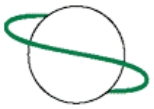
CONSERVATION AND SUSTAINABLE USE
OF THE
MESOAMERICAN BARRIER REEF SYSTEMS PROJECT
(MBRS)

Belice – Guatemala – Honduras – Mexico




Infusing the Mesoamerican Barrier Reef System Themes into Primary and Secondary Curricula



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Education for Sustainability (EfS) in Schools

Education for Sustainability is a vehicle for social and environmental education because it is one way of encouraging change. It helps people and communities to examine critically the technologies, systems of economic production, cultural systems of reproduction, laws and politics, and ideas and ideologies they currently employ for living with the rest of nature. It also helps them to reflect and act on viable alternatives. Sustainable development is dependent on the informed participation of all sectors of society. As informed participation is a skill that needs practice, it is essential that experience of democratic processes and thoughtful participation in decision-making and action should start early.

Knowledge of natural systems helps children understand the interconnections between all life and the way human actions affect these systems. Alternative solutions cannot be explored unless children have an understanding of the basic processes involved. It should be linked with a critical knowledge of the social systems that shape their lives. Only this combination provides an adequate basis for understanding causes, exploring alternative solutions, making decisions and taking responsible action. Learning to respond thoughtfully to issues is an important part of growing up and needs to be part of the school curriculum.

Education for sustainability can enrich many subject areas. It draws on scientific knowledge and understanding as well as the processes of making predictions, obtaining and evaluating evidence. While it is an excellent vehicle for spoken and written language work, it also uses mathematical data and geographical skills and knowledge. It promotes historical understanding and can provide a stimulating and relevant context for work in almost every other area of the curriculum.

The goals of EfS are:

- to foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;

- to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;

- to create new patterns of behavior of individuals, groups and society as a whole towards the environment.

The categories of EfS objectives are:

- *Awareness*: to help social groups and individuals acquire an awareness and sensitivity to the total environment and it's allied problems.

- *Knowledge:* to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and it's associated problems.

- *Attitudes:* to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.

- *Skills:* to help social groups and individuals acquire the skills for identifying and solving environmental problems.

- *Participation:* to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

(UNESCO-UNEP 1978)

The Mesoamerican Barrier Reef System (MBRS) Focus

In 1997, the countries of Mexico, Belize, Guatemala and Honduras signed the *Declaration of Tulum*, recognizing the interrelated nature of the MBRS and the importance to conserve and sustainably develop its biodiversity and natural resources. This action led to the development of the MBRS project aimed at the conservation and sustainable use of MBRS resources. The interrelated aspect of the MBRS is crucial to consider during management, legislation and education.

Although a lack of information exists across a range of themes about the ecological status and the extent of threats to the MBRS, some actions and phenomena have been identified as current potential threats to the MBRS. These include: dredging and construction activities related to expanding coastal tourism industry; growing and unplanned human settlements located along the coast and cays of the MBRS; and water-borne pollutants originating from untreated wastewater, industrial effluent and non-point sources of pollution (mainly from agricultural runoff); natural disturbances such as El Nino.

One principal area that the project addresses relates to transboundary issues. Several major ocean currents affect the Western Caribbean and the MBRS. These currents move sediments and contaminants from coastal drainage into the Gulf of Honduras and Bahia de Chetumal and unto the reef. Uncontrolled coastal development by the MBRS countries increases the damage caused by tropical storms and hurricanes. The storms destroy coastal infrastructure spilling large quantities of contaminants and sediments throughout the MBRS. Uncontrolled cross-border artisanal and industrial fishing especially during spawning aggregations is another problem.

Some of the objectives of the MBRS program, therefore, include the strengthening of Marine Protected Areas; reducing non-sustainable patterns of economic usage within the MBRS and strengthening and coordinating of national policies, regulations and institutional arrangement for marine ecosystem conservation and sustainable use. For these objectives to be effectively fulfilled requires the support of the majority of society.

Within the education component of the MBRS program, existing and potential threats need to be introduced and addressed. Students have to be given the essential information for them to understand the variety of factors influencing the issues of the MBRS. Students require basic knowledge on the biology, geology, ecology and functions of coral reefs and coastal ecosystems. Social and economic factors are taught within the context of the utilization of the MBRS. Students are given the opportunity to understand the issues and conceptualise and where possible, realize the potential solutions. To facilitate the integration of the concepts regarding the MBRS, the education aims have been divided into thematic areas (Figure 1).

Transboundary connectivity is a cross-cutting theme because it's components occur throughout most the general thematic areas of the MBRS. For example, fish spawning aggregations arises when discussing reef organisms, coral reef ecology, coral reef partner ecosystems and reef fisheries. It is important to distinguish opportunities in the curricula that are specifically targeted to transboundary themes (e.g. fish spawning) from those where transboundary principles can be introduced less forcefully. To clarify the difference between themes and principles, both have been defined below:

Transboundary connectivity theme: The actual mechanisms by which MBRS countries are connected across boundaries. These include fish spawning aggregations, ocean currents that transfer larvae and pollutants, and fishing activities across national borders. A curriculum would include a transboundary connectivity theme if it explicitly asked for a lesson on how MBRS countries are connected across boundaries or if it asked for a lesson on either of the mechanisms (fish spawning etc).

Transboundary connectivity principles: The term "Transboundary connectivity principles" is used whenever an MBRS theme includes one or more aspects of transboundary connectivity. In short, a theme would deal with transboundary connectivity in great detail whereas the principles might only be mentioned in the context of something else (e.g. pollution).

Thematic Areas for the MBRS

Coral Reef Biology & Ecology

- Coral Biology and Geology
  Biology of coral:types
  Formation of coral reefs: the three types

- Reef Organisms
  Plants
  Invertebrates
  Vertebrates

- Coral Reef Ecology
  Levels of organization (individual, population, community)
  Relationships among organisms
  Food chain, food web
  Natural disturbances to coral reefs: coral bleaching, hurricane

- Coral Reef Partner Ecosystems
  Connectivity between coral reefs, seagrass beds and mangroves

People and Coral Reef

- Goods & Services of Coral Reefs: coastal protection (from hurricanes), fisheries, biodiversity, sand/building materials, medicinal cures, tourism

- Reef Fisheries

- Coastal Development & Pollution

- Alternative Livelihoods

- Marine Protected Areas

Transboundary Connectivity

Fish Spawning Aggregations
Ocean Currents (moving larvae & pollutants throughout the MBRS)
Fishing

Figure 1. Thematic areas for MBRS education

Model for Integrating MBRS Themes

Coral reef problems and issues are connected to every fabric of our global society. Coral reef education should draw upon sociology, psychology, communications, economics, geography, history and many other disciplines in order to develop and implement resolutions to these complex issues. Educational systems should prepare citizens to cope with environmental issues by infusing topics appropriately throughout these disciplines in the curriculum. Students whose only exposure to coral reef problems is a short unit on ecology in their science/biology class will be poorly equipped to understand and respond to coral reef problems. To achieve the MBRS education aims, one key approach in the formal school curriculum is a coordinated infusion model (Peyton, et al, 1995). Teachers are shown the opportunities to infuse the MBRS themes into various sections of their countries' curricula. This model ensures that appropriate MBRS education goals are achieved in selected disciplines, science and geography, using teaching strategies and materials designed for that purpose.

The advantages of the coordinated model include:

- The importance and critical nature of problems and issues within the MBRS is reinforced by exposing students to the topic repeatedly throughout their educational experience.

- The need to accept environmental criteria in our personal and social actions – and the skills to do so – is strongly reinforced by integrating MBRS concepts into the problem solving of various disciplines.

- Allows educators to take full advantage of the students' readiness and capability to learn; improve understanding and retention; present complex, overwhelming problems in more solvable, understandable pieces.

The most obvious subject areas that would facilitate easy integration of MBRS themes are social science/geography and natural science/science in primary schools and biology, geography within secondary schools. Science focuses on systems. Social studies is based around concepts such as distribution of power, division of labor, conflict, interdependence and change. It is about people and their relationships in society. Social studies is concerned to develop children's critical awareness and understanding. It does this by using their everyday experiences of social life as a starting point. (Brand in Huckle, 1996)

Linking MBRS with MBC, principles underlying the approach

The Mesoamerican Barrier Reef System(MBRS) education component links with the Mesoamerican Biological Corridor(MBC) education component by considering the concepts used to approach the MBC principles and themes. The following list highlights the underlying concepts:

Interdependence:	understanding the connections and links between all aspects of their lives and those of other people and places at a local, national and global level, and that decisions taken in one place will affect what happens elsewhere.
Citizenship:	recognizing that they have rights and responsibilities to participate in decision-making, and that everyone should have a say in what happens in the future.
Needs and rights of Future Generations:	learning how they can lead lives that consider the rights and needs of others, and what they do now has implications for life in the future.
Diversity:	understanding the importance and value of diversity in their lives – culturally, socially, economically and biologically – and that their lives are lessened without it
Quality of Life:	recognizing that for any development to be sustainable it must benefit people in an equitable way; it is about improving everybody's lives
Sustainable Change:	understanding there is a limit to the way in which their community, their district, country and the world can develop, and that the consequences of unmanaged and unsustainable growth are increased poverty and hardship, and the destruction of the environment, is to the disadvantage of us all.

(from Morter-Lewis, 2002)

The goal in environmental education is to ensure that students are making informed choices that evaluate all known consequences against clearly identified values and with the best information available. The learning environment needs to encourage and foster critical holistic thinking, inquiry, listening skills, participatory and ethics.

Coral reef education must utilize interactive group learning strategies to develop skills which enable them to participate in group problem solving during coral reef issues. Environmentally literate citizens are capable of interacting with others in the process of investigating and evaluating issues, and in selecting and implementing actions.

Education Programs of the MBRS Countries and Subject Areas for Integration

In reviewing the education plans for the MBRS countries, most areas within science and geography have existing topics for integration. Varying degrees of overlap occur among the various curricula. Common general themes occur throughout the primary and secondary education plans. These themes are in all of the country education plans but occur at different grades within the individual plans.

Further investigation highlighted specific areas for integration. First, the MBRS thematic areas were coded. (Appendix A) The subject areas were compared with the MBRS thematic areas to identify the areas for integration. From this identification a grid was constructed that shows the thematic areas most easily integrated. (Appendix B) The grid was translated into a histogram (Figure 2) to show the hierarchy of opportunities.

The chart demonstrates that transboundary connectivity principles have the greatest opportunity to be integrated. However, the main opportunities to infuse these principles are indirect, being included in lessons on marine protected areas, coastal development & pollution and reef fisheries (highlighted in green). In contrast, the curricula contain few topic areas that are specifically targeted to transboundary themes. Of these themes, transboundary fishing may be infused at several positions in the curricula but ocean currents and fish spawning arise less often. This means that transboundary principles, which are fundamental to the MBRS project, must be infused indirectly through more general themes.

The greatest opportunities for integration under the general thematic areas involve People & Coral Reefs. Human interaction with the environment is a theme that occurs frequently within the countries' curricula. This creates interaction opportunities for the MBRS themes: coastal development & pollution, marine protected areas, alternative livelihoods and reef fisheries. This is a key area for students to understand their relationship with coral reefs and the environment.

Opportunities for infusion on the thematic area on coral biology & ecology also occur fairly frequently. There are areas for lessons on the biology and formation of coral reefs, coral reef ecology as well as coral reef partner ecosystems. These areas complement the topics on People & Coral Reefs.

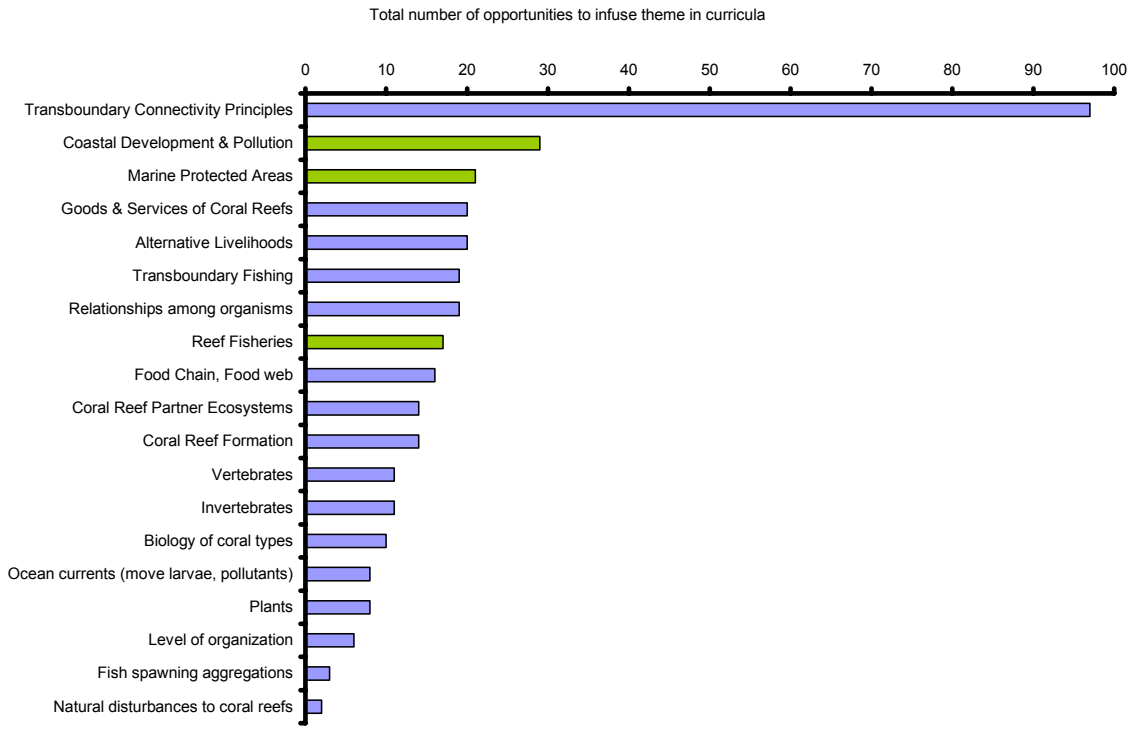

Figure 2. Opportunities for MBRS thematic areas within both primary & secondary education

The Primary Education Curricula and Areas for Integration

The comparison of primary education curricula among the MBRS countries showed areas of overlap. The effects of human action on the environment is the most common topic that occurs both in science and social studies for all countries. Both these subjects have various areas that allow for the integration of MBRS themes. Figure 4 shows the most common general theme areas.

Figure 4. Common thematic areas by subject for MBRS countries

Science	Social Studies
Living and non-Living Things in the Environment	Community
Effects of Humans on the Environment	Natural Resources of the Region
Protection of the Environment	Natural Resources of a country
	Problems of Environment caused by Humans

Coastal development & pollution has the highest opportunity for integration because both science and social studies contain areas of human interaction with the environment. The two transboundary themes, fish spawining aggregations and ocean currents (for movement of larvae and pollution), do not individually lend themselves to easy integration. There are other thematic areas in which they are imbedded, however that provide the vehicle for integration of these two thematic areas.

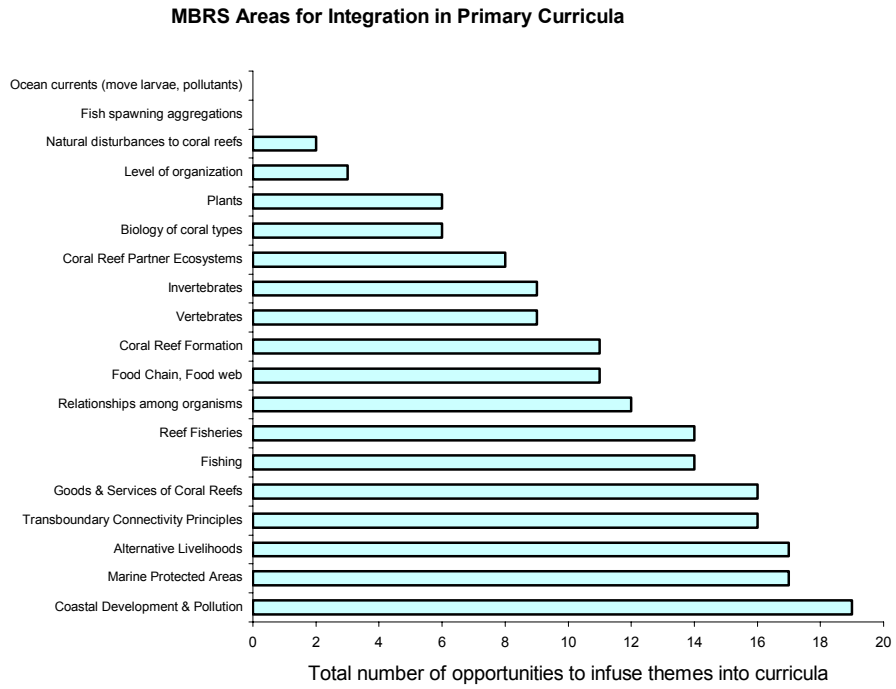

Figure 5. Opportunities for MBRS thematic areas within primary education

Each MBRS country curriculum was reviewed and the areas relative to the MBRS concepts were selected. These areas have been listed, by country, in tables according to subject (natural science, social studies). Each area has been coded with the relevant MBRS thematic code.

Primary Education Plan - Mexico						
	GRADE 1		**GRADE 2**		**GRADE 3**	
		CODE		**CODE**		**CODE**
NATURAL SCIENCE	The Environment & its Protection: ***Man transforms Nature*** (production of familiar products)	**DEV**	Living Things Living & Non-living Things in the Immediate Environment -general similarities/differences	**ECO**	Living Things: Environment & Protection -water & air & relation w/ plants, animals	**ECO**
			Living Things & their Environment -differences/similarities between plants & animals -characteristics of some plants in the community -characteristics of some animals in the community	**ORG** **ORG1** **ORG2** **ORG3**	*Natural Resources of the Community & the Region* –their relationship w/products used in the home & community -necessary care for preservation & improvement	**FIS** **ALT** **MPA**
			The Care & Protection of Living Beings in Environment: plants, animals, humans	**MPA**	*Origin & Destination of Rubbish* (organic, inorganic) produced in home & community	**DEV**
			Living Things in Terrestrial & Aquatic Environments -aquatic environments	**ORG**	Science, Technology & Society *Natural Resources of the Community & Region* –the relationship of resources w/products used at home & community -methods for rational use of natural resources	**SVC** **FIS** **ALT** **MPA**
			Environment & their Protection Changes in the Environment -Natural changes & those caused by man	**ECO4** **DEV** **TRA3**		
			Problems of Env Deterioration: -contamination of water, air, earth	**DEV**		
			Care & Protection that Required by Living Things	**ECO** **SVC**		

Primary Education Plan - Mexico						
NATURAL SCIENCES	**GRADE 4**		**GRADE *5***		**GRADE *6***	
		CODE		**CODE**		**CODE**
	Living Things *Notion of Ecosystem* -biotic & abiotic factors -types of organisms that inhabit ecosystems (producers. consumers, decomposers) -food chains -levels of organization (indiv, population, community) -examples of ecosystems	**ORG** **ECO2** **ECO3** **ECO1** **PAR**	Environment & its Protection *Human's Influence to Create, Control & Regulate Conditions of some Ecosystems*	**DEV** **TRA3**	Living Things *Large Ecosystems* -features of principal ecosystems -biotic & abiotic factors -interaction of humans w/environment & changes in ecosystems	**BIO** **ORG** **PAR** **SVC** **DEV** **TRA3**
	Environment & its Protection *Natural Resources of the Country* -cattle-rearing, agriculture, forestry -forms of rational exploitation of resources	**FIS** **TRA3**	*Contamination of Air, Water, Ground*: -consequences of contamination on living things; -actions to counteract contamination	**DEV**		
	Processes of Ecological Deterioration of the Country	**DEV** **TRA**				

Primary Education Plan - Mexico						
	GRADE 1		**GRADE 2**		**GRADE 3**	
		CODE		**CODE**		**CODE**
GEOGRAPHY	Countryside & City *Man Transforms Nature* *Env. Problems in Country & City*	**DEV** **TRA3**	Life in a Locality *Changes that have Taken Place in the Environment. by Society's Action & Natural phenomena.* *Activities that Cause Environmental Deterioration & Ways to Avoid it.*	**ECO4** **DEV** **DEV** **ALT** **MPA**	Resources & Population *Physical Characteristics*. - rivers, lakes, coasts *Natural Resources* -natural resources & their use/exploitation -environmental deterioration & its location -conservation of resources	**BIO2** **PAR** **SVC** **FIS** **DEV** **ALT** **MPA**

Primary Education Plan - Mexico						
	GRADE 4		**GRADE 5**		**GRADE 6**	
		CODE		**CODE**		**CODE**
GEOGRAPHY	Physical Characteristics & Natural Resources of Mexico *The Large, Natural Areas of Mexico* *Conservation of Natural Resources & Main Sources of Env. Deterioration*	**BIO2** **TRA** **DEV** **MPA** **ALT**	American Continent: Natural Resources & Economic Activities *Physical Characteristics of America:* -climate zones & principal natural regions; - natural resources & distribution *Regions & Economic Activities of the American Continent*: -environmental problems caused by human activities	**BIO1** **BIO2** **PAR** **TRA** **DEV** **TRA3**	Physical Characteristics of the Earth *The Earth's Great Natural Regions, Location & Characteristics*	**BIO1** **BIO2**
	Mexico: Principal Economic activities *Farming, Fishing, Forestry, Mining*	**FIS**			Productive Activities of the World *Main Natural Resources* -their use -main global environmental problems	**SVC** **FIS** **DEV** **TRA**

Upper Primary Education-Belize		
SCIENCE	**GRADES 5 & 6**	
		CODE
	Living Things *Environment is living and non-living things interacting with each other.* *Ecosystems: reefs, mangroves, rainforests* -Interrelationships & dependence that exists within the environment -The effects of society on the environment and the need to conserve and protect it	**ECO** **PAR** **DEV** **TRA3**
	Many Living Things in the world (land/water) *The Classification System* ▪ *Plant kingdom* ▪ *Animal Kingdom* -How living things develop different characteristics to adapt & survive in the environment -Structure & function of living things in relation to the categories in which they are grouped	**ORG** **ECO**
SOCIAL STUDIES	Physical Environment of Belize *Natural Regions (landscapes of Belize)* Types of Natural Resources as influenced by Natural Landscapes of Belize -How different landscape features and natural resources relate to human activity	**BIO** **FIS**
	Natural Resources and Settlement -How natural resources influence the settlement & development of Belize -How the distribution of natural resources across the world affects human activity & settlement	**FIS** **PAR** **DEV**

Basic Primary Education Plans - Honduras						
	Grade 1		**Grade 2**		**Grade 3**	
		CODE		**CODE**		**CODE**
NATURAL SCIENCE	Plants *Plants identified by their living environment (terrestrial, aquatic)*	**ORG1**	Vertebrate Animals *Most common animals in the community* Animals according to external characteristics, feeding habits (herbivores, carnivores, omnivores); reproduction (oviparous, viviparous), uses, habits (mammals, birds, reptiles, amphibians, fishes)	**ORG**	Animals are Living Things & Interdependence with Plants & Humans Differences between Vertebrate & invertebrate Similarities & differences among mammals, birds, fishes Importance of sea as a place where animals with food value live The role of animals in ecological equilibrium (food chains)	**ORG** **SVC** **FIS** **ECO2** **ECO3**
	Animals *Animals identified by their environment (aquatic, terrestrial)*	**ORG2** **ORG3**	The Importance of the Life of Animals Nutritional & economic values of fishes, mammals Measures to protect wildlife that are at point of extinction.	**FIS** **ALT** **MPA**		
	Animals are Living Things *Measures of protection for animals*	**MPA**				
	Humans are Part of Nature *Benefits humans get from nature*	**SVC**				

Basic Primary Education Plans - Honduras						
	Grade 4		**Grade 5**		**Grade 6**	
		CODE		**CODE**		**CODE**
NATURAL SCIENCE	Animals are Living Things Functions: feeding, respiration, reproduction Role of animals in the food chain Need to protect animals	**BIO** **ECO2** **SVC**	Animals are Living Things Interdependent with Plants & Humans Similarities/differences between vertebrate, invertebrates Importance of animals to maintain ecological equilibrium	**ORG2** **ORG3** **ECO2** **ECO3**	Plants & Animals are Connected in the Environment Relationships among living things of an aquatic & terrestrial community Species compete to live	**ECO1** **ECO2** **ECO3** **PAR** **ECO2**
					Sensibility for the Protection of Animals & Plants Importance of rational use of resources in the conservation of plants & animals Valid applications to protect and conserve plants & animals Project in conservation & environmental protection coordinated with the community	**ALT** **MPA** **ALT** **MPA** **TRA**

Basic Primary Education Plans - Honduras						
	GRADE 1		**GRADE 2**		**GRADE 3**	
		CODE		**CODE**		**CODE**
SOCIAL STUDIES	The Community Physical characteristics of the local community (relief, vegetation, fauna, water)	**BIO**	Relief of the District Different relief forms (mountains, valleys, rivers) Influence of relief on socio-economic development of the local community Benefits from natural resources Benefits that result from conservation & rational use of natural resource	**BIO** **FIS** **SVC** **FIS** **ALT** **MPA** **TRA**	Aspects of the Geography of Honduras Importance of relief forms (mountains, valleys, rivers, lakes and seas)	**BIO** **SVC**
	The Community Existing natural resources The usage of natural resources emphasizing economic value Care of natural resources	**BIO** **SVC** **FIS** **TRA3** **ALT** **MPA**	Social Attitudes Actions that contribute to the betterment and conservation of the environment	**ALT** **MPA**	Social Attitudes Behaviour that contributes to conservation & betterment of the environment	**ALT** **MPA** **TRA**

Basic Primary Education Plans - Honduras						
	GRADE 4		**GRADE 5**		**GRADE 6**	
		CODE		**CODE**		**CODE**
SOCIAL STUDIES	Ability to Use Maps & Globes Honduras in the context of the Central America Isthmus Countries & oceans that border Honduras Principal natural regions of Central America Isthmus (mountains, rivers, lakes, valleys, gulfs, bays & islands)	**TRA** **BIO** **TRA**	Productivity of America The most important natural resources of America The relation between technological development & the adequate use of natural resources	**SVC** **FIS** **ALT**	The Productivity of the Countries of the World Participation of the State in the conservation of natural resources Importance of rational use of natural resources for the good of humankind	**ALT** **MPA** **DEV** **FIS** **ALT**
	Demographic Information of Central America Territorial line of Honduras w/relation to the Central American Isthmus	**TRA**	Positive Social Attitudes The importance of the rational use of natural resources	**SVC** **DEV** **ALT**		
	Positive Social Attitudes Measures that contribute to conservation of the environment	**TRA** **ALT** **MPA**				
	Geography of Honduras Advantages & importance of the location of Honduras in Central America Importance of conservation & protection of natural resources	**TRA** **SVC** **MPA**				

Basic Primary Education Plan (based on Environmental Education plan)-Guatemala					
GRADES 1 & 2		**GRADES 3 & 4**		**GRADES 5 & 6**	
	CODE		**CODE**		**CODE**
Knowledge about Animals -Define terrestrial & aquatic animals. Describe terrestrial & aquatic habitats. - Benefits from animals Attitudes of respect, care and love for animals	**ORG2** **ORG3** **BIO1** **BIO2** **ECO3** **FIS** **MPA**	Animals Fauna of the community	**ORG2** **ORG3**	Families and Environment Use of Natural Resources by every family	**SVC** **FIS**
				World of Animals Ecosystem: types of ecosystems Relationships in an ecosystem Interrelationships among living things: symbiosis, parasitism, mutualism Habitat Food Chain	**BIO** **ECO2** **ECO2** **ECO3**
				Animals in danger of extinction Through Fishing Why do we need to protect some species?	 **FIS** **ALT** **MPA**
				How Trees Die Deforestation Causes & consequences of deforestation	**DEV**

The Secondary Education Curricula and Areas for Integration

According to the review of the secondary schools curricula of the MBRS countries, there are a few areas for integration. Biology and natural science subjects are predominantly concerned with the dynamics of ecosystems. These areas allow for the integration of lessons on the marine partner ecosystems (coral reefs, mangroves, seagrasses) and the organisms that comprise these systems. Geography and social science prepare students for becoming involved in the management of natural resources. They allow for the discussion of transboundary issues, investigating the countries ecological and economic relationships across borders.

Figure 6. Common thematic areas by subject for MBRS countries

Natural Science	**Geography**
Ecosystems (the relationship of living and non-living factors in the environment) Activities that Affect the Environment Environmental Management	Natural Regions Management of Natural Regions

The analysis shows that the most prominent theme for integration deals with coastal development and pollution within both subjects. General transboundary connectivity principles occur throughout the two subject areas. Again, the thematic areas of fish spawning aggregations and ocean currents have the least opportunities for integration on their own, but do occur within other thematic areas. Figure 7 demonstrates that there are less opportunities for pure transboundary issues such as fish spawning aggregations and the movement of larvae and pollution by ocean currents.

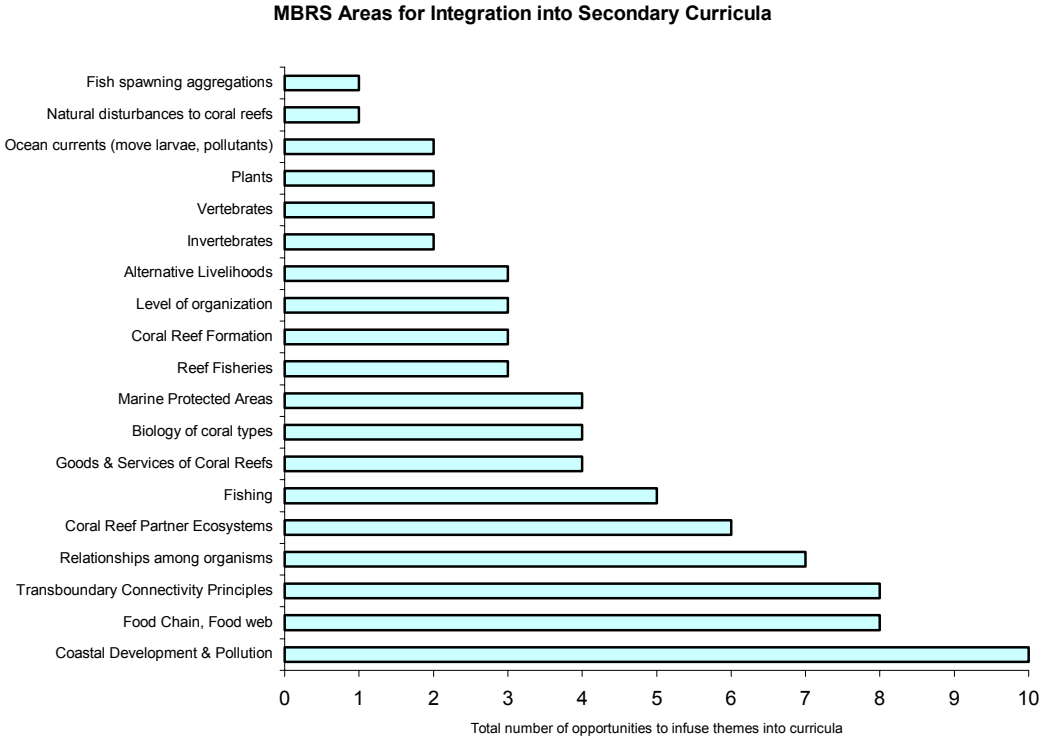

Figure 7. Opportunities for MBRS thematic areas within secondary education

Secondary Education Plans - Mexico		
BIOLOGY	**GRADE 1**	
		CODE
	The Living World & Study of Science *Meaning & use of Biology Studies* -environmental conservation	 **ORG** **ECO**
	Evolution: Change of Living Things in the Environment *Evolution, Diversity & Adaptation* -origin of bio diversity & speciation -principle of Adaptation	 **ECO2**
	Living Things in the Planet *Biodiversity* -types of living things (terrestrial, aquatic, aerobic, anaerobic, autotroph, heterotroph) -importance of biodiversity -reasons for cause of biodiversity loss -species in extinction	 **ORG** **SVC** **DEV**
	Ecology: Living Things & their Environment *What is Ecology* -origin of the term -imp of studying ecological processes	 **ECO**
	Ecological Systems -biotic & abiotic factors of the env -carbon, nitrogen, water cycles -principles of photosynthesis -food chains & energy transfer	 **ECO**
	Ecosystems -dynamic of an ecosystem -different types of ecosystem -local ecosystems	 **ECO** **PAR** **TRA**
	Consequences of Human Activity in the Environment -environmental conservation -loss of biodiversity	**MPA** **DEV** **TRA3**
	Actions to Prevent Environmental Problems -alternative forms of energy -regeneration of the ground/earth -reforestation & recycling -anticontamination measures	 **DEV** **MPA**

Secondary Education Plans - Mexico		
	GRADE 2	
GEOGRAPHY		**CODE**
	Water in Mexico *Oceanic Waters* -fishery & mineral resources (their use/exploitation)	 **FIS** **TRA3**
	Climate & Natural Regions in Mexico *Natural Regions of Mexico* -tropical regions, temperate & dry -their characteristics & distribution -biodiversity of Mexico & its worldwide importance	 **BIO** **PAR** **TRA**
	Relation between the Natural Regions, Population Distribution & Economic Activities	**FIS** **TRA3**
	Alterations Natural Regions have Suffered through Human Action	**DEV**
	Economic Activities in Mexico *Fishery*	**FIS** **TRA3**

Lower Secondary Curriculum – Belize (still being developed)		
SCIENCE	**GRADES 1 & 2**	
		CODE
	Classification -habitats -the physical environment -biotic environment – interdependence -balancing the ecosystem -reefs, mangroves, rainforests	**BIO** **ECO** **PAR** **TRA**
	Food Chains & Food Webs	**ECO3**
	Some human activities Have long term adverse consequences on the ecosystem; over exploit the natural resources on Earth; air, water and land pollution	**DEV**

	Basic Secondary Education Plan-Honduras	
SOCIAL STUDIES	**GRADE 2**	
		CODE
	Describe the Basic Characteristics of Sustainable development: Diverse concepts related to the idea of sustainable development. Central approaches known & ratified in the Rio de Janeiro Summit (Brazil, 1993 and the meeting of Central American presidents (Managua, 1994) Cultural standards & the idea of mother nature as guided by the behaviour of the ethnic groups: Aymara (Bolivia), Sioux (US), Pech (Honduras) Maya-Lacnadones (Mexico) Apply the cultural experiences of the Aymara, Sioux, Maya-Lacandones and the central ideas of the approaches from Rio and Managua the ideal model of sustainable development.	**ALT** **MPA**
	Identify the Principal Natural Resources of Latin America that guarantees Sustainable Development: Natural resources of America: renewable & non-renewable. Describe the natural resources that are fundamental to food consumption, natural medicine, raw materials.	**BIO** **SVC**

Basic Secondary Education Plans – Honduras				
	GRADE 1/Course 1		**GRADE 2/Course 2**	
		CODE		**CODE**
NATURAL SCIENCE	Recognize an Ecosystem Understand the terms Ecology & Environmental Education. Components of ecosystem - biotic, abiotic. Biotic components of an ecosystem: producers, consumers, decomposers Aquatic ecosystems local & Honduras. Concepts: biosphere, habitat, ecological niche. Laws & principles of ecology.	**ECO** **PAR**	Apply to Daily Situations some Terms Used in Ecology Ecological news most important for our country. Application & importance of ecology. Terms: habitat, ecological niche, biosphere, ecosystem, biotic & abiotic factors	 **DEV** **ECO**
	Determine Factors that unbalance Ecosystems 5 factors that alter aquatic & terrestrial ecosystems. Contaminants found in aquatic & terrestrial ecosystems of the community. Environmental problem of the community & general environmental problem of the country. Habits of the population that causes contamination. -Measures population can employ to avoid contamination in home & community	**DEV** **TRA2** **DEV**	Community Community & its characteristics. Biotic factors: producers, herbivores (primary consumers), carnivores (secondary consumers), omnivores and decomposers. Interactions & food chains. Relationships among living things: symbiotic (mutual, companion) and antagonist relations (competition, parasitism).	**ECO** **ECO3** **ECO3** **ECO2**
	Conserving the Environment Identify environmental problems, their causes, effects, consequences & the application of solutions.	**DEV**	Forests & Coastal Ecosystems of Honduras. Coastal ecosystems of Honduras: mangroves, reefs.	**PAR**
			Categories of Protected Areas in Honduras National parks Biological reserves Biosphere reserve Natural monument Marine parks Multiple use zones Local environmental laws w/references to environmental protection	**MPA**

	Basic Secondary Education-Guatemala					
	GRADE 1		**GRADE 2**		**GRADE 3**	
		CODE		**CODE**		**CODE**
NATURAL SCIENCES	Our Planet Earth Natural resources: use & conservation Renewables, non-renewable Protected areas as one option of natural resource conservation	**SVC ALT MPA**	Humans & relationships with animals & plants of community Animals & plants for food, medicine, industry	**SVC FIS**	Environmental Conservation Principal environmental problems & its causes, effects on municipality, district, country Deforestation, erosion Loss of habitat	**FIS DEV TRA3**
	Organisms & Environment Ecosystems Factors of ecosystems Abiotic & biotic factors	**BIO1/2 ORG**	Guatemala's fauna & flora Importance of conservation & its economic importance Threatened species & protected areas as a conservation alternative	**ALT MPA TRA3**	Contamination Fertilizers, pesticides	**DEV**
	Organisms & relationship with Environment Interspecies relationships: symbiosis, mutualism, food chain, web	**ECO2 ECO3**	Economic resources of Guatemala Agriculture, industry, ecotourism, fishery Location of principal productive zone of country	**FIS** **SVC FIS**	Conservation action & Sustainable in District & Country Knowledge & analysis of laws on environmental protection in country Protected areas an alternative of conservation	**ALT** **MPA**
	Deterioration of environment by human actions Contamination of air, water, ground	**DEV**	Environmental Conservation Principal environmental problems &, its causes, effects in the municipality, district, country Deforestation Loss of habitat for	**FIS DEV**		
	Identify environmental problems in community	**DEV FIS**				
	Institutions involved in natural resource conservation Laws of environmental protection Sustainable development	**ALT MPA**				

	Basic Secondary Education-Guatemala					
	GRADE 1		**GRADE 2**		**GRADE 3**	
		CODE		**CODE**		**CODE**
SOCIAL SCIENCES	Municipal Community Economic activities: agriculture, industry, fishing, mining, ecotourism Economic activities & their relationship with sustainable development. Importance & impact of sustainable development over short, medium, long time.	**FIS** **ALT** **MPA**	Guatemala Society: our district Natural resources are the base of society	**SVC** **PAR**	Guatemala – National Community Use of natural resources on a grand scale. Sectors of national productivity: fishery, agriculture	**SVC** **FIS** **TRA3** **FIS**
	The Municipality Geographic location, boundaries, maps Natural resources	**BIO2** **BIO1/2** **SVC**	Economic Activities: Agriculture, eccotourism, fishery, etc. & impact on district's environment.	**FIS**	Guatemala in Relation to the world World problems: social, environmental, natural phenomena Development, subdevelopment, sustainable development	**TRA2** **TRA3** **MPA**
	Guatemala in Relation to Central America Geographic location in theCentral America isthmus Relationships of Guatemalans with their habitats. Natural & caused distasters & contingency plans International relations: diplomatic, cultural, economic & other with Central American countries	**TRA2** **TRA3** **ECO4** **DEV** **TRA2** **TRA3** **TRA2** **TRA3**	Cooperatives Legal base & types of cooperatives. Cooperatives of district & their role in environmental conservation. Environmental laws (forestry, protected areas, environment)	**ALT** **MPA**		
			Guatemala in relation to America Common characteristics & factors w/other Latin American countries: politics, economy, common environmental problems, etc. International relations of Guatemala with other countries of America: Geographic location(climate, water availability, soil) Climatic changes as products of environmental alterations & its effect on regional economy & politics	**FIS** **DEV** **TRA2** **TRA3** **TRA2** **TRA3** **ECO4**		

Teacher's Module on Integrating MBRS Themes into the Curriculum

The same module is useful for both primary and secondary schools because the principles and objectives for integrating MBRS thematic areas is the same for both levels of education.

The module is designed to provide:

- background information on both the social and ecological dimensions of the MBRS issues
- a framework to guide development of educational materials and experiences
- the application of environmental education principles to coral reef education
- guidelines for teaching and evaluating coral reef education
- recommendations for implementing this training module

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The module is intended to assist its users to become:

- knowledgeable about factors influencing MBRS issues and problems.
- knowledgeable about the range of values held by people which influence the creation and resolution of problems within the MBRS.
- skilled at recognizing the structure of MBRS issues, identifying specific needs for resolution.
- better able to apply recommended principles of teaching and evaluation to the selection, design and/or adaptation of effective coral reef education teaching materials.
- sufficiently knowledgeable to identify opportunities for infusion of coral reef education into diverse education subjects.

The lesson plans chosen for the module meet the objectives of the MBRS thematic areas whilst fulfilling compatible learning objectives within a subject's sections. Initially the lesson plans are coded to match the thematic areas. Then they are cross-referenced with the subject areas to identify the most appropriate lesson for incorporation.

Example of Teacher's Module
Lesson Plans

Lesson 30

SVC
FIS
ALT
TRA3

FISHING FOR THE FUTURE

Grade(s): 6+, Secondary
Subject(s): social studies, geography, biology

Objectives

Consider social, environmental, and economic impacts of overfishing within the region. Identify sustainable fishing practices.

Overview

Through a fishing simulation, students model several consecutive seasons of a fishery and explore how technology, population growth, and sustainable practices impact fish catch and fisheries management.

Materials

- Plain M&Ms, one 14-ounce bag for up to 30 students or beans
- Peanut M&Ms, one 14-ounce bag for up to 30 students or beans
- Small cups, 1 per student
- Serving bowls, medium size, 1 per group
- Spoons, 1 per group
- Straws, 1 per student
- Watch, for timing activity
- Handout *Fishing Log*, 1 per student
- Handout *Fishery Facts*, 1 per student

Preparation

1. Students will simulate fishery activity in different oceans. As the students progress through the fishing seasons, they will likely overfish their oceans and will have to migrate to other oceans to meet their basic needs. Most groups will eventually create a total crash of fish stocks in all the oceans.

2. Check for peanut allergies in your class. You can do the activity using only plain M&Ms, if necessary.

3. For a class of 20, you will have five or six groups of 3–4 students each. Each group will start with 20 plain and 10 peanut M&Ms. Count out the first round of M&Ms and place them in cups or bags. As a pre- or post-activity reference, have students read the handout *Fishery Facts*.

Introduction Discussion

1. Introduce and discuss the concept of sustainability using the following definition: "Sustainability is meeting the needs of the present without limiting the ability of people, other species, and future generations to survive." Ask why sustainability might be an important goal for a society and what might be difficult about realizing this goal.

2. Tell students that today they're going to go fishing and explore some of these sustainability concepts

Procedure

1. Explain the game rules:
   Each student will be a "fisher" whose livelihood depends on catching fish.
   Peanut M&Ms represent the largest and most valuable fish (tuna, swordfish, et cetera).
   Plain M&Ms represent the next most-valuable fish (cod, salmon, et cetera).
   Each fisher must catch at least two fish (large or small) in each round to survive (i.e., get enough fish to either eat or sell).
   When the fishing begins, students must hold their hands behind their backs and use the "fishing rod" (straw) to suck "fish" (M&Ms) from the "ocean" (bowl) and deposit them into their "boat" (cup).

   The fish remaining in the ocean after each fishing season represent the breeding population, and thus one new fish will be added for every fish left in the ocean (bowl).

2. Divide the class into groups of 3 or 4 students and have each group choose an ocean name such as North Atlantic, North Pacific, Arctic, Mediterranean, et cetera.

3. Give each group one serving bowl and each student one cup, one straw, and one copy of the handout *Fishing Log*.

4. Put 20 plain and 10 peanut M&Ms in each group's bowl.

5. Start fishing" and give the students 20 seconds for the first "season" of fishing.

6. Have each fisher count his or her catch (M&Ms in their cup) and record the data in their *Fishing Log*.

7. Fishers who did not catch the two-fish minimum must sit out for the following round.

8. Add one new fish for every fish left in the ocean (bowl).

9. Allow fishers to use their hands on the straws during the second session to represent "new technology."

10. After the second fishing season, give one fisher from each group a spoon representing more new fishing technology such as trawl nets, sonar equipment, et cetera. Continue the game for round three.

11. Ask, "What happened when ocean group [name] ran out of fish? How are the fishers going to survive now?" (One option is to move to another ocean.) Allow students to "invade" other ocean groups when their ocean is depleted, but don't tell them that they can do this beforehand. Fishers may either go as a group to another ocean or they may disperse to other oceans.

12. Repeat fishing, recording, and replenishing fish stocks until either sustainable fishing is achieved or until all (or most) groups fish out their ocean.

Inquiry/Critical Thinking Questions

- What happens when a commonly owned resource is overused?
- What are the impacts of overfishing or exploiting a natural resource?
- How can we establish and maintain the sustainable use of a resource?

Reflection

Use the following sample questions to lead a discussion about the activity:

- "How did you feel when you realized that you had depleted your fish stock?"
- "How did you feel when other fishers joined your ocean group?"
- "How does this activity relate to real ocean and fishery issues?"
- "What's missing in this game?" (Impacts to nonhuman animals that rely on fish for their survival, population growth, et cetera.)
- "What happens to a resource when you have infinite population growth, growing technology, and a finite resource?"
- "Are there any commonly owned resources in our region or community? If so, what are some similar issues around them, and how can they best be managed?" (Air is a commonly used resource—how do we deal with air pollution? Forestry or animal grazing rights also sometimes create similar discussions. You might also talk about city, national parks, and other public lands, and the competing uses and needs.)

4. Have students brainstorm ways to have a sustainable fishery. What rules could be developed? (For example, limits on type of equipment allowed, amount and type of fish, shorter seasons.)

Class Projects/Action Ideas

• Students can research which fish are harvested in a sustainable manner and which are being depleted. Have them do an advertising campaign in their school promoting the consumption of sustainable fish and avoiding the consumption of threatened fish. (This might include researching the kind of fish served in your school cafeteria, developing a system that protects threatened fish, and presenting it to the principal.) For recommendations about which seafood to buy or avoid, check out the Monterey Bay Aquarium's website "Seafood Watch" at www.montereybayaquarium.org or the Audubon website "What's a Fish Lover to Eat?" at http://magazine.audubon.org/seafood/guide/.

Have students research a local fishery and include interviews with local fishers, biologists, and other people involved with the fishery.

• Have students investigate fish farming and its environmental and economic impacts.

• Have students research laws relating to economic use of public lands by private companies and individuals. Determine whether these laws balance environmental protection and economic development. If not, outline new laws to create such a balance.

• Visit the United Nations Food and Agriculture Organization Fisheries Resource website at www.fao.org/fi. For information and pictures about the state of the world's

fisheries, see the New International Magazine on-line issue on fishing at www.newint.org/issue325/facts.htm.

- Do a watershed planning/protection project to help protect fisheries from environmental damage.
- Participate in a beach or river cleanup project.

Variations

1. Use two types of dried beans instead of M&Ms. Be sure that the beans are large enough so that the students cannot suck them through the straws.

FISHING LOG

OCEAN GROUP:_____FISHERS:_____

Record your group's catch and fish left in ocean after each season:

SEASON	CATCH			FISH LEFT IN OCEAN
	High Value Fish	Medium Value Fish	Total Catch	
1				
2				

Write a brief description of the status/health of your fishery: _____

_____

SEASON	CATCH			FISH LEFT IN OCEAN
	High Value Fish	Medium Value Fish	Total Catch	
1				
2				

Discuss changes in fishing practices or regulations. Are any fisheries in trouble? What did they do and how did that impact your fishery?

_____

_____

_____

SEASON	CATCH			FISH LEFT IN OCEAN
	High Value Fish	Medium Value Fish	Total Catch	
1				
2				

Write a brief description of the status or health of your fishery now:_____

_____

How could you have made your fishing sustainable? _____

_____

Lesson 17

DINNERTIME ON THE REEF

BIO2
ORG2
ORG3
ECO2
ECO3

Grade(s): 2-4
Subject(s): science

Objectives

Identify the main parts of a coral reef.
Describe organisms found within the Mesoamerican Barrier Reef System
Describe a coral reef food chain.

Materials

- Copies of Activity Page
- Additional reference books with pictures of coral reefs.

Procedure

1. Using the Introduction as a guide, present the coral reef as an example of a dynamic ecosystem. Within every ecosystem, physical conditions such as temperature and the amount of sunlight affect and are affected by the organisms in an environment, such as plants, animals, and microscopic organisms. Ask students if they have ever visited a coral reef or seen pictures of one. Perhaps they can name some of the fish that live there. (*Angelfish and barracuda might be two fish that students can recognize.*) You might also refer students to one of the many reference books with colorful photographs of coral reefs.

2. Tell your students that each dynamic ecosystem consists of many interacting parts, each using energy and producing wastes. Ask them to speculate why coral reefs host an abundance of marine life. (The key is that the coral reef receives a wealth of sunlight, which causes algae within the reef to produce an abundance of food. The waves crashing over the reef distribute oxygen and food throughout the ecosystem, creating a hospitable environment for animals). Tell your students that many kinds of living things makeup the coral reef community: producers (plants), filter feeders (animals that take in microscopic plants and animals from the water), grazers (algae eaters), predators (animals that eat other animals), and scavengers (animals that eat the remains of dead creatures). A complex food web connects all of these living things. You might wish to write the five organism types on the blackboard and ask students to suggest an animal that fits into each type.

3. Give each student a copy of Activity Page. Tell the class to examine carefully the diagram as you describe some of the following organisms found along a coral reef:

    - At the highest point (crest) of the reef, large, dome shaped, brain coral forms huge boulders. Colorful parrotfish, their large front teeth fused together like a parrot's beak, scrape algae off the coral rock. (*Refer to the Introduction to remind students that coral grows with the help of algae.*) Nearby, the queen angelfish sports an electric-blue, crown-like growth and eats sponges, which in turn feed on microscopic life.

- On the outer reef, Elkhorn coral extends its branches like sign posts and withstands the constant pounding of the waves. Sea fans expose themselves to the prevailing current to receive food, while predators like the barracuda ready themselves for the hunt.

- Between the reef and the shore is a quieter environment known as the lagoon. Here the turtle grass is dense, protecting the young members of reef species. Schools of French grunts who stay among the corals all day move to the grass beds at night to hunt for small crustaceans like grass shrimp. Nearby, a pink-tipped anemone floats food its way by waving its tentacles.

2. Ask your students to complete the Activity Page by writing their answers on a blank piece of paper. When they finish, discuss the correct answers with them. Be sure to emphasize that all of the organisms depicted in the diagram are related to each other in a vast food web.

For the Teacher

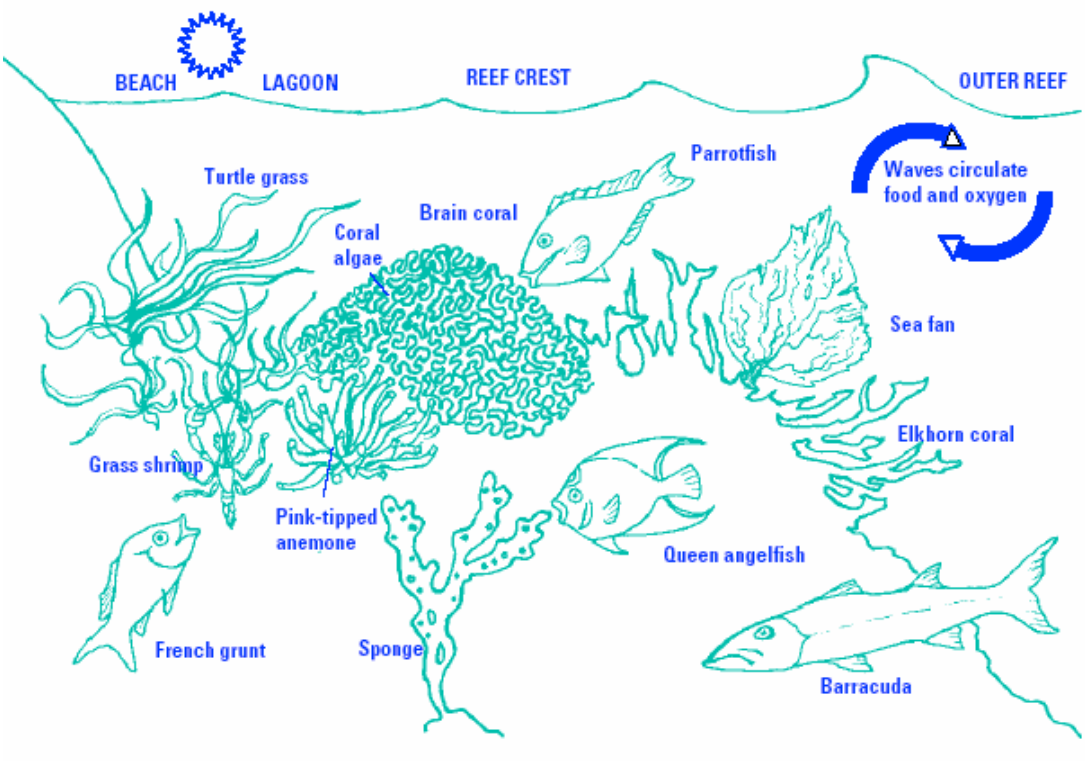
ANSWER KEY TO ACTIVITY PAGE

1. brain 2. reef crest 3. algae 4. parrotfish 5. food 6. oxygen 7. sea fan 8. barracuda 9. outer 10. lagoon 11. grass shrimp 12. French grunt 13. pink-tipped anemone

ACTIVITY PAGE

It's always dinnertime for some animals on the coral reef. Fill in the missing words as you observe what's on the menu for these reef organisms.

Corals such as the ____1___ coral live in the highest part of the reef, the ___2__ _____. Corals are tiny animals that live together in large, stony colonies as big as boulders. Inside the coral are __3___ that produce food and oxygen using sunlight. A __4___ grazes on the coral to get food. The crashing waves circulate __5___ and ___6___. A nearby _____ 7___ is a filter feeder that uses waves to capture its dinner. The __8___ is a predator that patrols the ___9__ reef, looking for other fish. In the calmer waters of the __10___, a little ____11_ _____ scavenges through the lagoon. Watch out! A hungry ____12_ _____ is coming closer. Nearby, a _____ __13___ _____ waves its tentacles to take in its food.


BEACH
LAGOON
REEF CREST
OUTER REEF
Turtle grass
Parrotfish
Waves circulate food and oxygen
Brain coral
Coral algae
Sea fan
Elkhorn coral
Grass shrimp
Pink-tipped anemone
Queen angelfish
French grunt
Sponge
Barracuda

REFERENCES

World Bank, (2000), MBRS Project Appraisal Document.

Ministry of Education, Honduras, (1999) *Manual de Educacion Ambiental para el Nivel Pre-escolar y Primario.*

Secretary of Public Education, Mexico, (1994) *Plan y programas de estudio para educación básica y secundaria.*

Mario Dary Fundation, (1999) *Guía de Ciencias Naturales con orientación a la educación ambiental para el área de protección especial Punta de Manabique.*

Ministry of Public Education; RECOSMO Project, Guatemala, (1998) *Guía de educación ambiental para primaria rural.*

Mesoamerican Biological Corridor, (2022) Teacher Guide for Infusing the MBC Concept Into the National School Curricula.

Nature's Nautical Nurseries - *An educational module from the Queensland Fisheries Service. The State of Queensland (Department of Primary Industries) 2002*

Bermuda Biological Station for Research and Tropical College Of Exploration Coral Web Site Team http://www.coexploration.org/bbsr/coral Funded by a grant from the Goldman Foundation, Gail Swenson., 1999

J.L. Scott Marine Education Center & Aquarium, (2001), Walker, Sharon, ,Newton, R.A. & Alida Ortiz, *Coral Reefs: An English/Spanish Compilation of Activities for Middle School Students*,

Royal Society for the Protection of Birds, England, (1995), *Seabirds and the Sea,* RSPB Curriculum Guide 8-14 yrs.

Products of the Sea, ***Green Teacher*** Planet Earth Pages**:** Oceans and Seafaring, Mark Madden, Anne Springs Close Greenway, South Carolina.

Treasure Hunt Houghton Mifflin 2001.

University of South Florida, SPRING (2000),*Grow your own coral reef*, PROJECT OCEANOGRAPHY.

Brooks, W., Price, L. & A. Abbuhl *Explore the Coral Reefs* San Diego City Schools, Triton Project.

NASA, 2002, *Students AS Coral Reef Scientists,* (Kaams) Kids as Airborne Scientists.

Smithsonian Office of Elementary and Secondary Education, November/December (1996), *Art to Zoo Contrasts in Blue: Life on the Caribbean Coral Reef and the Rocky Coast of Maine*.

Center for Biodiversity Conservation, *Interpreting Biodiversity*. American Museum of Natural History.

Smithsonian Institution, Washington (1996), ILKA C. FELLER, MARSHA SITNIK, *MANGROVE ECOLOGY: A Manual for a Field Course, A Field Manual Focused on the Biocomplexity on Mangrove Ecosystems*,

Michael King & Sarah King, Environmental Education Module: *The Oceans and Coastal Areas and their Resources,* Western Samoa.

Marine Education Society of Australasia Inc. MESA. Seaweek Marine Biodiversity Activities 1999. http://www.mesa.edu.au/seaweek99/tr_09.htm

Romero, FG, Kadleci, L., Alverez, A. & V. Pratt. *CREST (Coral Reef Education for Students and Teachers) Manual*, International Marinelife Alliance, Phillipines.

Appendices

Appendix A: Coding for MBRS Thematic Areas

Coral Reef Biology & Ecology		
Coral Biology & Geology	**BIO1**	Formation of coral reefs: the three types
	BIO2	Biology of coral types
Reef Organisms	**ORG1**	Vertebrates
	ORG2	Plants
	ORG3	Invertebrates
Coral Reef Ecology	**ECO1**	Level of organization (individual, population, community)
	ECO2	Relationships among organisms
	ECO3	Food chain, food web
	ECO4	Natural disturbances to coral reefs: coral bleaching, hurricanes
Coral Reef Partner Ecosystems	**PAR**	Connectivity between coral reefs, seagrass beds and mangroves
People & Coral Reefs		
Goods & Services of Coral Reefs: coastal protection, fisheries, biodiversity, sand, building materials, medicinal cures	**SVC**	
Reef Fisheries	**FIS**	
Coastal Development & Pollution	**DEV**	
Alternative Livelihoods	**ALT**	
Marine Protected Areas	**MPA**	
Transboundary Connectivity		
	TRA1	Fish Spawning Aggregations
	TRA2	Ocean Currents (moving larvae & pollutants)
	TRA3	Fishing