

# Kids as Airborne Mission Scientists

## Lesson overview: How are Coral Reefs Important to Us?

### FRAME

Students are reminded of the overall problem

### INFORM

Students look at the web sites and understand that different perspectives are required to investigate the importance of coral reefs.

### EXPLORE

Students are grouped into several teams and explore the importance of coral reefs based on their given roles.

### TRY

Students present the results of their investigation to find the values of coral reefs to human life.

### SUPPORT

Support materials for the teacher includes ideas to promote student reflection, sample answers to activities, and extension of these ideas.

Click on FRAME, INFORM, EXPLORE, TRY, or SUPPORT above to view the detailed lesson plan.

**Lesson context:** This lesson provides students with answers to the questions about why the investigation about coral reefs is important to them. They explore the coral reefs' value to life. During this lesson, students are grouped into teams and participate in role-playing to investigate the coral reefs' values based on different perspectives. They are asked to take the perspective of individuals responsible for coastal development, ocean related tourism, pharmaceutical research, commercial fishing, coral reefs ecologists, the geological record, and the Native Hawaiian culture. Based on their understanding about the importance of coral reefs in both economic, scientific, and cultural perspectives, students can develop the background necessary to determine how coral reefs are important to them.

### **Key science concepts:**

- Definition of coral reefs
- Definition of biodiversity
- The role of ecologists, biologists, and geologists.

### **Links to teacher resources:**

- [Importance of coral reefs \(http://oceanworld.tamu.edu/students/coral/coral4.htm \)](http://oceanworld.tamu.edu/students/coral/coral4.htm)
- [Why Learn About Coral Reef Ecosystems? \(Biologically, Geologically, Culturally\) http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html](http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html)

### **Problems addressed in this lesson:**

- How are coral reefs important to us based on an economic perspective (ocean related tourism, pharmaceutical research, and commercial fishing)?
- How are coral reefs important to us based on an aesthetics perspective (biodiversity, geological record, and cultural significance to native Hawaiian Polynesian culture)?

- How do different perspectives influence our view of the importance of coral reefs?

**Activity bursts:**

- Study the perspective of coastal developers
- Study the perspective of ocean related tourists
- Study the perspective of commercial fishers
- Study the perspective of pharmaceutical researchers
- Study the perspective of coral reef ecologists
- Study the perspective of geologists
- Study the perspective of Native Hawaiian representatives with cultural activities in the Hawaii Islands

**Links to other resources:**

<b>Lesson</b>	<b><u>Teacher</u></b>	<b><u>Student</u></b>
INFORM	Importance of coral reefs <a href="http://oceanworld.tamu.edu/students/coral/coral4.htm">http://oceanworld.tamu.edu/students/coral/coral4.htm</a>	Importance of coral reefs <a href="http://oceanworld.tamu.edu/students/coral/coral4.htm">http://oceanworld.tamu.edu/students/coral/coral4.htm</a>
	Benefits of Reef (for all roles) <a href="http://www.personal.psu.edu/users/a/m/amr221/benefits_of_reefs.htm">http://www.personal.psu.edu/users/a/m/amr221/benefits_of_reefs.htm</a>	Benefits of Reef <a href="http://www.personal.psu.edu/users/a/m/amr221/benefits_of_reefs.htm">http://www.personal.psu.edu/users/a/m/amr221/benefits_of_reefs.htm</a>
	Coral reef slide   8   -coral reefs are a vital protein source (for commercial fisher's role) <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld008.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld008.htm</a>	Coral reef slide   8   -coral reefs are a vital protein source <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld008.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld008.htm</a>
	Commercial Fishers <a href="http://icpac.indiana.edu/careers/career_profiles/100042.xml">http://icpac.indiana.edu/careers/career_profiles/100042.xml</a>	Commercial Fishers <a href="http://icpac.indiana.edu/careers/career_profiles/100042.xml">http://icpac.indiana.edu/careers/career_profiles/100042.xml</a>
	Coral reef slide   9   -Beach-related tourism (for tourist role) <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld009.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld009.htm</a>	Coral reef slide   9   -Beach-related tourism <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld009.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld009.htm</a>
	Coral reef slide   10   -Coral reefs can save human lives (for pharmaceutical research role) <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld010.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld010.htm</a>	Coral reef slide   10   -Coral reefs can save human lives <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld010.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld010.htm</a>

	<p>Coral reef slide   11   -Coral reefs are a valuable resources (for all roles)  <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld011.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld011.htm</a></p>	<p>Coral reef slide   11   -Coral reefs are a valuable resources  <a href="http://www.wri.org/wri/powerpoints/reefs/www/sld011.htm">http://www.wri.org/wri/powerpoints/reefs/www/sld011.htm</a></p>
EXPLORE	<p>Why Learn About Coral Reef Ecosystems? (Biologically, Geologically, Culturally) (For geologist and Native Hawaiian roles)  <a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html">http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html</a></p>	<p>Why Learn About Coral Reef Ecosystems? (Biologically, Geologically, Culturally)  <a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html">http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html</a></p>
	<p><u>Coral reefs and coastal development role</u> (for coastal developer)  <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html</a></p>	<p><u>Coral reefs and coastal development role</u> (for coastal developer)  <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html</a></p>
	<p>Coastal Development (for coastal developer)  <a href="http://www.igc.org/wri/powerpoints/reefswwww/sld018.htm">http://www.igc.org/wri/powerpoints/reefswwww/sld018.htm</a></p>	<p>Coastal Development  <a href="http://www.igc.org/wri/powerpoints/reefswwww/sld018.htm">http://www.igc.org/wri/powerpoints/reefswwww/sld018.htm</a></p>
	<p>Ocean Developer (for coastal developer)  <a href="http://www.oceanhammock.com/developer.htm">http://www.oceanhammock.com/developer.htm</a></p>	<p>Ocean Developer (for coastal developer)  <a href="http://www.oceanhammock.com/developer.htm">http://www.oceanhammock.com/developer.htm</a></p>
	<p>Castle &amp; Cooke Hawaii: Corporate Story (for coastal developer)  <a href="http://www.castlecookehawaii.com/corporatestory.htm">http://www.castlecookehawaii.com/corporatestory.htm</a></p>	<p>Castle &amp; Cooke Hawaii: Corporate Story (for coastal developer)  <a href="http://www.castlecookehawaii.com/corporatestory.htm">http://www.castlecookehawaii.com/corporatestory.htm</a></p>
	<p>Important protection for coastal communities from storms, wave damage and erosion (for coastal developer)  <a href="http://www.coralreef.noaa.gov/">http://www.coralreef.noaa.gov/</a></p>	<p>Important protection for coastal communities from storms, wave damage and erosion (for coastal developer)  <a href="http://www.coralreef.noaa.gov/">http://www.coralreef.noaa.gov/</a></p>
	<p><u>Coral Reefs and Tourism: The Threat and the Potential</u> (for tourist)  <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html</a></p>	<p><u>Coral Reefs and Tourism: The Threat and the Potential</u>  <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html</a></p>
	<p><u>Bad Sports and Tourist Traps</u> (for tourist)  <a href="http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/peril_tourism.html">http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/peril_tourism.html</a></p>	<p><u>Bad Sports and Tourist Traps</u> (for tourist)  <a href="http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/peril_tourism.html">http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/peril_tourism.html</a></p>

Career Resources- Commercial Fishers (for commercial fisher) <a href="http://icpac.indiana.edu/careers/career_profiles/100042.xml">http://icpac.indiana.edu/careers/career_profiles/100042.xml</a>	Career Resources- Commercial Fishers (for commercial fisher) <a href="http://icpac.indiana.edu/careers/career_profiles/100042.xml">http://icpac.indiana.edu/careers/career_profiles/100042.xml</a>
Pressroom (for commercial fisher) <a href="http://www.pewoceans.org/articles/2001/06/25/pr_19061.asp">http://www.pewoceans.org/articles/2001/06/25/pr_19061.asp</a>	Pressroom(for commercial fisher) <a href="http://www.pewoceans.org/articles/2001/06/25/pr_19061.asp">http://www.pewoceans.org/articles/2001/06/25/pr_19061.asp</a>
<u>Over-fishing and global food security</u> (for commercial fisher) <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_overfish_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_overfish_981019.html</a>	<u>Over-fishing and global food security</u> (for commercial fisher) <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_overfish_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_overfish_981019.html</a>
<u>Pharmaceutical Research</u> (for pharmaceutical researcher) <a href="http://www.greenreefbelize.com/reefbriefs/briefs34.html">http://www.greenreefbelize.com/reefbriefs/briefs34.html</a>	<u>Pharmaceutical Research</u> (for pharmaceutical researcher) <a href="http://www.greenreefbelize.com/reefbriefs/briefs34.html">http://www.greenreefbelize.com/reefbriefs/briefs34.html</a>
Career Resources (for – biologist) <a href="http://icpac.indiana.edu/careers/career_profiles/100254.xml">http://icpac.indiana.edu/careers/career_profiles/100254.xml</a>	Career Resources-Bilologist (for biologist) <a href="http://icpac.indiana.edu/careers/career_profiles/100254.xml">http://icpac.indiana.edu/careers/career_profiles/100254.xml</a>
<u>Biodiversity on coral reefs</u> (for biologist) <a href="http://www.environmentaldefense.org/pubs/FactSheets/f_REEFFact.html">http://www.environmentaldefense.org/pubs/FactSheets/f_REEFFact.html</a>	<u>Biodiversity on coral reefs</u> (for biologist) <a href="http://www.environmentaldefense.org/pubs/FactSheets/f_REEFFact.html">http://www.environmentaldefense.org/pubs/FactSheets/f_REEFFact.html</a>
<u>Teeming with biodiversity</u> (for ecologist) <a href="http://www.coralreefalliance.org/professorpoly/2002/march.html">http://www.coralreefalliance.org/professorpoly/2002/march.html</a>	<u>Teeming with biodiversity</u> (for ecologist) <a href="http://www.coralreefalliance.org/professorpoly/2002/march.html">http://www.coralreefalliance.org/professorpoly/2002/march.html</a>
Ecologists <a href="http://www.career.edu.my/path/desc.asp?career_id=165">http://www.career.edu.my/path/desc.asp?career_id=165</a>	Ecologists <a href="http://www.career.edu.my/path/desc.asp?career_id=165">http://www.career.edu.my/path/desc.asp?career_id=165</a>
<u>Coral provides clues to climate change</u> (for geologist) <a href="http://www.enn.com/enn-news-archive/2000/02/02062000/coralkey_9702.asp">http://www.enn.com/enn-news-archive/2000/02/02062000/coralkey_9702.asp</a>	<u>Coral provides clues to climate change</u> (for geologist) <a href="http://www.enn.com/enn-news-archive/2000/02/02062000/coralkey_9702.asp">http://www.enn.com/enn-news-archive/2000/02/02062000/coralkey_9702.asp</a>
<u>The Rise and Fall of the Sea</u> (for geologist) <a href="http://www.reef.edu.au/asp_pages/secc.asp?formno=1">http://www.reef.edu.au/asp_pages/secc.asp?formno=1</a>	<u>The Rise and Fall of the Sea</u> (for geologist) <a href="http://www.reef.edu.au/asp_pages/secc.asp?formno=1">http://www.reef.edu.au/asp_pages/secc.asp?formno=1</a>

<p>Geologists and Geophysicists  <a href="http://icpac.indiana.edu/careers/career_profiles/100104.xml">http://icpac.indiana.edu/careers/career_profiles/100104.xml</a></p>	<p>Geologists and Geophysicists  <a href="http://icpac.indiana.edu/careers/career_profiles/100104.xml">http://icpac.indiana.edu/careers/career_profiles/100104.xml</a></p>
<p>Hawaiians (for native Hawaiian)  <a href="http://www.hawaiiiguide.com/hawai1.htm">http://www.hawaiiiguide.com/hawai1.htm</a></p>	<p>Hawaiians (for native Hawaiian)  <a href="http://www.hawaiiiguide.com/hawai1.htm">http://www.hawaiiiguide.com/hawai1.htm</a></p>
<p>Venturing into Hawaii's Coral Reef (for native Hawaiian)  <a href="http://library.thinkquest.org/J002237/splash/page.htm">http://library.thinkquest.org/J002237/splash/page.htm</a></p>	<p>Venturing into Hawaii's Coral Reef (for native Hawaiian)  <a href="http://library.thinkquest.org/J002237/splash/page.htm">http://library.thinkquest.org/J002237/splash/page.htm</a></p>
<p><u>Black coral</u> (for native Hawaiian)  <a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html">http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html</a></p>	<p><u>Black coral</u> (for native Hawaiian)  <a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html">http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html</a></p>

# Kids as Airborne Mission Scientists

## How are Coral Reefs Important to Us?

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**Related subject area:** Science, Geography.

**Overall problem:** Which activities (if any) should be restricted around the coral reefs of Kailua Bay to insure their lasting protection?

**Relationship of problem in this lesson to overall problem:** To understand which activities should be restricted around the coral reefs of Kailua Bay, students need to know why coral reefs are important. The goal of this lesson is for students to develop background knowledge about the importance of coral reefs. They develop this background by participating in role-plays where they will explore different perspectives about the importance of coral reefs. Students are grouped into teams and are assigned to take one of the following perspectives: coastal development, ocean related tourism, pharmaceutical research, commercial fishing, biodiversity, the geological record, or the significance to native Hawaiian culture. By investigating these different perspectives, students can weigh the various problems that can be encountered against the various gains in order to prepare the recommendation called for in the Executive Order.

**Estimated time required:** 1 to 2 class periods

**Student outcomes/objectives:**

- Students will be able to describe the importance of coral reefs based on an economic perspective (coastal development, ocean related tourism, pharmaceutical research, commercial fishing).
- Students will be able to describe the importance of coral reefs based on an aesthetics perspective (biodiversity, geological record, significance to native Hawaiian culture).
- Students will be able to describe how different perspectives influence their view of the importance of coral reefs.

**Prerequisite skills or knowledge:**

- Basic internet skills.
- Working in teams.
- Basic understanding of problem solving.
- Basic reading skills.
- Basic presentation preparation and skills.

**Teacher preparation:**

- Bookmark appropriate websites for students.



# Kids as Airborne Mission Scientists

## How are Coral Reefs Important to Us?

(Continued)

- Print Student Journal /Activity sheets for these activities.

**Student reflection and assessment:** [Student reflection activity](#) | [Assessment](#)

**Education standards supported by this lesson:**

[National Science Education Standards](#) | [Project 2061 Benchmarks](#)

[National Standards for School Mathematics](#) | [National Technology Standards](#) | [National Geography Standards](#)

**Cross-curricular connections to National Education Standards for this lesson:**

**Math | Technology | Geography**

Teacher activities	Student activities
<p><b>Frame</b> the lesson</p> <p><b>Ask</b> what is the overall problem that we are addressing?</p> <p><b>Ask</b> why the recommendation from the Coral reefs Task Force led to intense debates?</p> <p><b>Ask</b> which groups have concerns about the coral reef reserve policy and what kinds of concerns they have?</p>	<p>Sample student responses:</p> <ul style="list-style-type: none"> <li>• Which activities (if any) should be restricted around the coral reefs of Kailua Bay to insure their lasting protection?</li> <li>• Because concerned groups have different opinions</li> <li>• Commercial fisher, Coastal developer, Tourist in Hawaii. Coral reef ecologist, pharmaceutical researcher, geologist, and Native Hawaiian representative.</li> </ul>

<p>Ask students why coral reefs are important to us.</p>	<ul style="list-style-type: none"> <li>• Some concerned groups consider it overly restrictive and therefore detrimental to the fishing industry, the coastal development, and the tourism in Hawaii.</li> <li>• Other groups worry that the review of the EO will result in weakening the Reserve.</li> </ul>
<p><b>Teacher activities</b></p>	<p><b>Student activities</b></p>
<p><b>Inform</b> students of the importance of coral reefs by prompting them to look at <a href="http://oceanworld.tamu.edu/students/coral/coral4.htm">Importance of coral reefs</a> (<a href="http://oceanworld.tamu.edu/students/coral/coral4.htm">http://oceanworld.tamu.edu/students/coral/coral4.htm</a>), <a href="http://www.personal.psu.edu/users/a/m/amr221/benefits_of_reefs.htm">Benefits of Reef</a> (<a href="http://www.personal.psu.edu/users/a/m/amr221/benefits_of_reefs.htm">http://www.personal.psu.edu/users/a/m/amr221/benefits_of_reefs.htm</a>), and Importance of coral reefs (see slide   8   (<a href="http://www.wri.org/wri/powerpoints/reefswww/sld008.htm">http://www.wri.org/wri/powerpoints/reefswww/sld008.htm</a>),   9   (<a href="http://www.wri.org/wri/powerpoints/reefswww/sld009.htm">http://www.wri.org/wri/powerpoints/reefswww/sld009.htm</a>),   10   (<a href="http://www.wri.org/wri/powerpoints/reefswww/sld010.htm">http://www.wri.org/wri/powerpoints/reefswww/sld010.htm</a>),   11   (<a href="http://www.wri.org/wri/powerpoints/reefswww/sld011.htm">http://www.wri.org/wri/powerpoints/reefswww/sld011.htm</a> ) web sites.</p> <ul style="list-style-type: none"> <li>• Circle terms they think as the benefits of coral reefs</li> </ul> <p><b>Have</b> students think about the different perspectives that can influence one’s view of the importance of coral reefs.</p> <p><b>Ask</b> which words in the websites do you think are important?</p> <ul style="list-style-type: none"> <li>• Ask how these perspectives are grouped?</li> <li>• How are the coral reefs important to us?</li> <li>• Does the importance of coral reefs have the same meaning to everyone?</li> <li>• If not, why do people think differently? How do we know the different perspectives?</li> </ul>	<p>Students activity</p> <ul style="list-style-type: none"> <li>• Look at the websites and find the words representing the importance of coral reefs.</li> <li>• Circled words may include: providing bio-diversity, protecting coast, source for many pharmaceutical compounds, tourist attraction, etc.</li> <li>• Economic perspective</li> <li>• Scientific and cultural perspectives</li> </ul>



<p><b><u>from your given perspective (HCR-2)</u></b> (See the Activity Sheet: Exploring the importance of coral reefs from your given perspective. This document below) and ask them to explore the importance of coral reefs based on a give role.</p> <p><b><u>Teacher Background</u></b></p> <ul style="list-style-type: none"> <li>• <u>Why Learn About Coral Reef Ecosystems? (Biologically, Geologically, Culturally)</u> (<a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html">http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/WhyCoralReefs.html</a>)</li> </ul>	
<b>Teacher activities</b>	<b>Student activities</b>
<p><b>Try</b> using their knowledge</p> <p><b>Ask</b> each group to present the importance of coral reefs based on their assigned role and perspective.</p> <p><b>Discuss</b> each group’s investigation results.</p> <ul style="list-style-type: none"> <li>• Each group provides feedback about the other groups’ presentation.</li> <li>• Be sure to point out the given roles to each group and how the importance of coral reefs can be explained differently according to the different roles.</li> <li>• During these presentations the students construct <b><u>an overall table with all different perspectives (HCR-3)</u></b> (See Activity sheet: an overall table with all different perspectives. This document below).</li> </ul> <p><b>Teacher Note:</b></p>	<p>Student activity</p> <ul style="list-style-type: none"> <li>• Students present the results of their exploration.</li> <li>• Students assess and provide feedback about other groups’ presentation</li> <li>• Students identify the common factors and distinctions between different perspectives in <b><u>an overall table with all different perspectives (HCR-3)</u></b> (See Activity sheet: an overall table with all different perspectives. This document below)</li> </ul>

- Each group may have various responses. Prompt students to clarify the reason for their views.
- Students may record notes on the worksheets or the class can create a combined table on the chalkboard or poster paper.

**Discuss** the next steps. Now you will investigate the threats to the health of coral reefs.

**Student reflection activity:**

- Prompt students to think about why coral reefs have the value to life.
- Prompt students to understand that there is no single solution in solving this complex problem.
- Prompt students to think about why different perspectives are required to understand the coral reef problem.
- Prompt students to think that there are three main perspectives: the economic, scientific and cultural perspectives that are needed in order to understand the importance of coral reefs.

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**Assessment:**

- Check the students' view of the importance of coral reefs based on scientific perspective , including: biodiversity, geological record,
- Check the students' view of the importance of coral reefs based on a cultural perspective, including: cultural significance to native Hawaiians.
- Check the students' view of the importance of coral reefs based on an economic perspective , including: commercial fishing, ocean-related tourism, coastal development.
- Check the validity of the descriptions including: a given role, the relationship between the given role and the coral reefs, the importance of coral reefs according to a given role.

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**Ideas for math lesson connections**

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**Related National Education Math Standards**

- none

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**Ideas for geography lesson connections**

- Students identify the geographic location of the Hawaiian Islands. For example, the students might create a report describing the location and geography of the island.
- Students identify latitude and longitude of Hawaiian Islands, and compare the two.

**Related National Education Geography Standards**

- The World in Spatial Terms (1)
- Places and Regions (4, 6)

- Human Systems (11, 12)
  - Environment and Society (14, 15, & 16)
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### **Ideas for technology lesson connections**

- Students create their own electronic journal for keeping notes on KaAMS project.
- Students create a database of vocabulary words and terms they will learn throughout KaAMS.
- Students learn to use presentation software while preparing a presentation on their investigation results.
- Students begin to develop a web site to report their progress and what they learn during the KaAMS project.

### **Related National Education Science Technology Standards**

- Technology and Society (#4)
  - The Designed World (#17)
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## Group activity reference sites and instruction (HCR-1)

Your goal is to identify the importance of coral reefs according to your given role. You will need to complete **Activity sheet: Exploring the importance of coral reef from your given perspective** (Activity sheet: Exploring the importance of coral reef from your given perspective, this document below) while working with your team.

Group/problem	Reference site
<b>Group 1 – Study perspective of coastal developers</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html">Coral reefs and coastal development role</a> (<a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html</a>)</li> <li>• <a href="http://www.igc.org/wri/powerpoints/reefswww/sld018.htm">Coastal Development</a> (<a href="http://www.igc.org/wri/powerpoints/reefswww/sld018.htm">http://www.igc.org/wri/powerpoints/reefswww/sld018.htm</a>)</li> <li>• <a href="http://www.oceanhammock.com/developer.htm">Ocean Developer</a> (<a href="http://www.oceanhammock.com/developer.htm">http://www.oceanhammock.com/developer.htm</a>)</li> <li>• <a href="http://www.castlecookehawaii.com/corporatestory.htm">Castle &amp; Cooke Hawaii: Corporate Story</a> (<a href="http://www.castlecookehawaii.com/corporatestory.htm">http://www.castlecookehawaii.com/corporatestory.htm</a>)</li> <li>• <a href="http://www.coralreef.noaa.gov/">Important protection for coastal communities from storms, wave damage and erosion.</a> (<a href="http://www.coralreef.noaa.gov/">http://www.coralreef.noaa.gov/</a>)</li> </ul>
<b>Group 2 –Study the perspective of ocean related tourists</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html">Coral Reefs and Tourism: The Threat and the Potential</a> (<a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html</a>)</li> <li>• <a href="http://seawifs.gsfc.nasa.gov/OCEAN_PLANE_T/HTML/peril_tourism.html">Bad Sports and Tourist Traps</a> (<a href="http://seawifs.gsfc.nasa.gov/OCEAN_PLANE_T/HTML/peril_tourism.html">http://seawifs.gsfc.nasa.gov/OCEAN_PLANE_T/HTML/peril_tourism.html</a>)</li> </ul>
<b>Group 3 –Study the perspective of commercial fishers</b>	<ul style="list-style-type: none"> <li>• <a href="http://icpac.indiana.edu/careers/career_profiles/100042.xml">Career Resources- Commercial Fishers</a> (<a href="http://icpac.indiana.edu/careers/career_profiles/100042.xml">http://icpac.indiana.edu/careers/career_profiles/100042.xml</a>)</li> <li>• <a href="http://www.pewoceans.org/articles/2001/06/25/pr_19061.asp">Pressroom</a> (<a href="http://www.pewoceans.org/articles/2001/06/25/pr_19061.asp">http://www.pewoceans.org/articles/2001/06/25/pr_19061.asp</a>)</li> <li>• <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_overfish_981019.html">Over-fishing and global food security</a> (<a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_overfish_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_overfish_981019.html</a>)</li> </ul>

<p><b>Group 4 – Study the perspective of pharmaceutical researchers</b></p>	<ul style="list-style-type: none"> <li>• <a href="http://www.greenreefbelize.com/reefbriefs/briefs34.html">Pharmaceutical Research</a> (<a href="http://www.greenreefbelize.com/reefbriefs/briefs34.html">http://www.greenreefbelize.com/reefbriefs/briefs34.html</a>)</li> </ul>
<p><b>Group 5-Study the perspective of ecologists</b></p>	<ul style="list-style-type: none"> <li>• <a href="http://icpac.indiana.edu/careers/career_profiles/100254.xml">Career Resources-Bilologist</a> (<a href="http://icpac.indiana.edu/careers/career_profiles/100254.xml">http://icpac.indiana.edu/careers/career_profiles/100254.xml</a>) (Ask the kids what kind of biologist studies coral reefs? Answer: a marine biologist/ecologist)</li> <li>• <a href="http://www.environmentaldefense.org/pubs/FactSheets/f_REEFFact.html">Biodiversity on coral reefs</a> (<a href="http://www.environmentaldefense.org/pubs/FactSheets/f_REEFFact.html">http://www.environmentaldefense.org/pubs/FactSheets/f_REEFFact.html</a>)) ( see the Biological And Economic Values in the middle of screen)</li> <li>• <a href="http://www.coralreefalliance.org/professorpoly/2002/march.html">Teeming with biodiversity</a> (<a href="http://www.coralreefalliance.org/professorpoly/2002/march.html">http://www.coralreefalliance.org/professorpoly/2002/march.html</a>)</li> <li>• Ecologists <a href="http://www.career.edu.my/path/desc.asp?career_id=165">http://www.career.edu.my/path/desc.asp?career_id=165</a></li> </ul>
<p><b>Group 6-Study the perspective of geologists</b></p>	<ul style="list-style-type: none"> <li>• <a href="http://www.enn.com/enn-news-archive/2000/02/02062000/coralkey_9702.asp">Coral provides clues to climate change</a> (<a href="http://www.enn.com/enn-news-archive/2000/02/02062000/coralkey_9702.asp">http://www.enn.com/enn-news-archive/2000/02/02062000/coralkey_9702.asp</a>)</li> <li>• <a href="http://www.reef.edu.au/asp_pages/secc.asp?formno=1">The Rise and Fall of the Sea</a> (<a href="http://www.reef.edu.au/asp_pages/secc.asp?formno=1">http://www.reef.edu.au/asp_pages/secc.asp?formno=1</a>)Geologists and Geophysicists <a href="http://icpac.indiana.edu/careers/career_profiles/100104.xml">http://icpac.indiana.edu/careers/career_profiles/100104.xml</a></li> </ul>
<p><b>Group 7- Study the perspective of native Hawaiian with cultural activities in Hawaii Islands</b></p>	<ul style="list-style-type: none"> <li>• <a href="http://www.hawaiiiguide.com/hawaii1.htm">Hawaiians</a> (<a href="http://www.hawaiiiguide.com/hawaii1.htm">http://www.hawaiiiguide.com/hawaii1.htm</a>)</li> <li>• <a href="http://library.thinkquest.org/J002237/splash/page.htm">Venturing into Hawaii’s Coral Reef</a> (<a href="http://library.thinkquest.org/J002237/splash/page.htm">http://library.thinkquest.org/J002237/splash/page.htm</a>)</li> <li>• <a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html">Black coral</a> (<a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html">http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html</a> )</li> </ul>

## **Activity sheet: Exploring the importance of coral reef from your given perspective (HCR-2)**

**Team members:**

**Name:**

**1. Defining our role:** What is our role?

**2. Relating our role to coral reef:** How is our role related to the coral reef problem?

**3. Why are coral reefs important to us as (fill in your role here):** Write two or three paragraphs about the importance of coral reefs to us.

## Activity sheet: an overall table with all different perspectives (HCR-3)

**Team member:**

**Names**

	<b>Defining Our Role</b>	<b>Relationship between our role and coral reefs</b>	<b>The importance of coral reefs to us</b>
<b>Coastal developers</b>	<p>Developing luxury hotels, championship golf courses, tennis courts, conference rooms, residential resort homes.</p> <p>(from: <a href="http://www.castlecookehawaii.com/corporatestory.htm">http://www.castlecookehawaii.com/corporatestory.htm</a> and <a href="http://www.oceanhammock.com/developer.htm">http://www.oceanhammock.com/developer.htm</a>)</p>	<p>“Unsound coastal development poses one of the greatest threats to coral reefs.”</p> <p>May lead to “loss of coastal water quality and increased nutrient and sediment runoff into coral ecosystems.”</p> <p>(from: <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html</a>)</p> <p>“Dredging of harbors, extraction of coral for construction materials, and building things such as airports atop coral reefs result in their outright destruction. Sewage discharge from coastal communities promotes growth of algae blocking sunlight, which corals need to survive.”</p> <p>(from: <a href="http://www.igc.org/wri/powerpoints/reefswww/slides018.htm">http://www.igc.org/wri/powerpoints/reefswww/slides018.htm</a>)</p>	<p>“Coastal environments support many of the world's most naturally productive and biologically diverse ecosystems, produce most of the world's fish catch, and support innumerable water-dependent and water-enhanced industries and activities.”</p> <p>(from: <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_coast_981019.html</a>)</p> <p>“Important protection for coastal communities from storms, wave damage and erosion.” Coastal developers would stand to lose a lot of money on their investments if they disregard the health of the reef.</p> <p>(from: <a href="http://www.coralreef.noaa.gov/">http://www.coralreef.noaa.gov/</a>)</p>

<p><b>Ocean related tourists</b></p>	<p>To experience the beauty of the ocean environment, to engage in recreational activities including diving, snorkeling, and boating.</p>	<p>“Damage to corals by divers, snorkelers, and boat anchors; and damage by cruise and recreational boat groundings; sedimentation and pollution associated with coastal tourism development; waste disposal from cruise ships and land-based hotels.”</p> <p>(from: <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html</a>)</p>	<p>From an aesthetic viewpoint: coral reef contain some of the Earth's most diverse living ecosystems, and the destruction of the reefs would be a tremendous loss to this incredible natural beauty.</p> <p>From an economic standpoint: “more than 100 countries could benefit economically from the recreational value provided by reefs.” Billions of tourism dollars will be lost if we don’t protect the coral reefs.</p> <p>(from: <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html">http://www.state.gov/www/global/global_issues/coral_reefs/fs-coral_tourism_981019.html</a>)</p>
<p><b>Commercial fishers</b></p>	<p>To catch ocean fish and other marine life using nets, cages, and other devices.</p> <p>(from: <a href="http://icpac.indiana.edu/careers/career_profiles/100042.xml">http://icpac.indiana.edu/careers/career_profiles/100042.xml</a> )</p>	<p>Coral reefs are a home and nursery for almost a million fish and other species, many that we rely on for food;</p>	<p>“The value of the U.S. reef fisheries off the Florida Keys and Hawaii is estimated at \$48.4 and \$20 million, respectively. The rich biodiversity of the reefs also holds promise of future food resources that may be exploited through aquaculture or biotechnology.”</p> <p>(from: <a href="http://www.state.gov/www/global/global_issues/coral_reefs/fs-">http://www.state.gov/www/global/global_issues/coral_reefs/fs-</a></p>

			<a href="#">coral_overfish_981019.html</a> )
<b>Pharmaceutical researchers</b>	<p>“Using sources such as sponges, corals, snails, and algae in order to find treatments for ailments such as AIDS, prostate, lung and breast cancer.”</p> <p>(from: <a href="http://www.greenreefbelize.com/reefbriefs/briefs34.html">http://www.greenreefbelize.com/reefbriefs/briefs34.html</a>)</p>	<p>“Corals use enzymes called secosteroids as a chemical defense mechanism against disease. Researchers have found that secosteroids can also be used in a similar way in humans, controlling tumor growth. These steroids are already being used to treat asthma, arthritis, and inflammatory disorders.”</p> <p>(from: <a href="http://www.greenreefbelize.com/reefbriefs/briefs34.html">http://www.greenreefbelize.com/reefbriefs/briefs34.html</a>)</p>	<p>Coral reefs have thousands of species that have yet to be identified. And some species contain significant sources of pharmaceutical knowledge that can never be duplicated. Conserving and protecting these areas is extremely important.”</p>
<b>Ecologists</b>	<p>Ecologists study the relationship between organisms and their environments. Coral reefs are very closely tied to their surrounding environment.</p> <p>(from: <a href="http://www.career.edu.my/path/desc.asp?career_id=165">http://www.career.edu.my/path/desc.asp?career_id=165</a>)</p>	<p>Coral reef ecologists study the complex interactions that go on within a coral reef ecosystem. Coral reefs are a treasure trove to ecologists because they are one the most biodiverse regions in the world. “This means that the variety of species living on a coral reef is greater than almost anywhere else in the world.”</p> <p><a href="http://www.coralreefalliance.org/professorpolyp/2002/march.html">Teeming with biodiversity (http://www.coralreefalliance.org/professorpolyp/2002/march.html)</a></p>	<p>Despite the fact that coral reefs only cover less than 0.2% of the ocean floor, they contain 25% or more of all marine species. This enables ecologists to study a wide range of marine species within such a localized environment.</p> <p><a href="http://www.environmentaldefense.org/pubs/Factsheets/f_REEFfact.html">Biodiversity on coral reefs</a> (<a href="http://www.environmentaldefense.org/pubs/Factsheets/f_REEFfact.html">http://www.environmentaldefense.org/pubs/Factsheets/f_REEFfact.html</a>)</p>

<p><b>Geologists</b></p>	<p>Geologists study how the earth's surface and interior are formed and what they are made of.</p> <p><a href="http://icpac.indiana.edu/careers/career_profiles/100104.xml">http://icpac.indiana.edu/careers/career_profiles/100104.xml</a></p> <p><a href="http://www.career.edu.my/path/desc.asp?career_id=165">http://www.career.edu.my/path/desc.asp?career_id=165</a></p>	<p>Just like tree rings reveal the age of trees and the past environmental conditions, coral rings show us the relative periods of growth and decline in the reef. This tells geologists something about what the past climate (paleoclimate) was like.</p> <p><a href="#">Coral provides clues to climate change</a> (<a href="http://www.enn.com/en-n-news-archive/2000/02/02062000/coralkey_9702.asp">http://www.enn.com/en-n-news-archive/2000/02/02062000/coralkey_9702.asp</a>)</p>	<p>Information can be obtained from coral cores, such as which times the Earth experienced changes in sea level, atmospheric conditions and also interruptive events such as ice ages, huge volcanic eruptions and meteors falling to Earth causing mass (widespread) extinctions.</p> <p><a href="#">Coral provides clues to climate change</a> (<a href="http://www.enn.com/en-n-news-archive/2000/02/02062000/coralkey_9702.asp">http://www.enn.com/en-n-news-archive/2000/02/02062000/coralkey_9702.asp</a>)</p>
<p><b>Native Hawaiian</b></p>	<p>The Native Hawaiians are the earliest settlers who sailed to Hawai'i on their canoes from the Marquesas Islands of Eastern Polynesia, arriving between 500 and 800 A.D.</p> <p>They recognized the value of coral reefs and incorporated a respect for the ecosystem into their collection practices.</p> <p><a href="http://www.hawaiiiguide.com/hawaii1.htm">http://www.hawaiiiguide.com/hawaii1.htm</a></p>	<p>Coral was used extensively throughout Hawaiian culture. They were presented as offerings during religious ceremonies and used as a medicinal powder. Today, we value black coral in jewelry and, in 1987, black coral was designated as Hawaii's state gem.</p> <p><a href="http://library.thinkquest.org/J002237/splash/page.htm">http://library.thinkquest.org/J002237/splash/page.htm</a></p> <p><a href="#">Black coral</a> (<a href="http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html">http://waquarium.mic.hawaii.edu/MLP/root/html/MarineLife/Invertebrates/Cnidarians/BlackCoral.html</a>)</p>	<p>Coral reefs are especially important to the Hawaiian tradition because the coral polyp was the first creature to emerge during the creation story in Hawaiian mythology.</p> <p><a href="http://www.hawaiiiguide.com/hawaii1.htm">http://www.hawaiiiguide.com/hawaii1.htm</a></p> <p><a href="http://library.thinkquest.org/J002237/splash/page.htm">http://library.thinkquest.org/J002237/splash/page.htm</a></p>