the world ocean. Students will use the Ocean Tiled Map to learn about animal migration routes, the ocean food chain, dead zones, and the connections humans have with the ocean.

■ 3: OCEAN FLOW

This learning activity will help students learn about the world ocean as a moving system. Students will use the Ocean Tiled Map to learn about ocean currents and the effect they have on life on the planet.

■ 4: OCEAN CHANGE

This learning activity will use the information provided on the Ocean Tiled Map to encourage discussions about the impact of climate change around the globe. Students will examine climate change maps as well as investigate the effects that changes in sea ice are having on Arctic communities.

■ 5: OCEANS STORYMAP EXPLORATION

This learning activity will teach students about a variety of issues affecting the ocean. Students will use the Ocean StoryMap to investigate how images and layers on maps can be used to convey information and important messages about the ocean.



OCEAN: LIFE, FLOW, CHANGE

Using a Tiled Map

Tiled Maps are a fun, engaging and hands-on resource that students of all ages can enjoy. Think of a Tiled Map as a puzzle — where each tile contains valuable information to form a larger picture — in this case, a map.

Tiled Maps are:

- an easy way to introduce your students to new perspectives
- great for group work or exploration
- portable and can be used outside the classroom on field trips and excursions
- versatile — you can add labels, annotations, and notes to document ideas and relevant information

Pedagogical approaches to using Tiled Maps

- **Individual Tiles:** Used individually, the map tiles can be examined to understand how smaller locales contribute to the bigger picture. Each student can study and research their locale and then share what they've learned with their classmates. Have your students identify key features and patterns, such as natural resources, land use, religious or ethnic communities, and transportation corridors. Ask them to consider how this type of geo-inquiry can provide a mosaic of information when the individual tiles are put together to form a complete map.
- **Full maps:** As a whole, the Tiled Maps can be used to explore or discuss ideas with the entire class. Printing out duplicate maps enables groups to work from a common base or template to map out ideas for land-use planning, habitat protection, transportation, etc. They can then use their maps to compare ideas with other groups.

Tips

- Laminate the tiles, so you can use them again and again. Use a whiteboard marker to temporarily record students' ideas. Have students write on the tiles to provide a more permanent record of their work (easier for assessment).
- Tiled Maps can be pieced together on the floor or you can use a blank wall in your classroom or school to display the map for longer periods of time.
- Print out several copies of the same map to allow students to work in smaller groups.

1. Making Connections

Overview:

This learning activity will introduce the Ocean Tiled Map and highlight the layers depicted on the map. Students will explore each layer and discuss how each layer plays a role in the life, flow, and change of the ocean.

Time:

75 minutes (can be adapted to fit one or multiple class periods)

Grade:

The activities provided in this learning activity can be adapted for elementary, intermediate and secondary students.

Materials:

- Ocean Tiled Map
- Legend Information Sheet
- Coloured string or yarn (not included)
- Bingo chips (not included)

Learning objectives:

In this activity, students will:

- Explore the Ocean Tiled Map to understand the vastness of the world ocean.
- Discuss how people are connected to the ocean.
- Investigate the different layers of the Ocean Tiled Map under the categories of life, flow and change.

Introduction: Using the map

Write the word “ocean” on the board and, as a class, discuss what students imagine when they think about the ocean. Explain to students that while there are names for different ocean basins, such as Atlantic or Indian, there is one global ocean. Ask students to think about any personal experiences they might have had with the ocean or how the ocean is portrayed in stories, pictures and movies. On the board, or virtually, create a mind map about all the words that come to mind in connection to the ocean. Which words stand out the most?

Next, have students piece together the Ocean Tiled Map as a class. As students are putting the tiles together, encourage them to explore the content that is on each tile and make notes of what they see.

Once the Tiled Map has been completed, have students stand or sit around the map and share what they learned. Alternatively, ask students what stands out to them the most on this map.

Diving deeper

Explain to students that all maps tell a story and that this map focuses on the life, flow and change of the world ocean. The following activities will help students learn about each layer on the map as a starting point to learning about how different species (including humans) are affected by ocean systems and climate change. The remaining learning activities in this teacher’s guide will help students learn about each layer in more depth.

Activity: Life

Ask students how ocean life is displayed on this map. Explain that the green displayed on the map represents phytoplankton, or tiny floating ocean plant organisms, which absorb carbon dioxide. Using the Legend Information Sheet, read about the role phytoplankton play in the oceans and how they contribute to all living things living in the oceans. Have students use the bingo chips to highlight key areas on the map where there are significant amounts of phytoplankton. What patterns and trends do they notice?

Next, bring attention to the coral reefs displayed on the map. Explain to students that the purple colour represents coral reefs and that the map displays both deep water corals and shallow water corals. Use the Legend Information Sheet to learn more about the difference between them. Have students use bingo chips to locate where coral reefs can be found on the map.

Activity: Flow

Another layer on this map are ocean currents. These currents represent the patterns of water flow throughout the ocean. Explain to students that ocean currents are important because they help control the climate and carry food to sea life that only lives in one place. Ocean currents are created by wind, water temperature, and salt content. Even the gravity of the moon plays a role in the creation of ocean currents. Use the Legend Information Sheet to learn more



1. Making Connections

Connection to the Canadian Geography Framework:

Concepts of Geographic Thinking

- Patterns and trends
- Interrelationships
- Spatial significance

Inquiry Process

- Formulate questions
- Gather and organize

Geospatial Skills

- Foundational elements
- Spatial representations

about what makes the currents on this particular map unique. Explore the map to identify various warm and cold ocean currents and discuss any patterns or trends that arise. Bring attention to the ocean temperature inset map displayed at the bottom left corner of the map and ask students what comparisons they can make between the ocean temperature and the ocean currents displayed on the map. Finally, have students use coloured string or bingo chips to identify large warm and cold ocean currents.

Activity: Change

The third main theme of the map is change. Ask students to examine the map and share ideas on how change is represented on the map. Explain that change is depicted through sea ice. This map uses dates as well as arrows to show the changes in sea ice. Divide students into two groups — one group representing the Arctic region and one group representing the Antarctic region. Allow time for each group to explore their region and look at how sea ice is depicted in their region and how change is shown. Using the coloured string and the information on the legend, have students use the string to highlight the current extent of sea ice displayed on the map. Once each group has mapped their sea ice extent, allow time for students to discuss patterns and trends they notice and to compare what is similar and different in both regions, as well as to make observations about how sea ice has changed from historical extent.

Taking Action

Whether students have personally visited the ocean or have seen it in an image or video, most people have an image of the ocean or an idea of the types of characteristics associated with the ocean. Have students think about their own connection to the ocean and ask them to write a reflection piece about their experience. This reflection can be in the form of a poem, a drawing, a journal entry, or whichever method they choose. Afterwards, allow time for students to share their thoughts and conclude with a discussion about why it is important to protect the ocean.

1. Making Connections

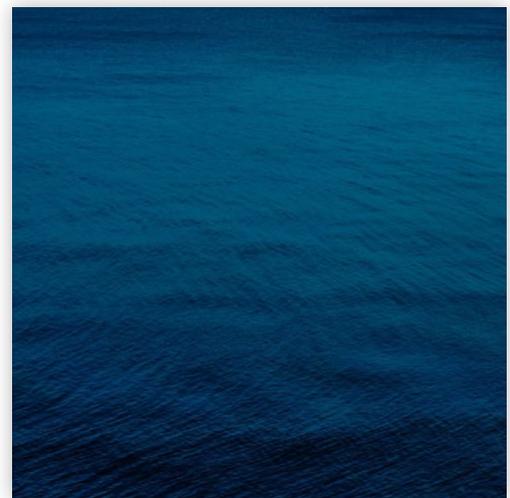
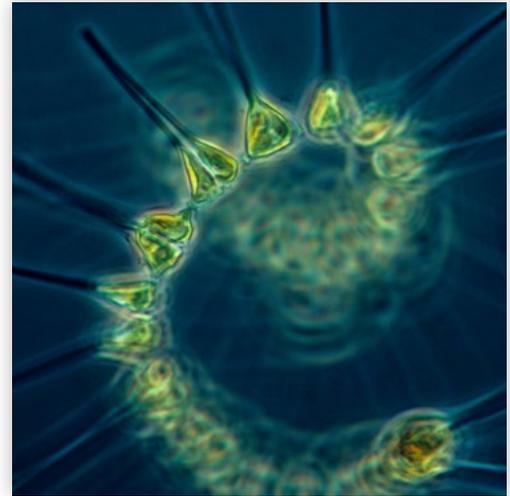
LEGEND INFORMATION SHEET

Ocean life

- **PRODUCTIVITY:** Phytoplankton, or tiny floating ocean plant organisms, absorb half of the planet's carbon dioxide, using it, along with sunlight, to grow. These phytoplankton form the foundation of all life in the ocean, as they are eaten by tiny animals, which are in turn eaten by larger animals, all the way up the food chain to whales and sharks. Recent advancements in ocean-observing satellite technology have allowed us to get a clear picture of where phytoplankton live and grow (the green pattern shown on this map). The open ocean is the least productive. By far, the most productive areas of the ocean are along continental shelves, where nutrients are pushed up from the bottom of the ocean in a process known as upwelling and at the mouths of rivers where nutrients are collected along the rivers' ocean-ward journey, stimulating massive phytoplankton growth. The productivity of phytoplankton shown on this map is the average productivity for the period between 2003 and 2017.
- **CORAL REEFS:** Deep-sea corals and warm-water corals are displayed on the map. Deep-sea corals are coral reefs located in water deeper than 50 metres. They can be found throughout the world ocean in tropical and polar regions. Warm-water corals are found in warm, shallow, tropical waters.

Surface ocean currents:

- Ocean currents are continuous, predictable movement of seawater caused by wind, water temperature, salt content, and the gravity of the moon. Ocean currents play an important part in regulating climate around the globe. They also transport food to animals that do not migrate. Ocean water moves in two directions — vertically and horizontally. Ocean water moving vertically is referred to as currents and water moving horizontally is called upwellings or downwellings.
- The ocean currents displayed on this map are surface ocean currents. The flow of surface ocean currents varies from moment to moment and from season to season. There are, however, some consistent general patterns, where strong and fast currents tend to follow regular paths. The flow arrows shown on the main map represent these observed patterns of surface flow. Currents described as "cold" are those where the water flowing into an area is colder than the waters they are flowing into, and the "warm" currents are warmer than the waters they are flowing into.



2. Ocean Life

Overview:

This learning activity will help students discuss, investigate and explore life in the ocean. Students will use the Ocean Tiled Map to learn about animal migration routes, the ocean food chain, dead zones, and the connections humans have with the ocean.

Time:

75 minutes (can be adapted to fit one or multiple class periods)

Grade:

The activities provided in this learning activity can be adapted for elementary, intermediate and secondary students.

Materials:

- Ocean Tiled Map
- Wildlife Migration Cards
- Wildlife Migration Template
- Aquatic Dead Zone Map
- Bingo chips (not included)
- Coloured string (not included)

Learning objectives:

In this activity, students will:

- Use the Ocean Tiled Map to learn about life in the ocean.
- Discuss the human connection to the ocean and the impact humans have on it.
- Map out animal migration routes to learn about how various marine animals move around the ocean.
- Map dead zones located around the world and discuss the impact they have on ocean life.

Introduction: Using the map

As a class, piece together the Ocean Tiled Map. Once students have completed the map, explain to students that they will be focusing on ocean life. Use the following discussion questions as a way to introduce the topic of life when using this map and to refresh students on what was discussed in the first learning activity “Making Connections” about how to read the layers on this map.

- *How is life depicted on this map?*
- *How are humans connected to the ocean?*
- *What does the ocean provide to humans?*
- *How does ocean health influence life in and out of the ocean?*

Diving deeper

There are many ways to use the Ocean Tiled Map to examine and explore life in the ocean and human connections to the ocean. The following two activities are examples of how the Ocean Tiled Map can help strengthen the conversation around ocean life.

Activity: Animal Migration

As a class, brainstorm examples of marine animals. This can be turned into a game by having students match an animal to each letter of their name or each letter of the alphabet. Next, explain that animals, like humans, migrate to new places. Ask students to think of reasons why an animal would migrate. Common answers are: food, seeking warmer or cooler water temperature, changing seasons, and breeding.

Using the Wildlife Migration Cards provided, introduce animals that are commonly found in Canada as examples of animals that migrate. Have students use bingo chips or coloured string to map out each animal’s migration route on the Tiled Map.

Next, distribute the Wildlife Migration Template and have students select their own ocean animal to research. Have students complete their template and then map their new animal’s migration route on the Ocean Tiled Map.

Activity: Mapping Dead Zones

Explain to students that a “dead zone” refers to an area in the water that has reduced or very low oxygen levels in the water (this is also referred to as hypoxia). This results in low ocean biodiversity in these areas because very few organisms or species can survive these conditions. Using the Aquatic Dead Zone Map provided, have students use bingo chips or coloured string to identify where these dead zones are located. Afterwards, discuss with students any patterns or trends they notice about the location of these dead zones and how these zones may affect the ocean habitats nearby. Conclude this activity by discussing what humans can do to avoid the growth and expansion of these dead zones.



2. Ocean Life

Connection to the Canadian Geography Framework:

Concepts of Geographic Thinking

- Patterns and trends
- Interrelationships
- Geographic perspective
- Spatial significance

Inquiry Process

- Formulate questions
- Gather and organize
- Interpret and analyse
- Evaluate and draw conclusions

Geospatial Skills

- Foundational elements
- Spatial representations

Taking Action

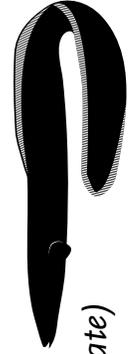
[Explore.org](https://www.explore.org/) is a multimedia organization that provides livestream footage of many different habitats from around the planet. Share this website with students and encourage them to explore the ocean habitats under the [ocean tab](#). Next, have students select one ocean habitat and create a diagram or model of this habitat using recycled materials. As students are learning about these ocean habitats, ask students to note any challenges these habitats are facing and what can be done to protect them.

2. Ocean Life

WILDLIFE MIGRATION CARDS

ASSG. 2014. The IUCN Red List of Threatened Species. Version 2014.3. iucnredlist.org. Downloaded on 28 November 2014. Augmented by life-cycle maps from Department of Fisheries and Oceans: dfo-mpo.gc.ca/species-especes/species-especes/eel-anguille-eng.htm • ASSG. 2014. La liste rouge de l'UICN des espèces menacées. Version 2014.3. iucnredlist.org. Téléchargée le 28 novembre 2014. Données obtenues par les cartes du cycle de vie du ministère des Pêches et des Océans : dfo-mpo.gc.ca/species-especes/species-especes/eel-anguille-fra.htm

Species cards • Cartes des espèces



American Eel • Anguille d'Amérique (*Anguilla rostrata*)

2. Ocean Life

WILDLIFE MIGRATION CARDS

American Eel • Anguille d'Amérique (*Anguilla rostrata*)

Canadian origin: Eastern Canada, including the St. Lawrence River, Ottawa River, Gulf of St. Lawrence, and off the coast of Newfoundland and Labrador

Destination: Sargasso Sea from the Bahamas to Bermuda

Habitat: The American eel is a bottom-dwelling catadromous (migrates from fresh water into the sea to spawn) fish found in eastern Canada and United States. They can be found in various habitats, such as streams, rivers and muddy or silt-bottomed lakes during their freshwater stage, as well as oceanic waters, coastal bays, and estuaries during their marine stage.

Food sources: Eels are generalists, which means they will eat almost any small aquatic organism they can, including crustaceans, small fish and insects.

Fun fact: Eels are nocturnal and therefore feed at night, so they rely on their keen sense of smell to find food.

Distribution au Canada : Est du Canada, notamment dans le fleuve Saint-Laurent, la rivière des Outaouais, le golfe du Saint-Laurent et sur les côtes de Terre-Neuve-et-Labrador

Migration : Elle rejoint la mer des Sargasses entre les Bahamas et les Bermudes.

Habitat : L'anguille d'Amérique est un poisson benthique catadrome (qui vit en eau douce et migre en mer pour frayer) qui se rencontre dans l'est du Canada et des États-Unis. Elle se rencontre dans divers habitats, notamment les ruisseaux, les rivières ou les lacs aux fonds boueux ou vaseux pendant leur stade continental et dans les eaux marines et côtières, dans les baies côtières et les estuaires pendant leur stade marin.

Alimentation : L'anguille se nourrit pratiquement de tous les petits organismes aquatiques qu'elle trouve, notamment de crustacés, de petits poissons et d'insectes.

Fait intéressant : L'anguille est nocturne, elle se nourrit ainsi la nuit et doit donc compter sur son odorat très fin pour trouver sa nourriture.



Status: **Endangered**

Statut: **Menacée**

2. Ocean Life

WILDLIFE MIGRATION CARDS

IUCN (International Union for Conservation of Nature). 2014. The IUCN Red List of Threatened Species. Version 2014.3. iucnredlist.org. Downloaded on 28 November 2014.
UICN (Union Internationale pour la Conservation de la Nature). 2014. La liste rouge de l'UICN des espèces menacées. Version 2014.3. iucnredlist.org. Téléchargée le 28 novembre 2014.

Species cards · Cartes des espèces



Leatherback Sea Turtle · Tortue luth
(*Dermochelys coriacea*)

2. Ocean Life

WILDLIFE MIGRATION CARDS

Leatherback Sea Turtle • Tortue luth (*Dermochelys coriacea*)

Canadian origin: Atlantic and Pacific Canadian coastlines

Destination: Caribbean, eastern Mexico and western Africa (eastern populations), western Mexico, Costa Rica, Indonesia, the Solomon Islands, and Papua New Guinea (western populations)

Habitat: Leatherbacks have the widest global distribution of all reptile species and inhabit every ocean except the Arctic. They can be found in the tropic and temperate waters of the Atlantic, Pacific and Indian oceans, as well as the Mediterranean Sea. Female leatherbacks return to their natal beaches during breeding season to nest and lay their eggs.

Food sources: Leatherbacks primarily eat jellyfish, but also feed on other soft-bodied organisms, such as tunicates and cephalopods — and sometimes floating plastic bags, which can be deadly.

Fun facts: Leatherbacks are the largest turtles on Earth, growing up to 2.5 metres long and exceeding 900 kilograms. Leatherbacks can dive to depths of 1,280 metres — deeper than any other turtle — and can stay down for up to 85 minutes.

Distribution au Canada : Côtes pacifique et atlantique du Canada

Migration : Les populations de l'Est rejoignent les Caraïbes, l'est du Mexique et l'Afrique de l'Ouest, alors que les populations de l'Ouest gagnent l'ouest du Mexique, le Costa Rica, l'Indonésie, les îles Salomon et la Papouasie-Nouvelle-Guinée.

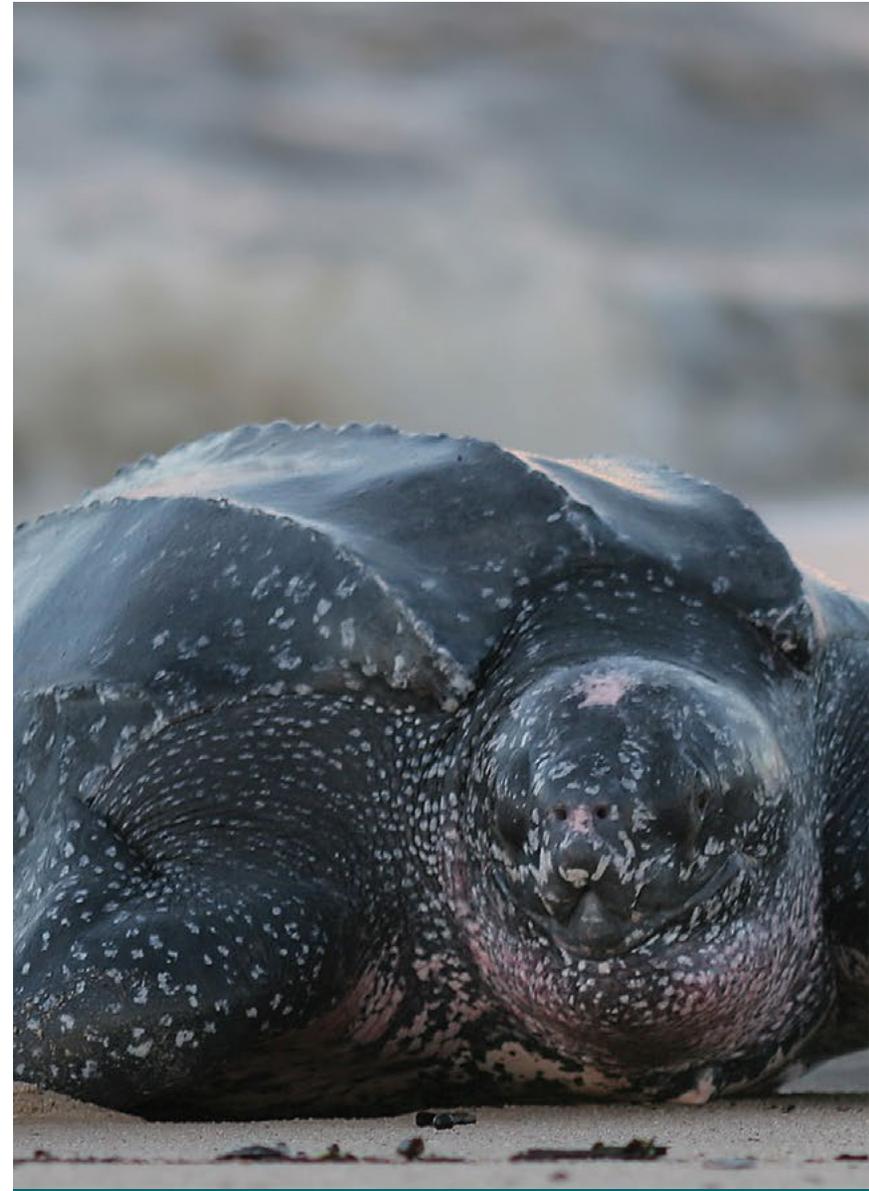
Habitat : De tous les reptiles, la tortue luth est l'espèce dont l'aire de distribution est la plus grande. On la retrouve dans tous les océans à l'exception de l'océan Arctique, notamment dans les eaux tropicales et tempérées des océans Atlantique, Pacifique et Indien ainsi que dans la mer Méditerranée. La tortue luth femelle retourne à sa plage natale pendant la période de reproduction pour y nicher et pondre.

Alimentation : La tortue luth se nourrit principalement de méduses et d'autres proies à corps mou comme les tuniciers et les céphalopodes, mais elle ingère parfois des sacs plastiques qui peuvent lui être mortels.

Fait intéressant : La tortue luth est la plus grosse tortue de la planète. Elle peut atteindre jusqu'à 2,5 mètres et peser plus de 900 kilogrammes. Elle peut plonger jusqu'à 1 280 mètres de profondeur, plus que toute autre tortue, et demeurer sous l'eau jusqu'à 85 minutes.

***Status:** The Atlantic and Pacific population are endangered

***Statut :** Les populations atlantique et pacifique sont en voie de disparition.



Status: **Endangered***

Statut: **En voie de disparition***

2. Ocean Life

WILDLIFE MIGRATION CARDS

IUCN (International Union for Conservation of Nature). 2014. The IUCN Red List of Threatened Species. Version 2014.3. iucnredlist.org.
Downloaded on 28 November 2014. • UICN (Union Internationale pour la Conservation de la Nature). 2014. La liste rouge de l'UICN des espèces menacées.
Version 2014.3. iucnredlist.org. Téléchargée le 28 novembre 2014.



Species cards • Cartes des espèces

North Atlantic Right Whale
Baleine noire de l'Atlantique Nord (*Eubalaena glacialis*)

2. Ocean Life

WILDLIFE MIGRATION CARDS

North Atlantic Right Whale

Baleine noire de l'Atlantique Nord

(*Eubalaena glacialis*)

Canadian origin: Lower Bay of Fundy, east of Grand Manan Island, Roseway Basin between Browns and Baccaro banks

Destination: Southeastern United States

Habitat: North Atlantic right whales are primarily found in coastal or continental shelf waters, although they have been known to move over deep waters. They follow the migrations of their food source, moving north in the summer and south in the winter.

Food sources: They feed on copepods and krill larvae by slowly swimming through patches of prey with their mouth open at or below the ocean's surface, a behaviour known as "skimming."

Fun facts: North Atlantic right whales are huge, reaching 18 metres for females and 12.9 metres for males, and can weigh up to 96,000 kilograms. These big whales eat the smallest foods, but with their huge appetite they can eat between 1,000 and 2,500 kilograms of copepods and krill every day.

Distribution au Canada : Embouchure de la baie de Fundy, est de l'île Grand Manan, bassin Roseway entre les bancs Browns et Baccaro

Migration : Sud-est des États-Unis

Habitat : La baleine noire de l'Atlantique Nord se rencontre principalement dans les eaux côtières et les eaux des plateaux continentaux, mais elle est parfois aussi observée en eaux profondes. Elle suit la migration des êtres dont elle se nourrit et se déplace ainsi au nord en été et au sud en hiver.

Alimentation : Elle se nourrit de copépodes et de krill en nageant lentement la bouche ouverte dans les essaims de proies situés en profondeur ou à la surface de l'eau (une méthode appelée écrémage).

Fait intéressant : La baleine noire de l'Atlantique Nord est immense. Elle peut peser jusqu'à 96 000 kilogrammes et la femelle peut mesurer 18 mètres alors que le mâle peut en mesurer jusqu'à 12,9. Cette énorme baleine se nourrit des plus petits organismes, mais elle est dotée d'un appétit colossal et peut ingérer de 1 000 à 2 500 kilogrammes de copépodes et de krill quotidiennement.



Status: **Endangered**

Statut: **En voie de disparition**

2. Ocean Life

WILDLIFE MIGRATION CARDS

IUCN (International Union for Conservation of Nature). 2014. The IUCN Red List of Threatened Species. Version 2014.3. iucnredlist.org. Downloaded on 28 November 2014. Skomal et al., Transequatorial Migrations by Basking Sharks in the Western Atlantic Ocean, *Current Biology* (2009), doi:10.1016/j.cub.2009.04.019 · UICN (Union Internationale pour la Conservation de la Nature). 2014. La liste rouge de l'UICN des espèces menacées. Version 2014.3. iucnredlist.org. Téléchargée le 28 novembre 2014. Skomal et al., Transequatorial Migrations by Basking Sharks in the Western Atlantic Ocean, *Current Biology* (2009), doi:10.1016/j.cub.2009.04.019 (disponible en anglais)

Species cards · Cartes des espèces



Basking Shark · Requin Pélerin (*Cetorhinus maximus*)

2. Ocean Life

WILDLIFE MIGRATION CARDS

Basking Shark · Requin Pélerin (*Cetorhinus maximus*)

Canadian origin: Southeast Atlantic Canada, near the Bay of Fundy (Atlantic population); Pacific Ocean (Pacific population)

Destination: Final destinations are unknown. In the northwest Atlantic Ocean, the basking shark is found from White Bay and Notre Dame Bay in northern Newfoundland, through the Gulf of St. Lawrence, on the Scotian Shelf and southward to Florida. Satellite tagging has confirmed basking sharks move thousands of kilometres south during the winter, seeking plankton blooms; some of the tagged sharks crossed the equator to reach Brazil.

Habitat: The basking shark will feed in the surface waters along productive coastal zones and continental shelf waters, along both the Pacific and Atlantic oceans. While migrating south for the winter, the sharks remain at great depths of between 200 and 1,000 metres for many weeks.

Food sources: Basking sharks are one of three filter-feeding sharks in the world. They swim with their mouths wide open and filter in zooplankton, small fish and invertebrates.

Fun fact: The basking shark is the second-largest fish in the world after the whale shark.

Distribution au Canada : La population de l'Atlantique se trouve dans le sud-est canadien de l'Atlantique, près de la baie de Fundy; la population du Pacifique se rencontre dans l'océan Pacifique.

Migration : Son lieu de migration final est inconnu. Dans le nord-ouest de l'océan Atlantique, le requin pèlerin se rencontre dans la zone comprise entre la baie White et la baie de Notre Dame sur la côte nord de Terre-Neuve, le golfe du Saint-Laurent, les eaux de la plate-forme Néo-Écossaise et jusqu'en Floride au sud. L'utilisation d'étiquettes satellites a permis de confirmer que le pèlerin parcourt des milliers de kilomètres vers le sud pendant l'hiver, à la recherche de grande concentration de planctons. Certains des requins étiquetés ont même traversé l'équateur pour atteindre les eaux du Brésil.

Habitat : La population du Pacifique et celle de l'Atlantique se nourrissent dans les eaux de surface des zones côtières et des plateaux continentaux où foisonne le plancton. Lorsqu'il migre vers le sud pour l'hiver, il demeure à de grandes profondeurs, soit entre 200 et 1 000 mètres, pendant de nombreuses semaines.

Alimentation : Le requin pèlerin est l'un des trois requins au monde qui se nourrit en filtrant l'eau. Il nage la gueule grande ouverte en filtrant du zooplancton, des petits poissons et des invertébrés.

Fait intéressant : Le requin pèlerin est le deuxième plus gros poisson du monde après le requin-baleine.

***Status:** The Atlantic population is Special Concern and the Pacific Population is Endangered.

***Statut :** La population de l'Atlantique est préoccupante tandis que la population du Pacifique est en voie de disparition.



Status: **Special Concern***

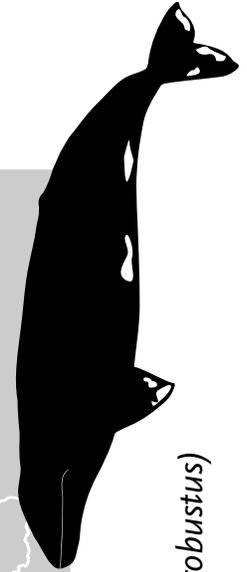
Statut: **Préoccupante***

2. Ocean Life

WILDLIFE MIGRATION CARDS

IUCN (International Union for Conservation of Nature). 2014. The IUCN Red List of Threatened Species. Version 2014.3. iucnredlist.org. Downloaded on 28 November 2014.
UICN (Union internationale pour la conservation de la nature). 2014. La liste rouge des espèces menacées de l'UICN. Version 2014.3. iucnredlist.org. Téléchargée le 28 novembre 2014.

Species cards · Cartes des espèces



Grey Whale · Baleine Grise (*Eschrichtius robustus*)

2. Ocean Life

WILDLIFE MIGRATION CARDS

Grey Whale · Baleine Grise

(*Eschrichtius robustus*)

Canadian origin: Coast of British Columbia to the top of Alaska

Destination: Travelling in groups called pods, some of these giants swim 20,000 kilometers round-trip from their summer home in Alaska and the North Pacific waters to the warmer waters off the Mexican coast, where they winter and breed in the warmer climate.

Habitat: Grey whales are the only whales that bear their young in warm, shallow, sheltered bays and lagoons. In the spring, they leave the winter breeding grounds in Mexico and migrate north towards Alaska.

Food sources: The grey whale feeds on amphipods and tube worms, which it eats by turning on its side or using its snout to dislodge these tiny creatures from the sea floor. It draws in the cloud of sediment, filters the crustaceans with its baleen, and then expels the waste.

Fun fact: Grey whales were formerly known as “devil fish” because of their fighting behaviour when hunted.

Distribution au Canada : Des côtes de la Colombie-Britannique à la pointe de l'Alaska

Migration : La baleine grise se déplace en troupeau. Certains de ces géants nagent 20 000 kilomètres pour faire l'aller-retour entre leur territoire estival dans les eaux de l'Alaska et du Pacifique Nord et les eaux plus chaudes au large du Mexique où la baleine grise hiverne et se reproduit.

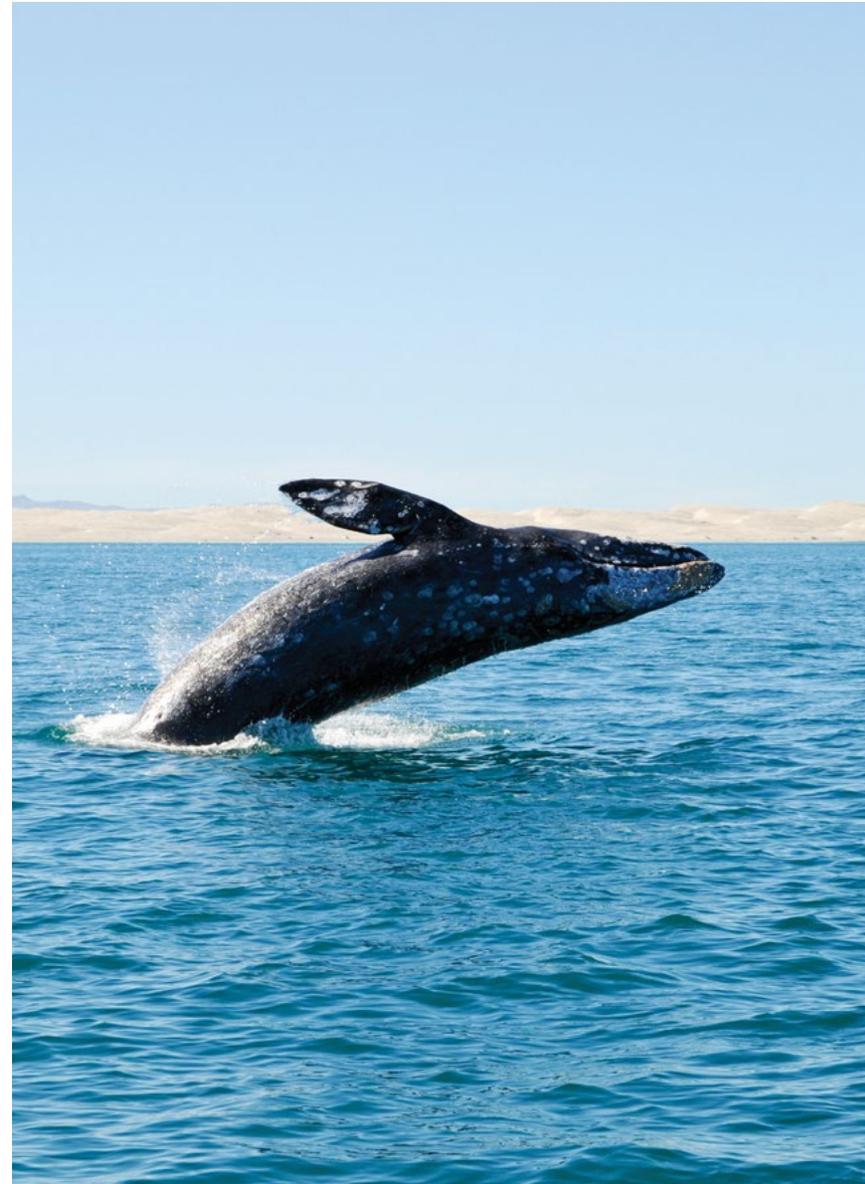
Habitat : La baleine grise est la seule baleine qui donne naissance à ses petits dans les eaux chaudes et peu profondes de baies et lagunes. Au printemps, elle quitte l'aire de reproduction des eaux du Mexique pour migrer dans celles de l'Alaska au nord.

Alimentation : Elle se nourrit d'amphipodes et de vers tubicoles qu'elle fait sortir du sol en remuant le fond marin à l'aide de ses flancs ou son museau. Elle aspire ensuite le nuage de sédiments et en filtre les petites créatures à l'aide de ses fanons pour finalement recracher ce qui n'est pas comestible.

Fait intéressant : La baleine grise se faisait autrefois appeler le « poisson diable » à cause de sa combativité lorsqu'elle était chassée.

***Status:** The Atlantic population is extirpated and the Pacific populations are mainly endangered..

***Statut :** La population de l'Atlantique est disparue du pays et la population de l'Est du Nord du Pacifique est préoccupante.

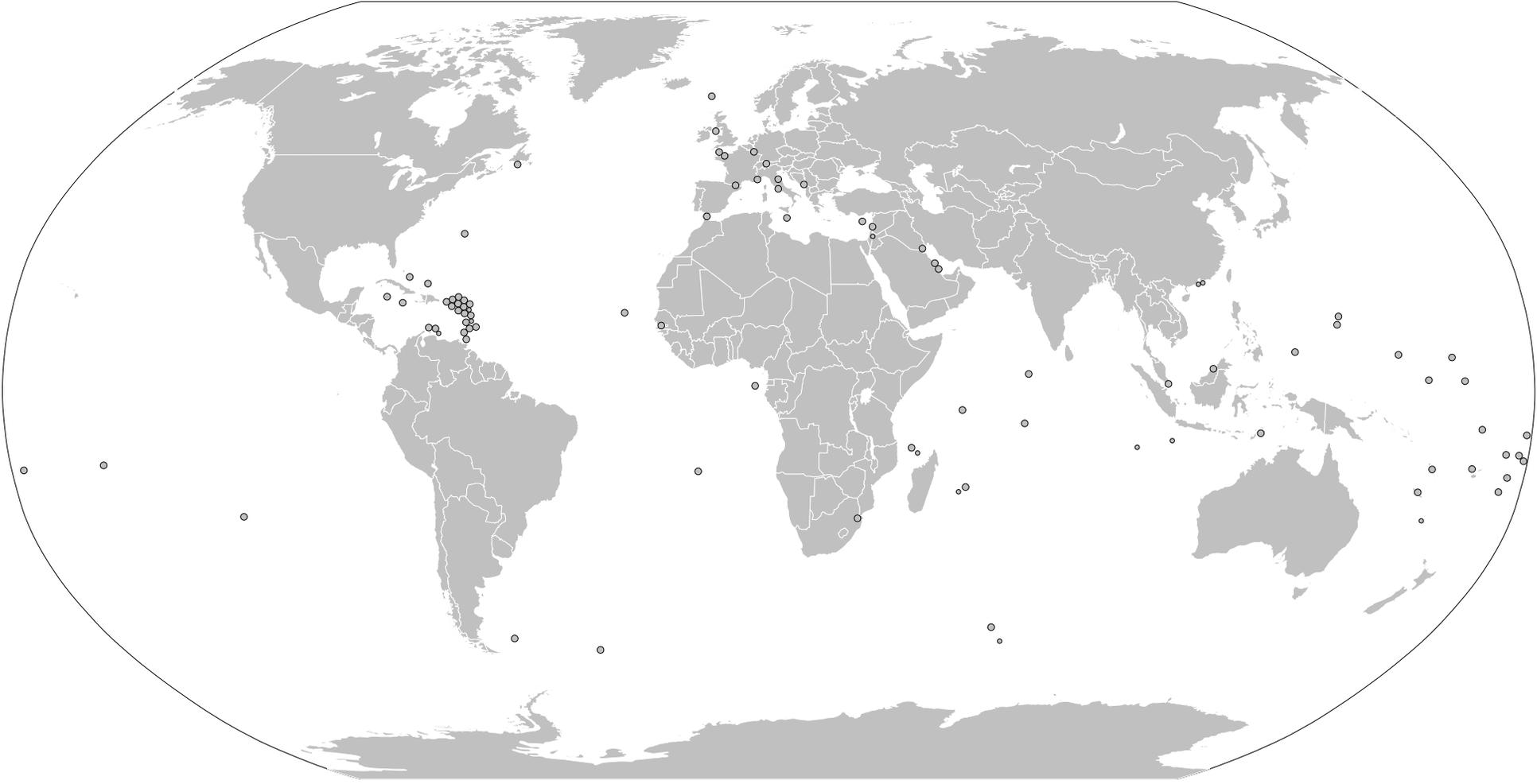


Status: **Endangered***

Statut: **Préoccupante***

2. Ocean Life

WILDLIFE MIGRATION TEMPLATE



2. Ocean Life

WILDLIFE MIGRATION TEMPLATE

Animal

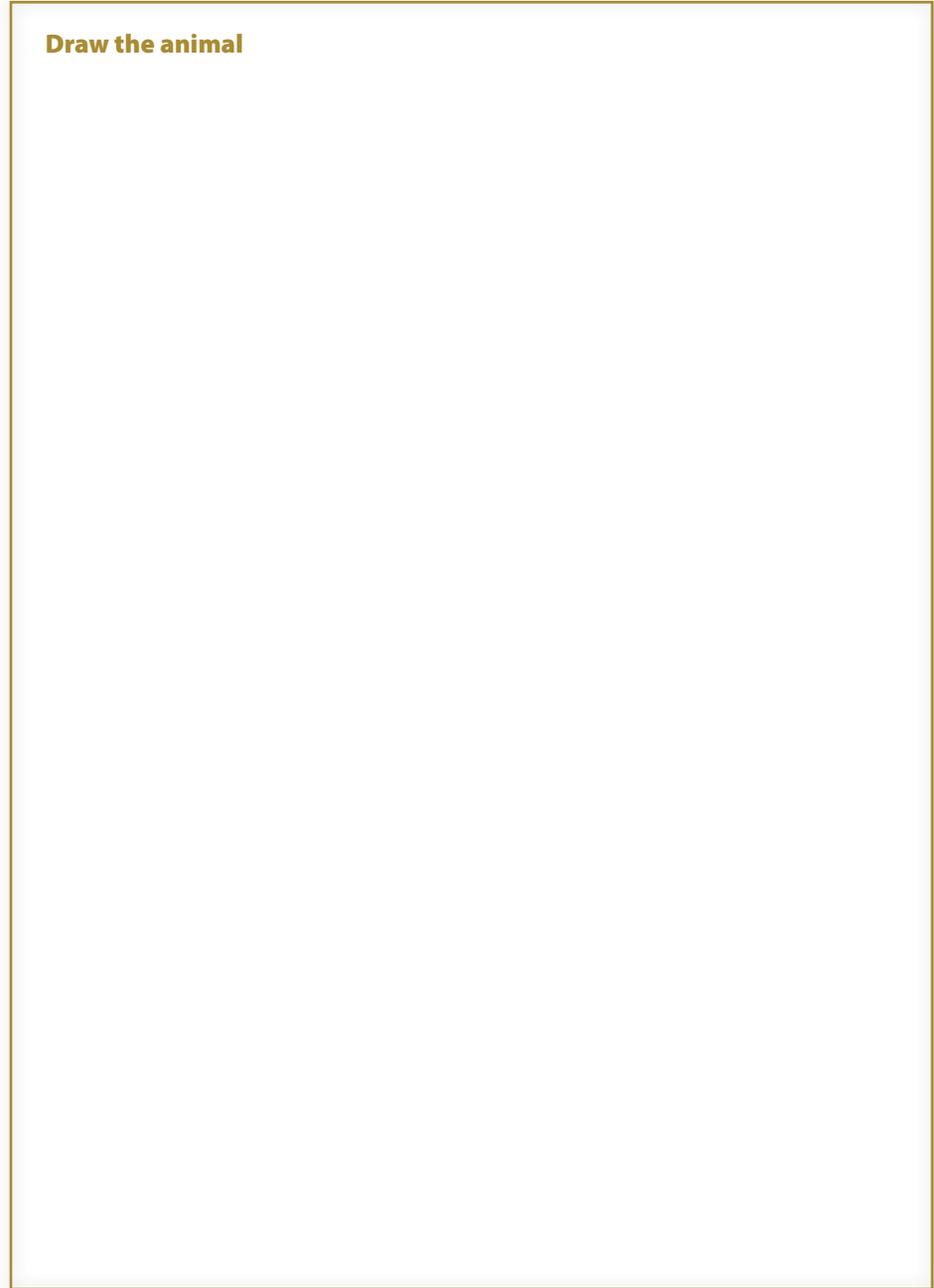
Location (Where can they be found?)

Habitat

Food sources

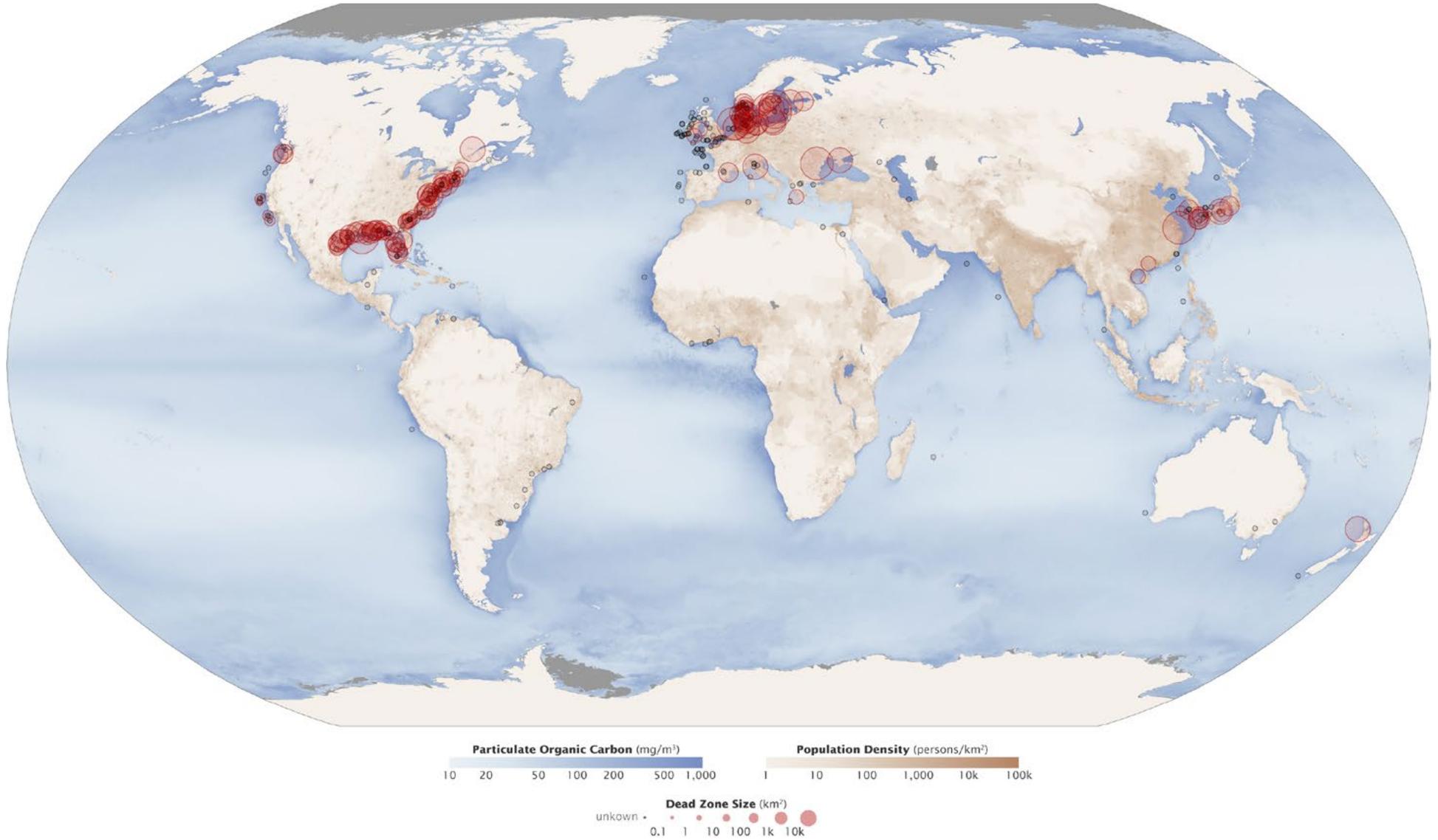
Fun fact

Draw the animal



2. Ocean Life

AQUATIC DEAD ZONE MAP



ATTRIBUTION: MAP BY ROBERT SIMMON & JESSE ALLEN; BASED ON DATA FROM ROBERT DIAZ, VIRGINIA INSTITUTE OF MARINE SCIENCE (DEAD ZONES); THE GSFC OCEAN COLOR TEAM (PARTICULATE ORGANIC CARBON); AND THE SOCIOECONOMIC DATA AND APPLICATIONS CENTER (POPULATION DENSITY). NASA, PUBLIC DOMAIN.

3. Ocean Flow

Overview:

This learning activity will help students learn about the world ocean as a moving system. Students will use the Ocean Tiled Map to learn about ocean currents and the effect they have on life on the planet.

Time:

75 minutes (can be adapted to fit one or multiple class periods)

Grade:

The activities provided in this learning activity can be adapted for elementary, intermediate and secondary students.

Materials:

- Ocean Tiled Map
- Global Conveyor Belt Map
- Projector to display [How do ocean currents work?](#) (not included)
- Coloured string (not included)
- Bingo chips (not included)
- Post-it notes (not included)
- The Great Pacific Garbage Patch Student Handout

Learning objectives:

In this activity, students will:

- Use the Ocean Tiled Map to learn about ocean currents.
- Map out the Global Conveyor Belt and identify how it affects humans and marine life.
- Learn about the Great Pacific Garbage Patch and discuss ways to tackle the plastic pollution in the ocean.

Introduction: Using the map

As a class, piece together the Ocean Tiled Map. Once students have completed the map, explain to them that they will be focusing on ocean flow. Use the following discussion questions as a way to introduce the topic of ocean movement when using this map and to refresh students with what was discussed in activity 1, "Making Connections," about how to read the layers on this map.

- *How is flow depicted on the map?*
- *How does the movement of water affect humans and other species living on land and in water?*
- *What conclusions can you draw about ocean currents based on the data shown on this map?*

Diving deeper

The flow of the world ocean can be a complex topic for students to learn. There are many ways to approach learning about ocean currents. The following two activities are examples of how the Ocean Tiled Map can help support learning about the movement of the ocean.

Activity: The Global Conveyor Belt

Show students the video [How do ocean currents work?](#) created by TED-Ed. Afterwards, reflect on what was discussed in the video by highlighting some key terms on the Tiled Map that students learned about in the video. Use bingo chips to identify any gyres on the map and pay attention to the direction of flow. Explain to students that the direction in which surface ocean currents travel is caused by the Coriolis effect.

Next, use the coloured string to map out the global conveyor belt. Provide students with the Global Conveyor Belt Map to assist them in mapping this system of currents. As students are mapping this out, have them use Post-it notes to write down what is happening in the following regions: the Arctic, Atlantic Ocean, Pacific Ocean, near the equator, and Antarctica. It is important to note to students that the ocean currents on this Tiled Map are surface currents only and that the global conveyor belt affects both surface and deep sea currents.

Once students have mapped out the global conveyor belt, discuss why this system of currents is important and how it affects us. Ask students how climate change is impacting this natural system. For additional information about the global conveyor belt and to access an infographic of how this system works, students can visit National Geographic's lesson on the subject [here](#).

Activity: The Great Pacific Garbage Patch

Using coloured string, outline the North Pacific Ocean. Ask students to examine the ocean currents in this region and to make observations. Next, explain that this is the area where the Great Pacific Garbage Patch is located. Ask students if they have heard of this phenomenon and to share what they know or what they think it might be.



3. Ocean Flow

Connection to the Canadian Geography Framework:

Concepts of Geographic Thinking

- Patterns and trends
- Interrelationships
- Geographic perspective
- Spatial significance

Inquiry Process

- Formulate questions
- Gather and organize
- Interpret and analyse

Geospatial Skills

- Foundational elements
- Spatial representations

Explain that the Great Pacific Garbage Patch is a huge area of garbage floating in the ocean. The garbage is made up of debris such as fishing lines and plastic containers, as well as microplastics, left behind from human activities. Inform students that strong ocean currents carry the garbage from all around the North Pacific Ocean into the garbage patch, where it builds up over time. Have students research more about the Great Pacific Garbage Patch and note what they have learned on the student handout provided. Students are encouraged to visit the following resources:

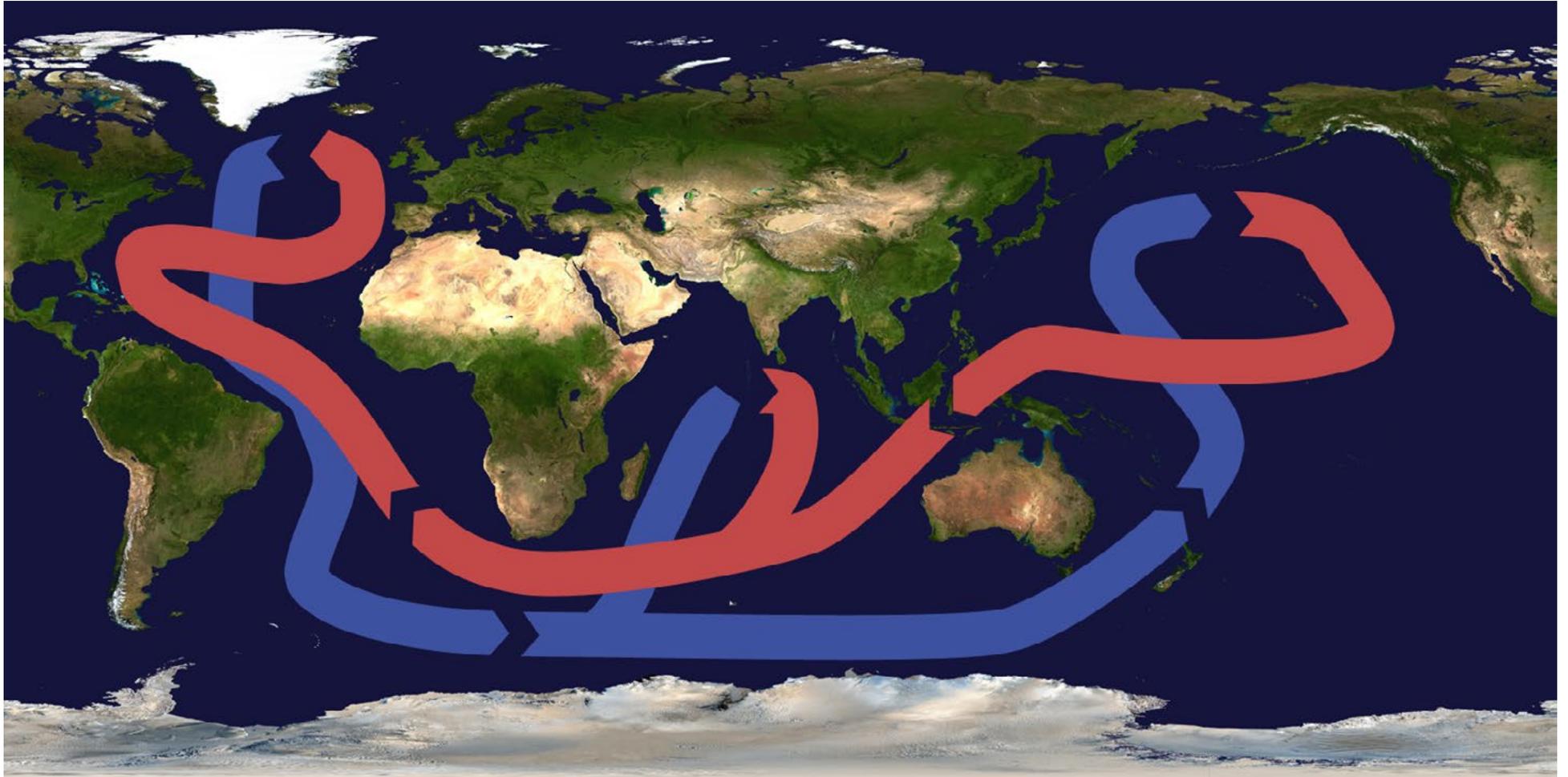
- [The Ocean Cleanup](#)
- [National Geographic: The Great Pacific Garbage Patch](#)
- [NOAA: National Ocean Service](#)
- [ArcGIS - Ocean Circulation Patterns: Garbage Patches](#)

Taking Action

Have students visit the interactive website Earth.nullschool.net. Explain that this website allows students to explore various data around ocean currents, air currents, and waves. Students can overlay information such as temperature and wind, as well as change the map projection. Use this interactive tool to guide discussion about how the ocean is continuously changing and how it is a system that plays an important role in our lives. Conclude the activity by asking each student to complete an exit ticket identifying one action item they can do to work towards protecting the ocean.

3. Ocean Flow

GLOBAL CONVEYOR BELT MAP



3. Ocean Flow

THE GREAT PACIFIC GARBAGE PATCH STUDENT HANDOUT

Consult the following resources to help you learn about the Great Pacific Garbage Patch.

- [The Ocean Cleanup](#)
- [National Geographic: The Great Pacific Garbage Patch](#)
- [Ocean Service: NOAA](#)
- [Ocean Circulation Patterns: Garbage patches StoryMap](#)

1. Why is the Great Pacific Garbage Patch something to be concerned about?

2. What types of debris can be found in it?

3. How does the garbage patch affect ocean life?

4. How does the garbage patch affect humans?

5. What is currently being done to clean up the Great Pacific Garbage Patch?

6. What ideas do you have that could help clean up the ocean?

7. What other questions do you have about the Great Pacific Garbage Patch?

4. Ocean Change

Overview:

This learning activity will use the information provided on the Ocean Tiled Map to encourage discussions about the impact of climate change around the globe. Students will examine climate change maps and investigate the effects changes in sea ice are having on Arctic communities.

Time:

75 minutes (can be adapted to fit one or multiple class periods)

Grade:

The activities provided in this learning activity can be adapted for elementary, intermediate and secondary students.

Materials:

- Ocean Tiled Map
- Canadian Arctic Communities Card
- Global Warming Prediction Map
- Natural Disasters Map
- Blank Map of the World
- Projector and access to the internet (not included)
- Coloured string (not included)
- Bingo chips (not included)

Learning objectives:

In this activity, students will:

- Examine how sea ice has changed over time.
- Map out Canadian Arctic communities and learn about their connection to sea ice.
- Discuss how climate change is affecting the world and map out changes that are happening or may occur in the future.

Introduction: Using the map

As a class, piece together the Ocean Tiled Map. Once students have completed the map, bring attention to the sea ice information, specifically how ice has changed over time. Use the following discussion questions as a way to introduce the topic of change when using this map and to refresh students on what was discussed in the first learning activity, "Making Connections," about how to read the layers on this map.

- *How is change shown on this map? What other ways can maps show change?*
- *What conclusions can you draw from the ice data displayed on this map?*
- *How do you think the change in ice in the polar regions is affecting the planet, including those who do not live in polar regions? What about the local communities who live in these polar regions?*

Diving deeper

Climate change is a popular topic discussed in classrooms of all grade levels and there are many resources that exist to help introduce the topic. The following activities are examples of how teachers can use the Ocean Tiled Map to have discussions about climate change.

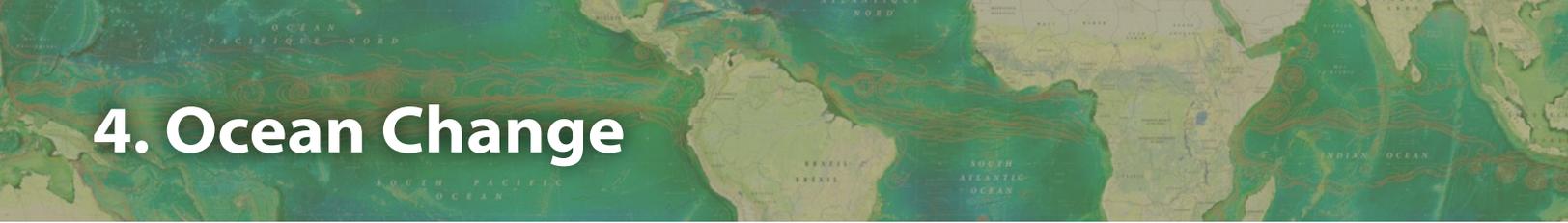
Activity: Mapping Arctic Communities

Bring attention to the Arctic region on this map and ask students to share what they know about this region or what information the map is displaying. Inform students that this activity will explore the Indigenous communities living in the Canadian Arctic. Next, using personal electronic devices or a class projector, examine the [Inuit Nunangat Map](#) on the Inuit Tarpiriit Kanatami website. Using coloured string, map out the four Inuit Nunangat regions on the Tiled Map. Next, using the Canadian Arctic Communities Card, have students cut out the community cards, examine the meaning of the community names, locate the communities and place the cards on the map.

Bring attention to the location of these communities and point out how most Arctic communities are located along the coast or next to a large body of water. Ask students to think about and discuss with a partner the role sea ice plays in these communities and how climate change is affecting this. Conclude this activity by encouraging students to read about sea ice in the Inuit volume of the [Indigenous Peoples Atlas of Canada](#). Students can create a K-W-L chart to record what they learn.

Activity: Mapping Global Climate Change

Reflect on what students discussed in the first learning activity, "Making Connections," about how change is displayed on the map. Using the coloured string, map out the changes of the various sea ice extents and discuss what patterns and trends exist. Next, distribute a blank world map to each student and project or hand out the Natural Disasters Map and Global Warming Predictions Map. Allow time for students to examine each map and to use their blank world map to record the information they have learned about how climate change is affecting the planet. When students have finished, gather students around the Ocean Tiled Map and have them reflect on what they



4. Ocean Change

Connection to the Canadian Geography Framework:

Concepts of Geographic Thinking

- Patterns and trends
- Interrelationships
- Geographic perspective
- Spatial significance

Inquiry Process

- Formulate questions
- Gather and organize
- Interpret and analyse

Geospatial Skills

- Foundational elements
- Spatial representations

have learned. Using coloured string and bingo chips, ask students to place their learnings from the other maps on the Tiled Map. Conclude by discussing what actions people, communities and entire countries can take to combat climate change.

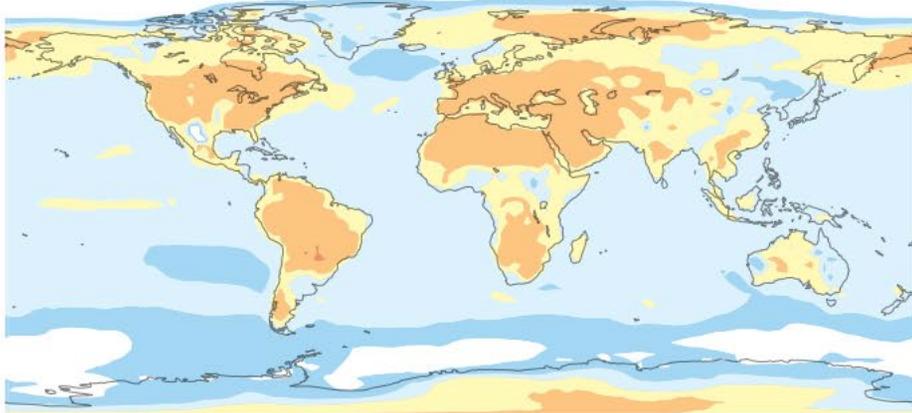
Taking Action

Goal 14 for the UN Sustainable Development Goals addresses protecting life below water. There are 10 targets for this goal. Have students visit the [UN Sustainable Development Goals website](#) and learn more about Goal 14 by exploring the three tabs: overview, targets and indicators, and progress and info. Assign students one of the 10 targets and indicators that accompany this goal and have students use the Ocean Tiled Map to highlight their indicator in some way. Conclude this activity by having students review the progress that has taken place and discuss and share ideas on how other targets can be met.

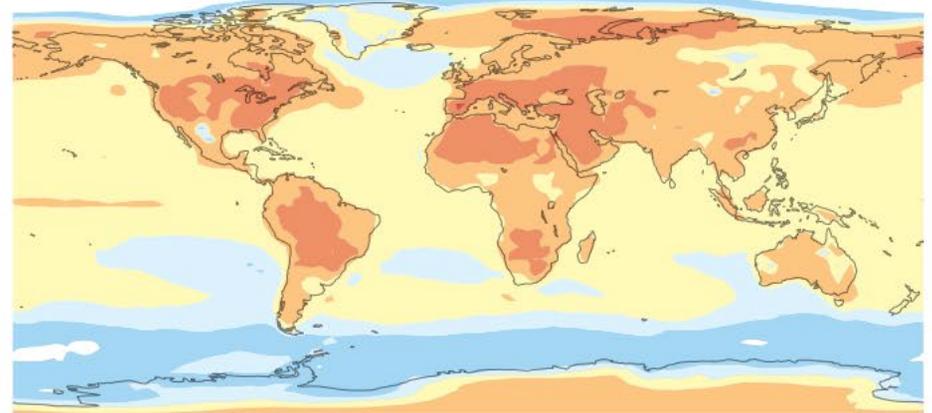
4. Ocean Change

GLOBAL WARMING PREDICTION MAP

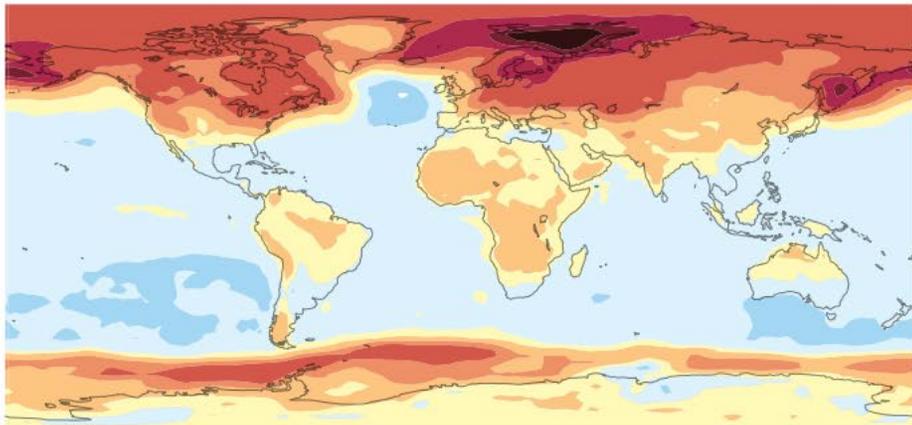
+ 1.5°C: Change in average temperature of hottest days



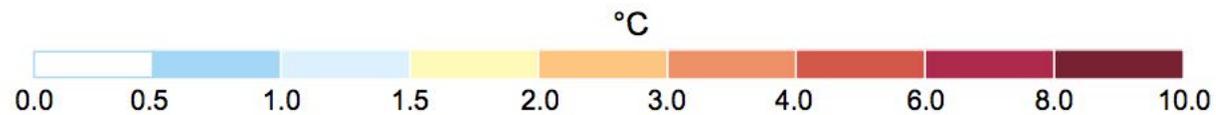
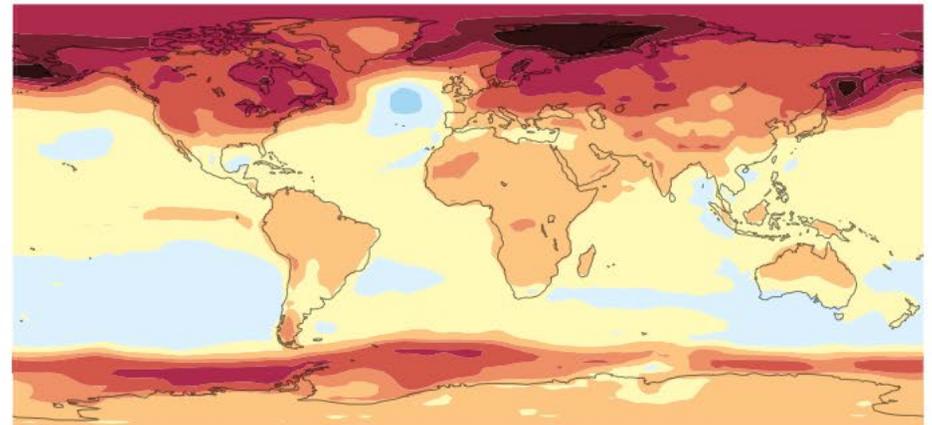
+ 2.0°C: Change in average temperature of hottest days



+ 1.5°C: Change in average temperature of coldest nights

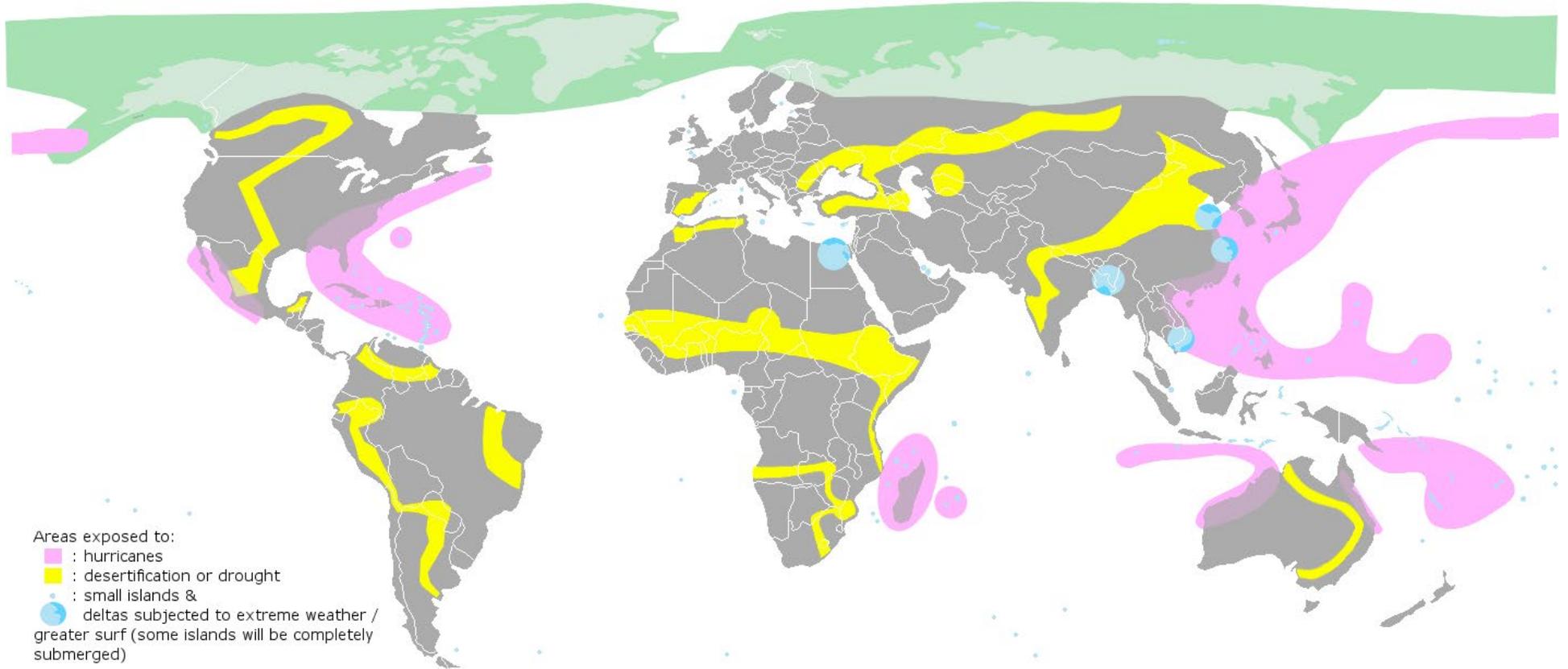


+ 2.0°C: Change in average temperature of coldest nights



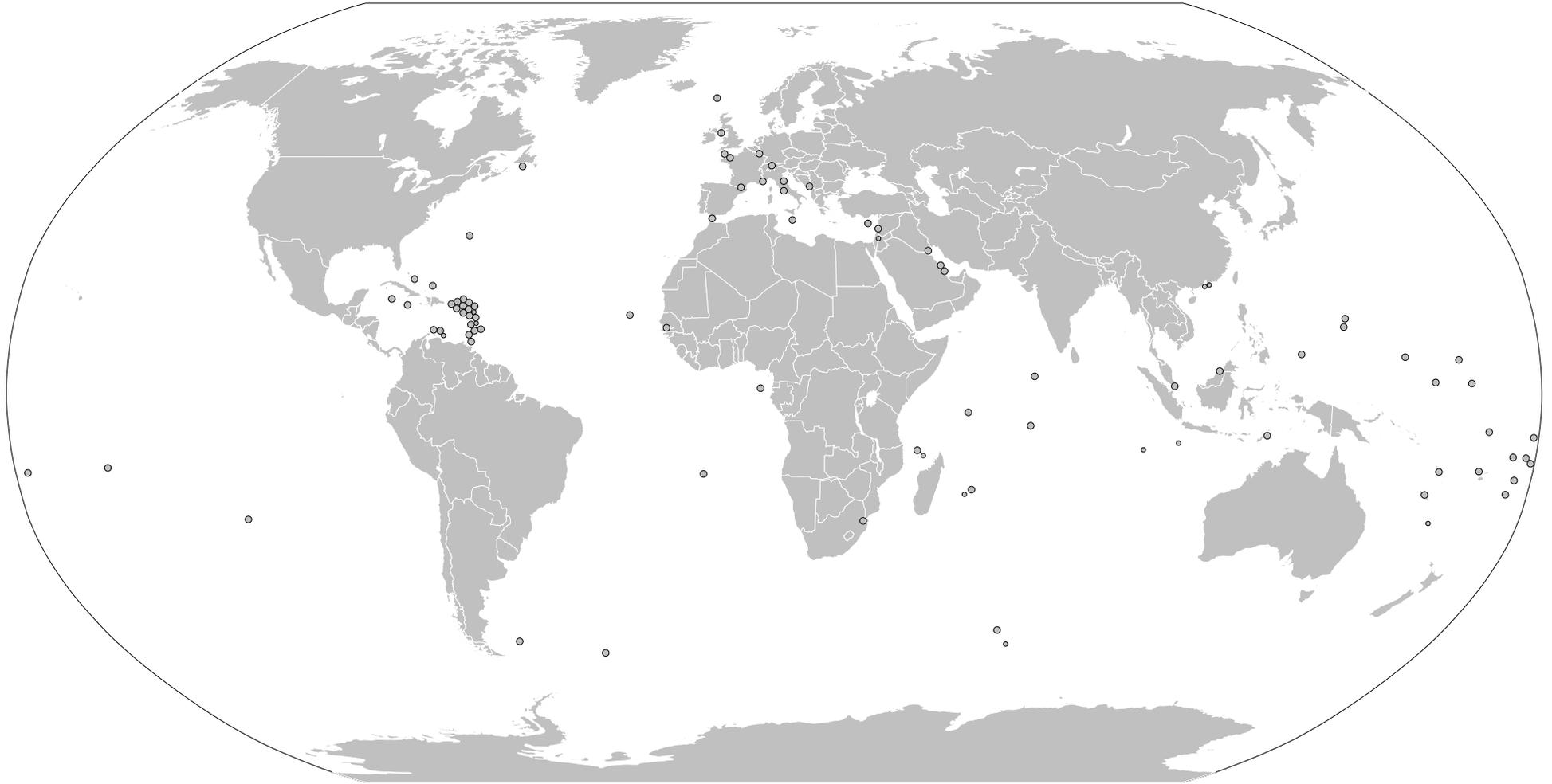
4. Ocean Change

NATURAL DISASTERS MAP



4. Ocean Change

BLANK MAP OF THE WORLD



4. Ocean Change

CANADIAN ARCTIC COMMUNITIES CARD

Cut out the following cards and place these communities on the Ocean Tiled Map.

Aqituuq

Settler name: Hopedale
Meaning: place of whales

Qausuittuq

Settler name: Resolute Bay
Meaning: place with no dawn

Kangiqtugaapik

Settler name: Clyde River
Meaning: nice little inlet

Qamani'tuaq

Settler name: Baker Lake
Meaning: where the river widens

Tikirarjuaq

Settler name: Whale Cove
Meaning: long point

Uqsuqtuuq

Settler name: Gjoa Haven
Meaning: lots of fat

Igluligaarjuk

Settler name: Chesterfield Inlet
Meaning: place with few houses

Inujuak

Settler name: n/a
Meaning: many Inuit lived here

Iqaluit

Settler name: Frobisher Bay
Meaning: many fish

Ausuittuq

Settler name: Grise Fiord
Meaning: place that never thaws

Kangiqsujuaq

Settler name: Wakeham Bay
Meaning: very big bay

Qurluqtuuq

Settler name: Coppermine
Meaning: place of moving water

Iglulik

Settler name: Igloodik
Meaning: place of igloos

Puvirnituuq

Settler name: n/a
Meaning: putrefied, place where there is a smell of rotten meat

Mittimatalik

Settler name: Pond Inlet
Meaning: where the landing place is

Kuujaarjuk

Settler name: Pelly Bay
Meaning: little stream

Ikpiarjuk

Settler name: Arctic Bay
Meaning: the pocket

Sanikiluaq

Settler name: n/a
Meaning: fast runner

Panniqtuuq

Settler name: Pangnirtung
Meaning: place of bull caribou

Ikaluktutiak

Settler name: Cambridge Bay
Meaning: good fishing place

Akulivik

Settler name: n/a
Meaning: central prong of a kakivak (harpoon)

4. Ocean Change

CANADIAN ARCTIC COMMUNITIES CARD

Cut out the following cards and place these communities on the Ocean Tiled Map.

Ivujivik

Settler name: n/a
Meaning: ice that piles up and becomes jumbled

Salliq

Settler name: Coral Harbor
Meaning: large flat island in front of the mainland

Kangiqualujuaq

Settler name: Fort Severight, Fort George River
Meaning: very large bay

Kangiqsuk

Settler name: Payne Bay, Bellin
Meaning: bay

Sanirajak

Settler name: Hall Beach
Meaning: one that is along the coast.

Kuujuuaq

Settler name: Fort Chimo
Meaning: great river

Quaqtaq

Settler name: n/a
Meaning: tapeworm

Kimmirut

Settler name: Lake Harbour
Meaning: heel

Tasiujaq

Settler name: n/a
Meaning: it looks like a lake

Nunainguk

Settler name: Nain
Meaning: n/a

Naujaat

Settler name: n/a
Meaning: seagull nesting place

Qipuqqaq

Settler name: Postville
Meaning: n/a

Kikiak

Settler name: Rigolet
Meaning: nail

Kangiqtliniq

Settler name: Rankin Inlet
Meaning: deep inlet

Marruuvik

Settler name: n/a
Meaning: "Vik" is an Inuktitut word meaning "place." "Makko" may be a corruption of the Inuktitut word for "two," which is "maggok."

Arviat

Settler name: n/a
Meaning: place of bowhead whale

Talurjuaq

Settler name: Taloyoak
Meaning: large caribou hunting blind

Kinngait

Settler name: Cape Dorset
Meaning: tip of the island

Aupaluk

Settler name: n/a
Meaning: the ground is almost red.

Umiujaq

Settler name: n/a
Meaning: hill that resembles a umiaq, a large boat made of seal or walrus skin.

5. Ocean StoryMap Exploration

Overview:

This lesson will teach students about a variety of issues affecting the ocean. Students will use the [Ocean StoryMap](#) to investigate how images and layers on maps can be used to convey information and important messages about the ocean.

Time:

90 minutes (can be divided into multiple class periods)

Grade:

The activities provided in this lesson plan can be adapted for elementary, intermediate and secondary students.

Materials:

- Electronic devices with internet access
- [Ocean StoryMap](#)
- My Photo Essay worksheet
- StoryMap Exploration worksheet
- Blank Map of the World
- Ocean Tiled Map (optional)

Learning objectives:

In this activity, students will:

- Use the [Ocean StoryMap](#) to learn about issues affecting the ocean.
- Create a photo essay that conveys a message about the health of the ocean.
- Design a layer that they would like to add to the Ocean Tiled Map.

Introduction: Exploring the StoryMap

As a class, ask students to reflect on what they have learned from the Ocean Tiled Map, what story this map was trying to tell and what message(s) students took from the map. Next, have students, individually, in pairs or as a class, explore the online [Ocean StoryMap](#). Ask students to focus on the images provided and have a discussion about what type of story this resource is telling. Use the following questions to guide the discussion:

- *Who and what is depicted in these images and why do you think they were included?*
- *What emotional response do you have to the images? What does that tell you about the story this resource might be trying to tell?*
- *How do images (including maps) help us to understand messages?*

Diving deeper

Maps are useful tools for depicting numerous layers of information, and, as students have learned, for telling a story or getting a message across. The following two activities will have students explore the [Ocean StoryMap](#) and think about important stories and messages that can be told about the ocean through photos and map layers.

Activity: Photo Essay

As students learned in the first learning activity, “Making Connections,” photos, like maps, are very effective tools to tell stories and relay messages. Allow time for students to explore the [Ocean StoryMap](#), paying careful attention to the messages being told through the text and photos. This can also be done as a large group. Then, have students select one section they found particularly interesting: climate change, pollution or resource use.

Using the My Photo Essay worksheet, have students summarize the information in the section (or part of the section). Once they have finished their summary, have students decide what important messages they would like to share with an audience about what they learned. Students will then conduct photo research for images to effectively convey the information and/or message they are trying to share. Have a discussion with students about how to find photographs that they can use (i.e., photos under a licence that allows for use or photos that are in the public domain) and how to properly credit photos. Students can then compile their photos in a sequence that best suits the story they would like to tell.

Students can share their photo essay with a partner or the class, or organize a gallery walk for students to explore each other’s works.

Activity: My Ocean Map

Distribute the StoryMap Exploration worksheet. Allow students time to explore the [Ocean StoryMap](#). For each section, students should think about what information stood out for them and what they feel other people should know. Then, students should think about what they are left wondering about each topic — what would they like to research further?

5. Ocean StoryMap Exploration

Connection to the Canadian Geography Framework:

Concepts of Geographic Thinking

- Patterns and trends
- Interrelationships
- Geographic perspective
- Spatial significance

Inquiry Process

- Formulate questions
- Gather and organize
- Communicate

Geospatial Skills

- Foundational elements
- Spatial representations

Next, explain to students that they will have the opportunity to propose a new layer that could be added to the Ocean Tiled Map. If needed, have students assemble the Ocean Tiled Map again to remind them what is already represented on the map. Guided by their StoryMap Exploration worksheet, ask students to think about what layer they would like to add to the Ocean Tiled Map if they could. With information found in the StoryMap and their own research, students can use the Blank Map of the World as a template to design their layer. Encourage students to think about how they will represent their layer using colours, shapes and/or icons, and what additional information they might include on the map's legend to give the map user more information about the topic (similar to what has been written on the Ocean Tiled Map).

Taking Action

While there are many issues affecting the health of the ocean, there are also stories of resilience. A [scientific review](#) from the journal *Nature* offers hope that interventions do work. For example, between 2000 and 2019, marine species listed as threatened with global extinction fell from 18 per cent to 11.4 per cent. Have students research conservation measures, such as marine protected areas, hunting and fishing management and regulations, consultations and projects with Indigenous communities, and habitat restoration, among others. Have them write an exit slip about one form of intervention that is having a positive impact on the ocean. Alternatively, students can write an exit slip about an organization that is working to help improve the health of the ocean.

5. Ocean StoryMap Exploration

STORYMAP EXPLORATION

Name: _____

Explore the Ocean StoryMap and think about the important messages in each section. Use this sheet to record what information you feel is important for other people to know, as well as what else you are curious about.

Climate change

What I want people to know:

What I want to learn about:

Pollution

What I want people to know:

What I want to learn about:

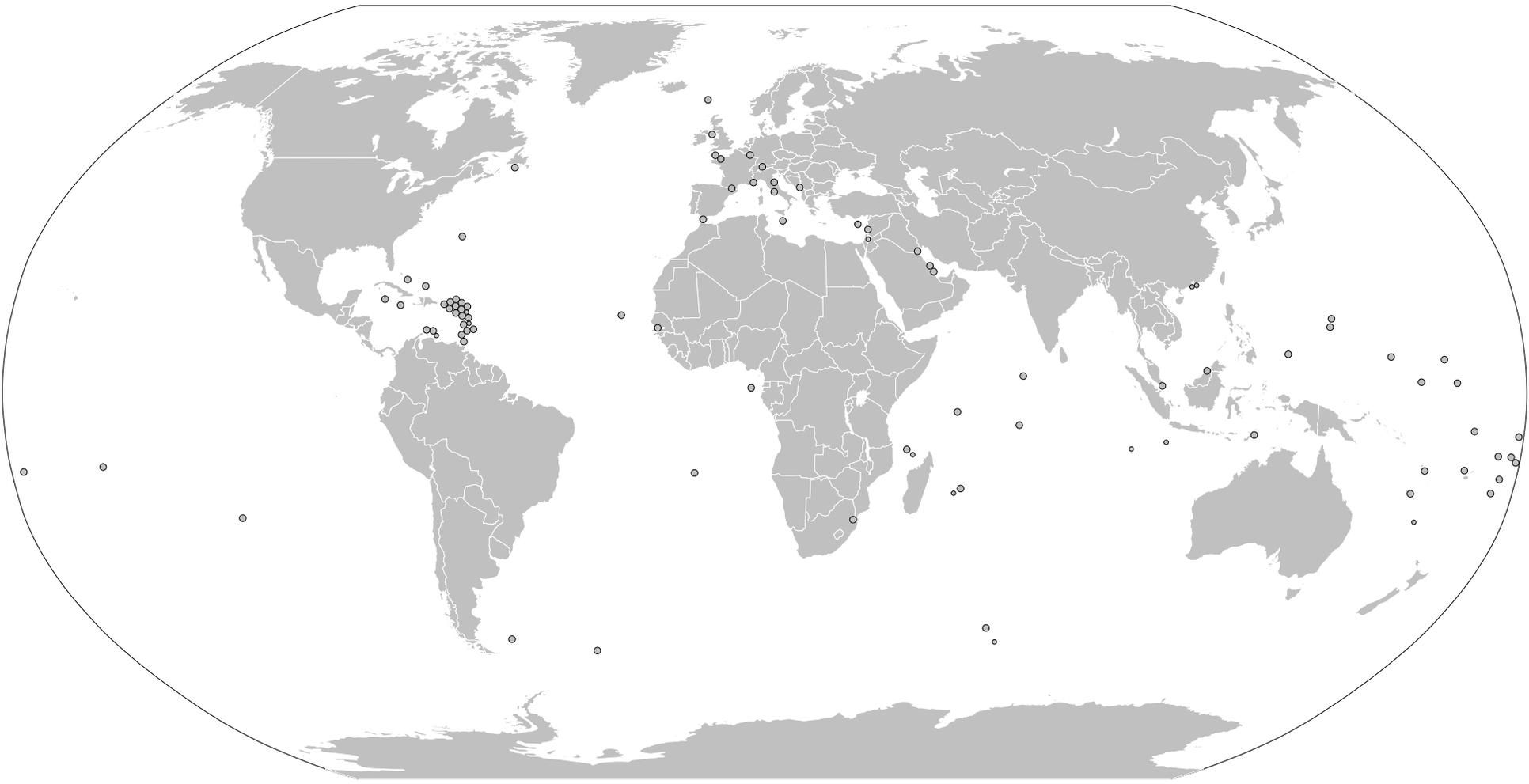
Resource use

What I want people to know:

What I want to learn about:

5. Ocean StoryMap Exploration

BLANK MAP OF THE WORLD



5. Ocean StoryMap Exploration

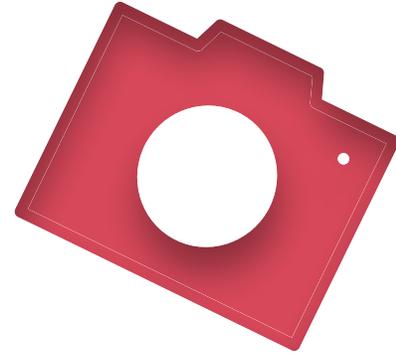
MY PHOTO ESSAY

Name: _____

Topic: _____

Important points:

- _____
- _____
- _____
- _____
- _____
- _____



Message I would like to share with my audience:

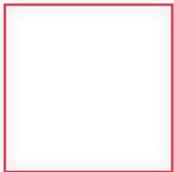


Image 1:

Message this photo is conveying: _____

Photo credit: _____

Source: _____

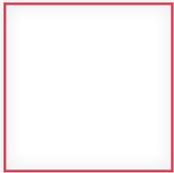


Image 2:

Message this photo is conveying: _____

Photo credit: _____

Source: _____



Image 3:

Message this photo is conveying: _____

Photo credit: _____

Source: _____



Image 4:

Message this photo is conveying: _____

Photo credit: _____

Source: _____



Image 5:

Message this photo is conveying: _____

Photo credit: _____

Source: _____