

RIVER GUARDIANS FRESHWATER TEACHING MANUAL

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INTRODUCTION



This Manual was designed to provide teachers and youth leaders with the basic information on the earth's freshwater: its types, areas where they are found, uses and threats from both human and natural impacts. It provides a guide that is needed in planning activities and also gives ideas of materials that could be used to supplement these activities. There are also suggested activities, discussion strategies and key vocabulary in each proposed lesson. In addition, this Manual may be helpful to the teacher or youth leader in self-reflection, to better assist students in understanding this very important topic as it relates to our beautiful, but threatened freshwater environment.

LESSON 1: TYPES OF WATER

The earth is made up of two main types of water, **saltwater** and **freshwater**. **97%** of the earth's water is saltwater, **2%** glaciers and a tiny **1%** of freshwater.



97%
Oceans



2%
Glaciers and
Polar Ice
caps



1%
Freshwater

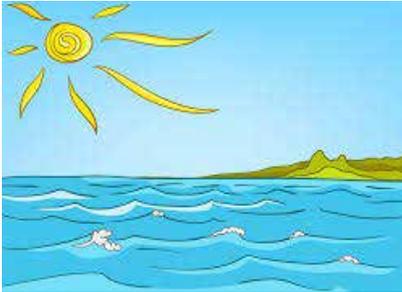
ALL THE WATER IN THE WORLD

TYPES OF WATER



Salt Water

Fresh Water



What is Freshwater?

Freshwater is any naturally occurring water that is salt-free or not seawater. Freshwater is not the same as potable water (or drinking water). Freshwater regions are found inland, away from the sea. These are stagnant water, where the water stays still, and **flowing water**, that is, water that is constantly moving.



- **Stagnant water** are ponds, lakes, swamps, marshes and puddles of water left from rainfall.



- **Flowing water** includes streams, creeks and rivers.

Freshwater in Guyana includes water in ponds, lakes, streams, creeks, rivers and even underground water called groundwater. **Freshwater** is crucial to plant and animal life!

Learning Objectives

Pupils will

- Identify the two main types of water.
- State what percentage of the earth's water is freshwater.
- Define accurately, the terms freshwater, saltwater, stagnant water, flowing water
- Name the freshwater regions.
- Correctly state one example of each type of freshwater region.
- In their own words, differentiate between the freshwater regions.
- Compile a scrapbook on freshwater regions.
- Create a model of either of the freshwater regions.

Vocabulary: saltwater, freshwater, glacier, stagnant, flowing, potable, marshes, swamps, rivers, earth, inland, constantly

Resources/Materials Needed

Computer, projector, whiteboard, dictionary, definition strips, Word cards, Word search, Pictures, crayons, scrapbook, materials for models, poems and songs.

Procedure

- Present video/ poster of the earth (globe/map) showing the masses of land and bodies of water
- Present or highlight facts on types and percentage of water on the earth

- Initiate and facilitate guided discussion on video/poster and facts presented
- Guide pupils into writing down key words arising out of the discussion, on cards
- Mount/display word cards arising from the discussion
- Allow pupils to read words then use at least one of the words in a sentence, as it relates to the topic
- Allow random/voluntary pupils to explain, in their own words, what is saltwater or freshwater
- Present fact sheet on topic and allow pupils to read
- Sing songs, say rhymes/poems relating to the topic
- Recap lesson through questioning, summarizing
- Evaluate lesson using differentiated evaluation activities, e.g. worksheet, word search, puzzles, drawing

Follow up activity

- Field trip to get firsthand experience of a freshwater region
- Writing of poem on the topic

LESSON 2: USES OF FRESHWATER

Plant and Animal Species make Freshwater their home

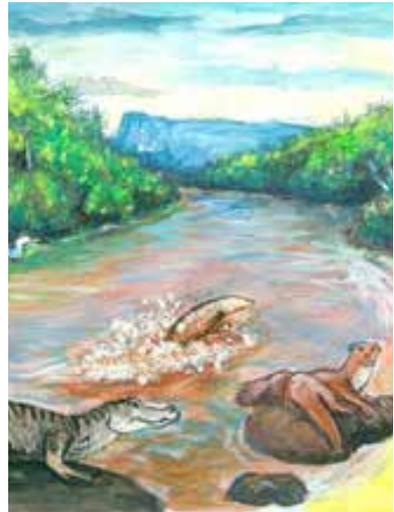
Although **freshwater** is **1%** of the earth's water, many species of plants and animals thrive in these freshwater regions. Forty per cent (**40%**) of fish species in the world live in freshwater.



In Guyana, freshwater fish include the Patwa, Hassa, Tilapia, Lukanani and the Arapaima - the largest freshwater fish in Guyana and the world.

The duck, Jabiru stork, the Giant River otter, River turtle, Manatee and Mata-Mata turtle are also common to Guyana's **freshwater**.

Common freshwater plants in Guyana are the water lettuce, moco-moco and lily, commonly known as the duckweed, including the most exotic and largest of species, the Victoria Regia.



FRESHWATER IS ALSO USED FOR

DOMESTIC PURPOSES



AGRICULTURAL PURPOSES



INDUSTRIAL PURPOSES



Freshwater not only encompasses the home of animal and plant species, but it is also used for domestic, agricultural and industrial purposes.

Domestic purposes of **freshwater** include drinking, cooking, cleaning, washing, washing of fruits and vegetables, bathing and brushing teeth among others.

Freshwater in agriculture is mainly used for watering garden crops such as bora, ochro, calalu, eggplant, cabbage, lettuce as well as commercial crops including rice. **Freshwater** is also used in feeding farm animals which include cows, sheep, pigs, goats and poultry. It is also used in making aquatic farms for the rearing of freshwater fish.

In large industries such as factories, **freshwater** plays a very important part in the manufacturing or processing of products, as a cooling agent, for diluting products and for sanitizing equipment

Learning Objectives

Pupils will

- Identify at least three plants that live in freshwater.
- Name not less than three animals that live in freshwater.
- Accurately state three uses of freshwater.
- Name a minimum of two domestic, two agricultural and two industrial uses of freshwater.
- Compile a scrapbook on different uses of freshwater.
- Differentiate between domestic, agricultural and industrial uses of freshwater.
- Create a model showing one of the three main uses of freshwater.

Vocabulary: domestic, agricultural, industrial, factories, crops, manufacturing, recreation, processing, sanitizing

Resources/Materials Needed

Pictures, videos, puzzles, projector, whiteboard, computer, crayon, markers, drawing paper, materials for scrapbooking, materials for a model, words of a poem, lyrics of the song.

Procedure

- Recap previous lesson
- Present video/ poster showing how freshwater is used
- Initiate and facilitate guided discussion on video/poster presented
- Guide pupils into writing down key words arising out of

the discussion, on cards

- Mount/display word cards arising from the discussion
- Allow pupils to read key words displayed
- Allow random/voluntary pupils to explain how freshwater is used.
- Sing song, say rhyme/poem relating to the topic
- Recap lesson through questioning, summarizing or role-playing uses of freshwater
- Evaluate lesson using differentiated evaluation activities, e.g. worksheet, word search, puzzles, drawing, scenarios etc.

Follow up activities

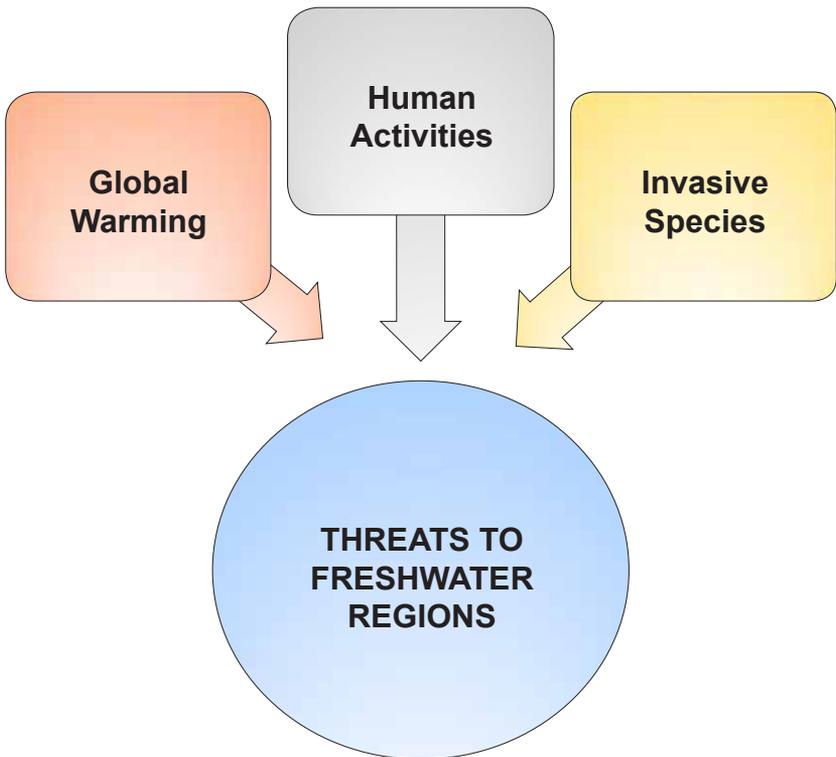
- Field trip to witness firsthand experience on at least one of the main uses of water
- Pupils to complete group work assignment making a scrapbook, collage, etc. showing how freshwater is used

LESSON 3:

How do Human Activities and Natural Phenomena impact Freshwater Regions?

Human activities pose the greatest threat to **freshwater** regions and to the plant and animal species that inhabit these regions.

Freshwater can also be impacted naturally by **global warming** and by **invasive species**.



Human activities such as careless sanitizing and dumping of garbage, farming, clearing the forest, building road, manufacturing products and mining can put harmful and unwanted substances into the freshwater. These activities cause pollution of freshwater areas and affect the quality of freshwater and damage natural systems.

Global warming can lead to devastating floods and droughts which directly impacts freshwater and the inhabitants of freshwater regions.

Invasive species which are plant or animal species that is not native to a specific location can also harm native species of animals and plants of freshwater regions as well the freshwater in lakes, rivers and streams. Invasive species out-compete native species for nutrients, damage water bodies in ways to choke out native species and spread to cause damage to the environment.

Human Activities cause pollution of freshwater areas and damage natural systems.

Careless sanitizing, dumping of garbage, industrial wastes, or factory effluents

Chemicals used in mining, fertilizers, sewage

Runoff from farmland and cities, build up of sediment.

Floods

**Global
Warming
impacts on
Freshwater**

Droughts

**Increased water
temperature**



Invasive Plant Species

- Out-compete native species for nutrients.



Invasive Animal Species

- Damage water bodies
- Choke out native species

Lesson 3.1: Impacts of Human Activities on Freshwater

Learning Objectives

Pupils will

- List at least three impacts of direct human activities on freshwater.
- State at least one impact of agricultural activities on freshwater.
- Identify a minimum of two impacts of industrial activities on freshwater.
- Briefly explain how any one of the human activities identified can impact freshwater regions.
- Explain at least one natural impact on freshwater.
- Compile a scrapbook on human impacts on freshwater.
- Create a model showing the impact of human activities on freshwater regions.

Vocabulary: freshwater, impact, industries, agriculture, pollution, species, invasive, native, inhabit, effluent, flood, mining, chemicals, sewage, runoff, drought, fertilizer, sediment

Materials/Resources needed

Projector, computer, whiteboard, pictures/posters, artificial aquariums, stickers, paste/glue, materials for scrapbooking, materials for a model.

Procedure

- Recap previous lesson
- Present scenario using video/ poster of the current lesson. Present one scenario at a time, for example, direct human activities, then agricultural activities then industrial activities.
- Initiate and facilitate guided discussion on the scenario presented
- Guide pupils into writing down key words arising out of the discussion, on cards
- Mount/display word cards arising from the discussion
- Allow pupils to read key words displayed
- Allow random/voluntary pupils to explain one way in which human activities impact freshwater
- Involve pupils in group work making scrapbook, collage, of human activities on freshwater
- Sing/song, say rhyme/poem relating to the lesson
- Recap the lesson through questioning, summarizing, worksheet, other
- Evaluate lesson using differentiated evaluation activity

Follow up activities

- Organize a field trip to give pupils firsthand experience
- Composition writing on the experience of a field trip on the topic

Lesson 3.2: Natural Impacts on Freshwater

Learning Objectives

Pupils will

- List at least three impacts of global warming on freshwater as it relates to floods, droughts and increased water temperature.
- State at least two impacts of invasive species on freshwater.
- Briefly explain how any one of the natural phenomena identified can impact freshwater.
- Compile a scrapbook on natural impacts on freshwater.
- Create a model showing how natural phenomena impacts freshwater regions.

Vocabulary: freshwater, impact, global warming, natural, pollution, species, invasive, native, inhabit, flood, drought, devastating

Materials/Resources needed

Projector, computer, whiteboard, pictures/posters, artificial aquariums, stickers, paste/glue, materials for scrapbooking, materials for a model.

Procedure

- Recap previous lesson
- Present scenario using video/ poster of the current lesson. Present one scenario at a time, for example, global warming then invasive species
- Initiate and facilitate guided discussion on the scenario presented
- Guide pupils into writing down key words arising out of the discussion, on cards
- Mount/display word cards arising from the discussion
- Allow pupils to read key words displayed
- Using keywords, allow pupils to create sentence strips and read sentences on the current topic
- Allow random/voluntary pupils to explain one way in which natural phenomena impact freshwater regions
- Involve pupils in group work making a scrapbook, collage, natural impacts on freshwater
- Sing/song, say rhyme/poem relating to the lesson
- Recap the lesson through questioning, summarizing, worksheet, other
- Evaluate lesson using differentiated evaluation activity

Follow up activity

- Organise field trip to give pupils firsthand experience on natural impacts on freshwater regions.
- Create a poster on natural impacts on freshwater regions

Lesson 4: Protecting our Freshwater Regions

Why should We Protect Our Freshwater?



Plants, animals and humans all need fresh water to survive.



Freshwater is the single most important building block of ecosystems around the world. It is also one of the world's most valuable resources.

What impacts our Freshwater?

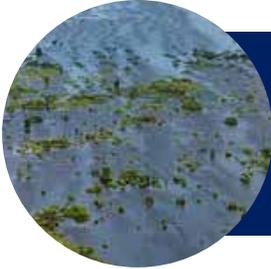


When chemicals and other harmful wastes leach into a body of water, they can devastate ecosystems.



Nitrogen and phosphorus, commonly used in fertilizers, lead to a surge in algae growth when they enter a water body, killing off existing aquatic life.

What naturally protects our Freshwater?



Wetlands act as a natural filter that keeps chemicals, excess nutrients and sediment from continuing through the water system.



Forests along waterways also act as filters, so preserving or planting trees along streams and rivers can also help to keep fresh water clean.

We must protect our freshwater!



To Protect our freshwater, we must



Learning Objectives

Pupils will

- Identify at least three ways by which freshwater regions can be kept clean.
- State at least three reasons why freshwater needs to be protected.
- Present solutions to control or prevent further destruction to freshwater regions.
- Develop posters that will help to promote freshwater conservation/preservation.
- Organize clean-up campaigns of an identified freshwater area within the community.

Vocabulary: preservation, conservation, protection, awareness, promote, highlight, plight, promote, destruction, solution, prevent, clean-up

Procedure

- Recap previous lesson
- Present scenario using video/ poster of the current lesson
- Initiate and facilitate guided discussion on the scenario presented
- Allow pupils to select and mount/display word cards arising from the discussion
- Allow pupils to read key words displayed
- Using keywords, get random/voluntary pupils to give a short talk on the topic

- Singsong, say rhyme/poem relating to the topic
- Get pupils involved in group work making a scrapbook, collage etc. on how we can protect freshwater regions
- Recap the lesson through questioning, summarizing, worksheet, other
- Evaluate the lesson using various activities

Follow up activity

- Organise cleanup campaign of freshwater regions within the community
- Produce a similar poster as shown above for your school or other institution in the community (e.g. health clinic, church, village council)
- Create a different/innovative poster on the topic

