

Sustainable Southern Belize: Coral Health Lesson Plan

Jennifer O'Shea

Lesson Title	Coral Health
Grade Level	5 th grade
Content Area	Science
Time Allotted	<p>5 class periods (45 minutes each)</p> <ul style="list-style-type: none"> ◆ Day 1: Expedition/Project Introduction & Picture Walk ◆ Day 2: Coral Powerpoint, Coral Polyp Pictorial, Group Definitions ◆ Day 3: Coral Picture Sort, Hands-on Identification, Process Grid ◆ Day 4: Coral Health Powerpoint & Hands-on Flow Chart ◆ Day 5: Individual Presentations
Academic Standards	<p>California Content Standards - Science</p> <ul style="list-style-type: none"> ◆ 2.a Students know many multicellular organisms have specialized structures to support the transport of materials. ◆ 3.a Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface. ◆ 4.b Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns. ◆ 4.c Students know the causes and effects of different types of severe weather. ◆ 6.a Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria. <p>California Content Standards - English Language Arts</p> <ul style="list-style-type: none"> ◆ 2.1 Understand how text features (e.g., format, graphics, sequence, diagrams, illustrations, charts, maps) make information accessible and usable. ◆ 2.3 Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas. ◆ 2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.
Abstract	<p>As a transition lesson into a long-term project with reducing plastic waste & impact on world water, students will participate in this introduction to coral reefs and their health. Students will learn various types of common corals, health threats posed to corals, and human & environmental effects on corals before being asked to brainstorm solutions to this issue and to create a pictorial representation of what they have learned. Students will need to read & summarize information, classify objects, identify characteristics, determine cause & effect, and synthesize information.</p>
Goal	<p>Students will be able to...</p> <ul style="list-style-type: none"> ◆ Name and identify 5 different types of coral ◆ Draw and label a coral polyp ◆ Name 3 potential threats to the reef and at least one corresponding solution to each threat
Performance Indicators	<ul style="list-style-type: none"> ◆ All assignments complete <p>Final project includes:</p> <ul style="list-style-type: none"> ◆ Key vocabulary

	<ul style="list-style-type: none"> ◆ Accurate information ◆ Use of own words
Background Information	<ul style="list-style-type: none"> ◆ Students will need to see a Powerpoint slideshow of my expedition in Belize AND/OR ◆ Students will need to participate in a picture walk of enlarged photos of corals and reefs and brainstormed prior knowledge about the pictures
Materials	<p>Day 2:</p> <ul style="list-style-type: none"> ◆ Copies of 4 different definitions of <i>What are corals?</i> ◆ Index cards ◆ Sentence strips ◆ LCD projector; document ◆ Butcher paper with lightly sketched coral polyp <p>Day 3:</p> <ul style="list-style-type: none"> ◆ Picture set of 5 varieties of corals to be worked with in groups of 4 ◆ Chart paper & markers ◆ Empty tissue boxes (opening covered) ◆ 3-D models of corals in several varieties <p>Day 4:</p> <ul style="list-style-type: none"> ◆ Place cards for headings, subheadings, and bullet points ◆ Example photos ◆ Place mat with flow chart outline ◆ LCD projector; document scanner <p>Day 5:</p> <ul style="list-style-type: none"> ◆ 12" x 18" white construction paper ◆ Pencils, markers, crayons, colored pencils
Technology	<p>Microsoft Powerpoint Elmo document scanner LCD projector</p>
Instructional Procedure	<p>Day 1. Students will participate in a gallery picture walk around the classroom & watch a Powerpoint presentation of the teacher's expedition & their project</p> <ol style="list-style-type: none"> a. Pictures & presentation include various corals & their health b. Distribute project guidelines, read through expectations & assessment rubric <p>Day 2. <i>What are corals?</i> Powerpoint presentation & definition activity</p> <ol style="list-style-type: none"> a. Watch Powerpoint - pictures of coral/reef/life cycle b. Teacher sketches & labels a coral polyp, structures, functions c. Students read & summarize a definition of coral d. Students synthesize their definition with those of other students in 1-2 sentences. <p>Day 3. Classifying Corals & process grid</p> <ol style="list-style-type: none"> a. In groups of 4, students classify photos of corals into

	<p>separate groups based on similarities</p> <p>b. Students feel models of coral & guess their classification</p> <p>c. Students complete a process grid of several common corals</p> <p>Day 4. Coral Health Powerpoint presentation & flow chart</p> <p>a. Watch Powerpoint on coral health - factors & solutions</p> <p>b. Pairs of students complete a flow chart on causes of coral health and examples, setting place cards in their proper location</p> <p>c. Class brainstorms solutions to the health issues</p> <p>Day 5: Finish coral project - tasks divided into 4 quadrants</p> <p>a. (1) Define coral in 1-2 sentences with own words; draw & label a coral polyp</p> <p>b. (2) Choose & draw one coral organism; label with common & scientific name</p> <p>c. (3) Name & illustrate one coral health threat</p> <p>d. (4) Name, label, & illustrate a potential solution to that threat</p> <p>e. When finished, students will present their page to their small group</p>
Assessment	Following, projects will be submitted & graded on participation & accuracy
Connection to Other Content Areas	Reading Comprehension - Reading nonfiction text and writing a brief summary in their own words requires students to determine main ideas and synthesize them
Extensions	<ul style="list-style-type: none"> ◆ MacGillivray <i>Coral Reef Adventure</i> Board game ◆ Create-a-Coral Art activity ◆ PBS Reef Scavenger Hunt
Acknowledgements	<ul style="list-style-type: none"> ◆ <i>The Blue Planet: Seas of Life</i> - Coral Seas. BBC Video. 2008 ◆ Chan, Seleem & Garcia, Christina. <i>Our Reef Let's Protect It: Coral Reef Education Curriculum Guide</i>. TASTE: Punta Gorda, BZE. ◆ Collard, Sneed B. <u><i>One Night In The Coral Sea</i></u>. Charlesbridge: Watertown, MA. 2005 ◆ Gibbons, Gail. <u><i>Coral Reef</i></u>. Holiday House: New York. 2007 ◆ MacGillivray Freeman Films. <i>Coral Reef Adventure: Teacher's Guide</i>. http://www.coralfilm.com/edu.html#guide

Lesson 1: What Are Corals?

Standards:

- ◆ Science 2.a - Students know many multicellular organisms have specialized structures to support the transport of materials.
- ◆ ELA 2.3 Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas.
- ◆ ELA 2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

Objectives: Students will be able to draw conclusions and determine main ideas in order to compose a summary of a collective definition of coral.

Materials:

- ◆ Copies of 4 different definitions of *What are corals?*
- ◆ Index cards
- ◆ Sentence strips
- ◆ LCD projector; document
- ◆ Butcher paper with lightly sketched coral polyp

Intro: Show students a Powerpoint Presentation of What Are Coral Reefs? Build on the picture walk and introduction to my expedition from the previous day.

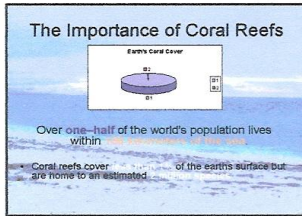
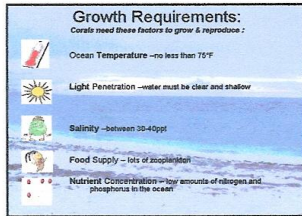
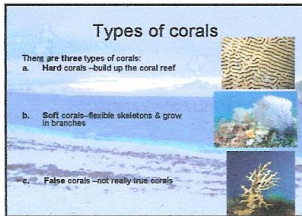
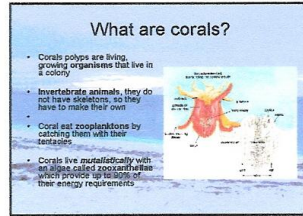
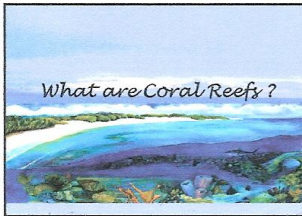
Directed Teaching: Using chart paper with a lightly sketched outline of a coral polyp, draw the polyp as you discuss it's main anatomy and its parts' functions - mouth, stomach, tentacles, zooxanthellae, skeletal cup - as well as how a coral colony forms, and eventually a reef.

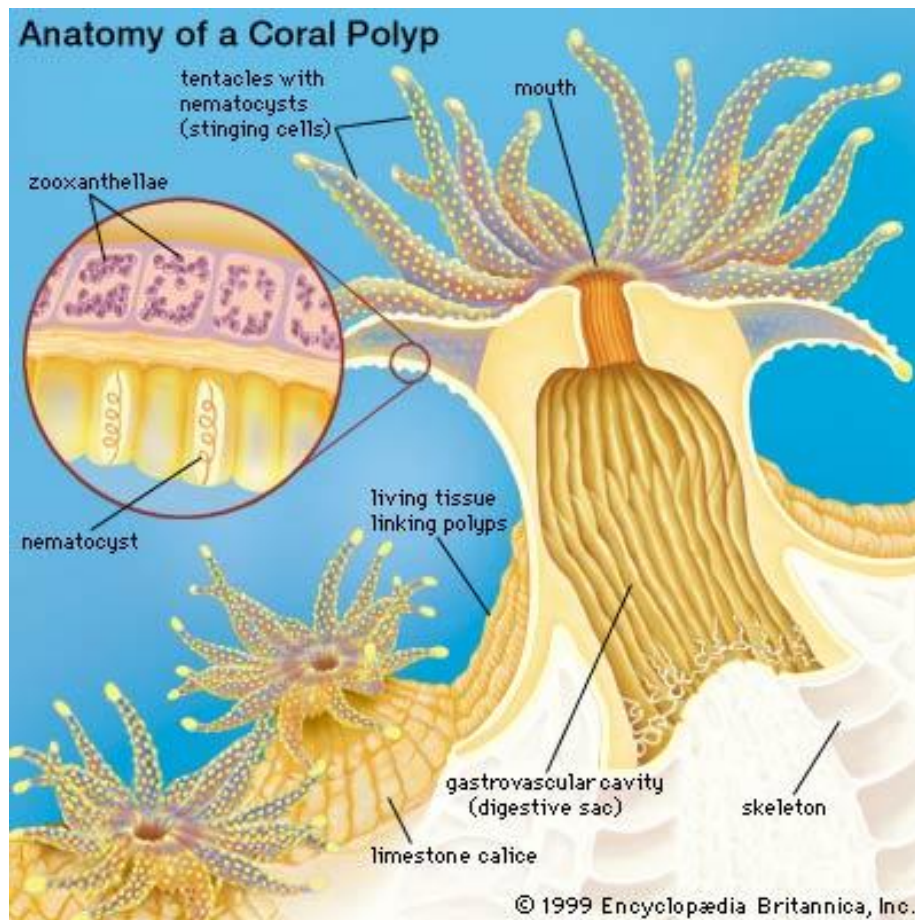
Guided Practice: Students are arranged into table groups of four & each child in the group has a different definition of *What are corals?* Students find the other members of the class who have the same number definition as they do and meet to read, discuss, & summarize their group's definition of *What are corals?* in 1-2 sentences on an index card. Each member of each group brings their index card back to their table group and shares their definition. As a table group, they create a collective definition of *What are corals?* and write in large writing on a sentence strip.

Closure: These definitions are shared with the class and placed in a pocket chart in the front of the class.

What are Corals? Assessment Rubric:

1	2	3 Proficient	4
<ul style="list-style-type: none"> · Relates a limited amount of information, conveying little or no understanding of the text. May copy extensively from text. 	<ul style="list-style-type: none"> · Demonstrates a partial understanding of the text, randomly restating facts/concepts, or relying heavily on the author's words. May copy some material from text. 	<ul style="list-style-type: none"> · Explains the main ideas and supporting details from the text in own words. 	<ul style="list-style-type: none"> · Accurately retells important concepts from the text in own words.
<ul style="list-style-type: none"> · May include some inaccuracies, omissions or confusions. 	<ul style="list-style-type: none"> · May utilize some key vocabulary. 	<ul style="list-style-type: none"> · Utilizes some key vocabulary. 	<ul style="list-style-type: none"> · Utilizes key vocabulary appropriately.
<ul style="list-style-type: none"> · May include information that is off topic 	<ul style="list-style-type: none"> · May include inaccuracies or omissions. 	<ul style="list-style-type: none"> · Attempts to draw inferences/generalizations and supports them with textual evidence and prior knowledge (schema) 	<ul style="list-style-type: none"> · Synthesizes concepts from the text, using textual evidence and prior knowledge to draw inferences and generate original conclusions





<http://cache.eb.com/eb/image?id=26994&rendTypeld=4>

Polyp Structure -

Mouth: The mouth or the open end of the polyp has tentacles around its edge. The mouth is the only opening a polyp has. The opening of the polyp is used to take in food and to expel waste.

Stomach: The middle section of the polyp is shaped like a tube; inside it has a hollow space called the gut.

Skeletal Cup: The base of the polyp is attached to its stony cup. The polyp of hard corals produces a stony skeleton of limestone beneath the base where the polyp lives.

Tentacles: Stinging cells to catch & kill pray, like plankton.

Zooxanthellae: Algae found inside coral that uses sunlight to make food and share it with the coral colony

Coral Definitions

1. What are corals? *Excerpt from One Night in the Coral Sea*

Corals are relatives of jellyfish and sea anemones. They can be found in all the world's oceans, warm and cold, from shallow waters to the deep ocean floor. Corals are made up of little individuals called **polyps**. Polyps look like tiny sea anemones. Most polyps are about the size of your fingertips, but some are so small you need a microscope to see them. Others - like the single polyp of this mushroom coral - are "giants," measuring up to 10 inches across.

2. What are corals? *Excerpt from Our Reef: Let's Protect It (TASTE)*

Corals are living, growing organism in a colony of tiny (less than a millimeter to a few centimeters in diameter) animals called coral **polyps**. Coral polyps grow in colonies, meaning that each individual polyp is attached to another, and then another. The polyps are **invertebrate** animals, meaning that it is an animal with no backbone. Coral polyps do not have skeletons, so they have to make their own out of limestone. Thousands of these tiny skeletons combine to become the structure of a reef.

3. What are corals? *Excerpt from Coral Reefs*

Coral reefs are found in shallow, unpolluted tropical waters near the equator. Marine biologists tell us that coral reefs were built over long periods of time with the tiny skeletons of animals called hard coral **polyps**. Layers of hard coral polyps build up when the polyps attach themselves to each other. When they die, their skeletons form coral rocks, the hard base of a coral reef. More living polyps continue building on top of the hard base, forming beautiful coral reefs teeming with life. Each kind of coral will grow into a structure with its own shape and size, called a **coral colony**.

4. What are corals? *Excerpt from <http://animals.nationalgeographic.com/>*

Coral organisms, called **polyps**, are tiny, soft-bodied animals related to sea anemones and jellyfish. At their base is a hard, protective limestone skeleton, which forms the structure of coral reefs. Coral polyps are actually translucent animals. Reefs get their wild colors from the billions of colorful **zooxanthellae** (ZOH-oh-ZAN-thell-ee) algae they host. Reefs begin when a polyp attaches itself to a rock on the sea floor, then divides, or buds, into thousands of clones. The bases of the polyp connect to one another, creating a **colony** that acts as a single organism.

Lesson 2: Types of Corals

Standards:

- ◆ Science 2.a - Students know many multi-cellular organisms have specialized structures to support the transport of materials.
- ◆ Science 6.a Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.

Objectives: Students will be able to determine at least one similarity & one difference between several types of coral. Students will use various senses (sight, touch) to identify corals.

Materials:

- ◆ Picture set of 5 varieties of corals to be worked with in groups of 4
- ◆ Chart paper & markers
- ◆ Empty tissue boxes (opening covered)
- ◆ 3-D models of corals in several varieties

Intro: Review student definitions of corals from the day before. Emphasize that as coral polyps combined form an entire coral organism. Reference the pictures around the classroom for the picture walk to show several common types.

Directed Teaching: Demonstrate how to sort various types of corals by using the picture walk photos. Model finding commonalities and differences with one type of coral, like brain. Place these photos on chart paper labeled with the common name. Then have the entire class help you sort another type.

Guided Practice: Hand each table group a set of photos with pictures of common types of coral - brain, star, lettuce, horn, etc. Have them work together to sort the pictures. When the groups have finished, go over their sorts, and have them place the photos on the appropriate chart paper labeled with the common names around the room.

Independent Practice: Students work on completing a process grid of the corals in the photos - illustrating it, listing their personal description, and listing the scientific name.

As students do this, they will be called in groups to feel corals hidden within empty tissue boxes. Using what they now know about various types of corals, students will use the sense of touch to describe and guess what type of coral is in each box.

Closure: Teacher will cover the process grid with the whole class & reveal which corals are inside the boxes.

Classifying Corals Process Grid

COMMON NAME	SKETCH	DESCRIPTION	SCIENTIFIC NAME
BRAIN			
STAR			
PILLAR			
LETTUCE			
HORN			

Picture Sort - Brain Corals



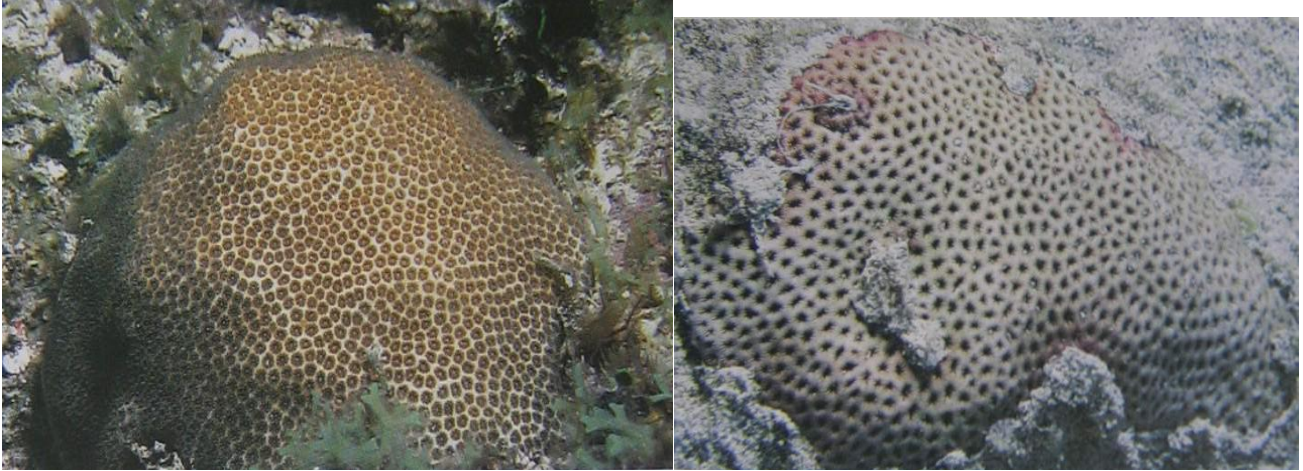
Picture Sort - Horn Corals



Picture Sort - Lettuce Corals



Picture Sort - Star Corals



Picture Sort - Pillar Corals



Lesson 3: Coral Health Threats

Standards:

- ◆ Science 4.b Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.
- ◆ Science 4.c Students know the causes and effects of different types of severe weather.
- ◆ ELA 2.1 Understand how text features (e.g., format, graphics, sequence, diagrams, illustrations, charts, maps) make information accessible and usable.
- ◆ ELA 2.3 Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas.
- ◆ ELA 2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

Objectives: Students will be organize information about coral health threats into sequential order, determine cause and effect, and brainstorm solutions to a problem.

Materials:

- ◆ Place cards for headings, subheadings, and bullet points
- ◆ Example photos
- ◆ Place mat with flow chart outline
- ◆ LCD projector; document scanner


Intro: Show students a Powerpoint Presentation of Coral Health Threats.

Directed Teaching: On the board demonstrate the various aspects of a flow chart - heading, subheadings, bullet points - and how they relate to one another.

Guided Practice: Students are arranged into table groups of four & given a manila envelope with place cards & a blank flow chart map. Students work together to arrange the place cards on the flow chart in the proper order.

Closure: Flow charts are corrected with the class & placed around the room. Teacher & students brainstorm solutions to these health threats.

Coral Reefs In Crisis?



A Look at Coral Health Threats

Threats

- **Human Expansion & Pollutants** – Agricultural runoff, freshwater run-off (drinking, toilet, etc.)
- **Natural disturbances** – ts, hurricanes or predators
- **Global Climate Change** – rising ocean temperatures, rising ocean depths


Human Impact

- **Water run-off** from agriculture & expansion
- **Waste** – can rub or smother corals




Natural Disturbances





- can't be helped BUT can harm coral
- **Hurricanes**
- **Predators** – like parrotfish or damselfish

Global Climate Change



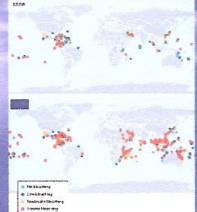
- **Rising Ocean Temperatures**
- **Melting of Polar Ice Caps**
- **Coral Bleaching**
- **Rising Ocean Deaths** – not enough food

Coral Bleaching

- When corals get stressed they can expel the *symbiotic* algae called zooxanthellae – called coral bleaching



Changes in water temperature and/or global warming are thought to be the main cause of coral bleaching.



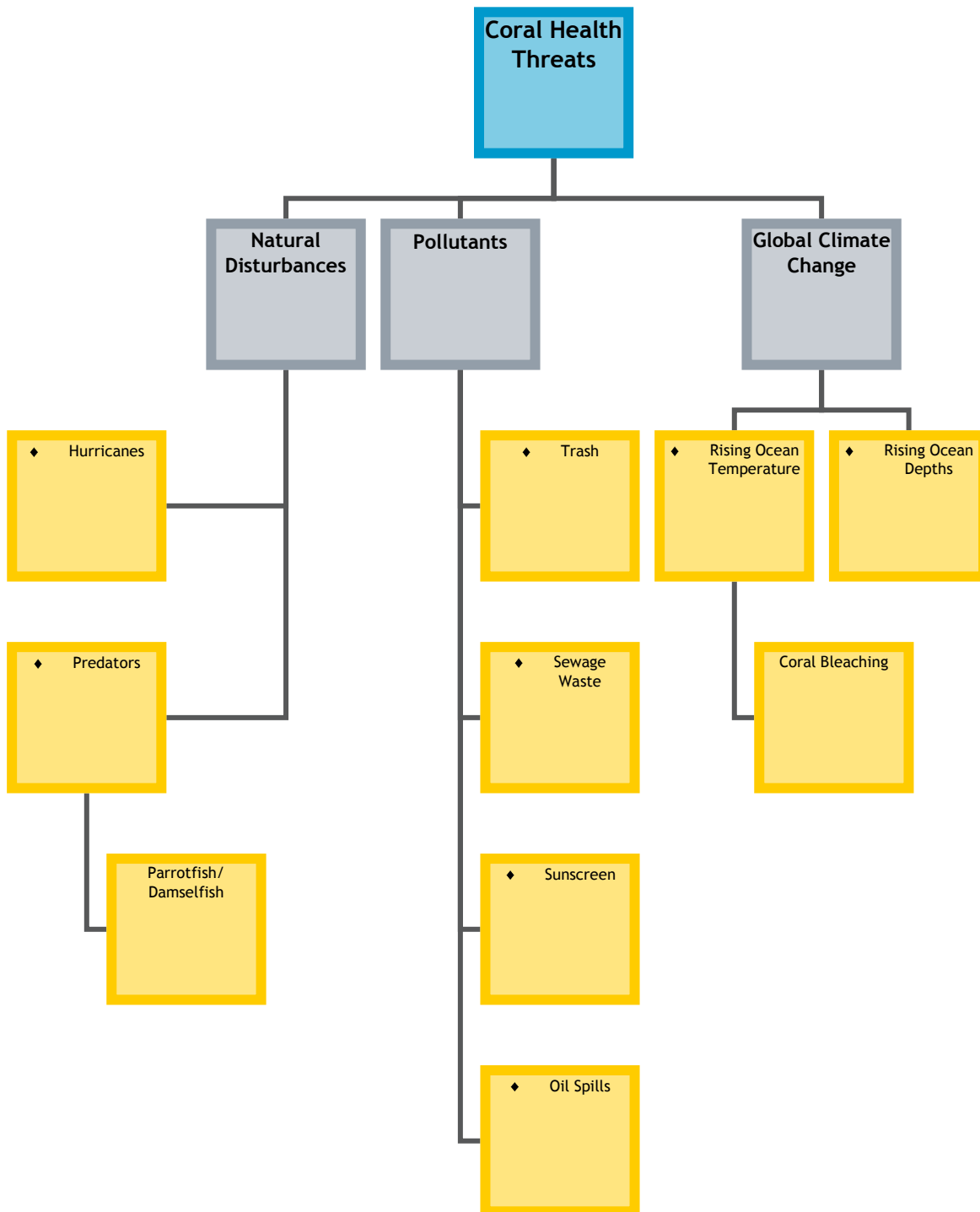
Legend:

- The World's Coral Reefs
- Coral Reefs
- Shallow Seagrass
- Deep Seagrass

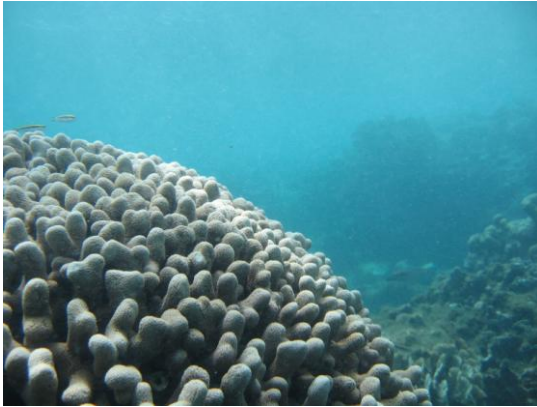
Coral Health

- Exposure to high temperatures can have devastating impacts
- Changes in water temperature and water quality make corals more susceptible to disease and death

Coral Health Threats Flow Chart (Key)



Corals in Crisis? You Betta Belize It!



For the past week, you have learned about the importance of coral in our world's oceans. It is truly **AMAZING** that over **one-half** of the world's population lives within **100 kilometers of the sea**. How can we stand by and let this be harmed????

In your final project, please demonstrate what you've learned about coral and its health this week. *Use the guide below and the rubric on back to help you.* On a 12" x 18" sheet of construction paper divided into four quadrants, your project should include the following:

Quadrant I

PROJECT DUE: _____

____ (4 points) Define coral in 1-2 sentences with own words

____ (4 points) Draw & label a coral polyp

Quadrant II

____ (4 points) Choose & draw one coral organism

____ (4 points) Label it with its common & scientific name

Quadrant III

____ (4 points) Name one coral health threat & explain it

____ (4 points) Illustrate what the threat might look like

Quadrant IV

____ (4 points) Name a potential solution to that threat & explain how it will help

____ (4 points) Illustrate what that solution might look like

___ /32 Total Points

REMEMBER: Use your creativity, ask questions, and be neat!

	1	2	3	4
Content	<ul style="list-style-type: none">◆ Few labels included◆ Most quadrants incomplete◆ Definition is not present, does not show understanding, or is copied	<ul style="list-style-type: none">◆ Some labels included◆ Some quadrants incomplete◆ Definition is present, but does not show definite understanding	<ul style="list-style-type: none">◆ Almost all items labeled correctly◆ All quadrants completed◆ Definition shows comprehension & uses own words	<ul style="list-style-type: none">◆ Items clearly labeled◆ All quadrants completed & shows complexity◆ Definition uses own words & shows in depth knowledge
Pictorial	<ul style="list-style-type: none">◆ Little to no effort shown◆ Work appears rushed and or sloppy◆ Picture does not represent the label or explanation	<ul style="list-style-type: none">◆ Some effort shown◆ Work is sometimes neat◆ Little connection between the pictures & the labels/ explanations	<ul style="list-style-type: none">◆ Demonstrates effort◆ Work is neat◆ Pictures clearly represent the labels/ explanation	<ul style="list-style-type: none">◆ Shows extra attention to details◆ Uses unique approach◆ Includes additional touches that enhance knowledge