



Methodological Support Module for Ecosystem Management and Restoration



ALIANZA POR LA RESILIENCIA



Cruz Roja Guatemala



Climate
Centre



Wetlands
INTERNATIONAL



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INTRODUCTION

Vulnerability to the effects of Climate Change affects a large number of countries around the world. Each year, many countries face more severe and more frequent disasters, ranging from drought to floods, which usually cause the poorest communities to suffer the most. Environmental degradation, often produced by humans, also makes us more vulnerable.

To address this situation, Partners for Resilience works to strengthen communities. This is best achieved when Disaster Risk Reduction (DRR) is combined with Climate Change Adaptation (CCA) and Ecosystem Management and Restoration (EMR). We believe that resilient communities are necessary to build the resilience of countries. A resilient community is one that has the capacity to resist, absorb, adapt and recover; one that anticipates risk, responds when disaster strikes, adapts to risks and changing livelihoods, and transforms itself to address the causes of the risk.

We are pleased to present you with these **Methodological Support Modules** which are part of the efforts made by

Partners for Resilience Guatemala and were developed as a result of the invaluable interest and support of the Ministry of Education (MINEDUC), Ministry of the Environment and Natural Resources (MARN), National Coordinator for Disaster Reduction (CONRED) and National Protected Area Council (CONAP).

We hope that these Methodological Support Modules become a tool for implementing actions and learning about resilience in our countries, since the construction of resilient communities depends on such actions.

We decided to include in these Modules challenging topics which are usually addressed individually: Climate Change Adaptation, Ecosystem Management and Restoration, Disaster Risk Reduction, and an inclusive approach to Resilience. The thematic content and each of the activities presented in the four Modules are designed to help people reflect and change their attitude by using an attractive and dynamic system to support them in becoming part of the solution while living in harmony with their environment and ensuring their own well-being in the long term.

This Module for Climate Change Adaptation provides the most relevant theoretical and conceptual aspects in the first section. Subsequently, the second section describes activities to be carried out with different audiences in order to reinforce knowledge with materials and resources easily available in the local setting.

We invite you to explore these Modules and put them into practice, hoping that they will serve as a guide and at the same time facilitate your educational activities. Like you, we are committed to education in Integrated Risk Management as a fundamental component of integral development and we hope that this small contribution will help you with the important mission of promoting a better future in our countries.

Since 2016, Partners for Resilience Guatemala has been promoting dialogue to address complementary work areas related to Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA) and Ecosystem Management and Restoration (ERM) through the Integrated Risk Management approach in order to strengthen Community Resilience in the country.



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Module guide

Dear educators

These materials are part of an educational kit made up of four modules: Climate Change Adaptation, Disaster Risk Reduction, Ecosystem Management and Restoration, and lastly, Resilience, which integrates the knowledge of the three previous modules.

The first three modules are independent and can be used in the order considered most appropriate. To better understand and take advantage of the Resilience module, the first three modules should be worked through first.

The current **Methodological Support Module for Ecosystem Management and Restoration** seeks to be a useful tool to be implemented at the regional level by teachers, community facilitators and people interested in the subject.

The first section of this module develops the most important basic concepts of Ecosystem Management and Restoration, aiming at providing general knowledge about the subject. The second section provides activities to develop and complement the theoretical content through practical exercises, which will provide methodological support to the facilitator.

The subject should be explained before carrying out each activity and time must be provided for conducting research in order for participants to have a better understanding of the topic and be able to share knowledge and experiences. The activities may be developed in different scenarios, according to the participants' context and the resources available.

To the extent possible, the activities and research assigned to the participants should be conducted based on their level of knowledge and context, taking into account both the location and the materials to be used.

The purpose of connecting these contents to the participants' experiences is to improve the understanding of Ecosystem Management and Restoration, as well as to suggest specific actions that may be implemented to contribute to the long-term sustainability of our ecosystems.

We hope that these materials will be useful and enrich your experience, as well as provide participants with significant knowledge that will allow them to value our natural wealth and the benefits that this provides us on a daily basis, in addition to helping them understand how human actions directly influence destruction and conservation. Finally, we hope that what they learn will motivate them to actively participate in ecosystem management and conservation with the aim of protecting the heritage of current and future generations.

Basic CONCEPTS



Natural wealth of the Latin American region

Latin America and the Caribbean is the region with the greatest biological diversity on the planet and is home to several of the world's mega-diverse countries.

The region possesses almost half of the world's tropical forests, 33% of all mammals, 35% of all reptile species, 41% of birds and 50% of amphibians.

The geographic position, topography, diverse climates and influence of the Pacific and Atlantic coasts in the region have favored the presence of diverse ecosystems which allow for the existence of great biological diversity with unique characteristics and species.

To better understand the subject, it is necessary to consider that: A **species** is a group of individuals with common ancestors who are capable of reproducing amongst themselves and producing fertile offspring. For example, quetzals (*pharomachrus mocinno*), macaws (*ara macao*), jaguars (*panthera onca*), manatees (*sirenia* sp), condors (*vultur gryphus*) and human beings (*homo sapiens*) all belong to different species. Each species has in its cells the information necessary to transmit special traits to its descendants through its genes.

A **gene** is the minimum unit of heredity in which certain characteristics are transmitted, such as eye color, nose shape, feather color and certain diseases.

Male and female quetzals



Young and adult jaguars



Images: <http://www.barrameda.com.ar/>

Ecosystem

An ecosystem is a natural system in which plants, animals and other organisms interact with the climate, temperature, humidity, soil type and other characteristics, resulting in a stable and self-sufficient system.

Human beings are also part of the ecosystems and many of the actions they conduct have a direct impact on them.

Ecosystems provide many benefits which are commonly called ecosystem services and refer to the goods and services provided directly or indirectly which promote human well-being and are fundamental to the livelihoods of people around the world. Some of these services could not be obtained if it were not for the presence and dynamics of ecosystems.

Ecosystem services include the following

- Food and medicine.
- Natural fibers used for making baskets and other utensils, fabrics and paper.
- Wood for construction and manufacturing furniture and others.
- Firewood used as fuel.
- Raw materials for manufacturing of basic materials such as rubber, dyes, gum, etc.
- Water harvesting for river, lake and underground reservoir formation.
- Improved air quality, carbon fixation and support for the mitigation of greenhouse gas emissions.
- Pest control due to the natural balance established among the species in an ecosystem.
- Mitigation of hydrometeorological phenomena such as hurricanes, floods, etc.
- Filtering of all the pollution produced by human activities.
- Temperature regulation, favoring climate balance.
- Provision of tourism and recreation locations, which in turn are a source of income for many people.
- The relationship with ecosystems has also enriched the cultural and historical heritage of each country.

Did you know that...

The Latin American and Caribbean region has six of the most biologically diverse countries in the world (Brazil, Colombia, Ecuador, Mexico, Venezuela and Peru), as well as the most biodiverse area on the planet; these countries cover less than 10% of the Earth's surface, but contain approximately 70% of the world's mammal, bird, reptile, amphibian, plant and insect species. (UNDP)

Did you know that...

South America alone possesses more than 40% of the Earth's biodiversity and more than a quarter of the world's forests. The Mesoamerican Reef is the largest barrier reef in the Western Hemisphere. Central America, despite covering only 0.5% of the land mass, represents 10% of the Earth's biological diversity. 50% of the plant life found in the Caribbean is not found in any other area of the planet. Impressive statistics, especially when one considers that the region occupies only 16% of the world's land mass and is home to only 10% of the world's population. (UNDP)

Did you know that...

By 2017 the urban solid waste generation in Latin America and the Caribbean reached a volume of almost 540,000 tons per day and the expectation is that by 2050, garbage generation in the region will reach 671,000 tons per day.

(United Nations Environment Programme).

The life of human beings is strongly linked to nature and to the benefits received daily from ecosystems. Continuing to receive such benefits in the long term depends on the conservation and proper use we make of them. Achieving sustainability means maintaining their diversity and productivity over time so that current generations benefit from them, without affecting their availability to future generations.

Ecosystems are naturally capable of recovering, but unfortunately many human actions are having a strong impact on them and are pushing them to their limits. Deforestation, forest fires, illegal trade,

overexploitation of species, pollution, climate variations as a consequence of Climate Change, etc., alter the dynamics and balance of ecosystems, directly affecting their recovery capacity and contributing to their degradation and destruction.

A degraded ecosystem is different from a healthy one mainly because of a reduction in the number of species present (and the subsequent appearance of new species that do not commonly live in that type of ecosystem) and the deterioration of the benefits it provides.

Inadequate waste management



Photo: <http://es.123rf.com/>



Photo: <http://es.dreamstime.com/>

Biological diversity

human beings belong to the same species but, genetically, all individuals are different and have characteristics that make them distinctive: some have a thick physical build and others are thin, with a lighter skin color, a different type of nose, etc.

Another example is jaguars, since some jaguars have well defined spots (the majority) and others have unnoticeable spots which seem to be completely black (commonly called black panthers); however, both belong to the same species.

With greater genetic diversity, species are more likely to survive environmental changes, as some of their individuals have

Biological diversity or biodiversity is derived from the Greek word bio, meaning life, and from the Latin word diversitas, meaning variety. Based on the aforementioned, it is defined as the variation of forms of life on the planet, that is, the variety of living elements in a given place. There are certain agricultural and ecosystemic aspects in the production mechanisms which respect the elements of biodiversity, such as certain coffee plantations where trees are planted to increase soil protection.

Biological diversity exists within three levels:

LEVEL 1. Genetic diversity

It is a variation in genes or characteristics among members of a species. For example,

Genetic variation within a species

Jaguar



Images: <http://www.mavasautenticos.com/>



Human beings



Photo: <http://www.istock.com/>

Did you know that...

Biodiversity is essential for the long-term provision of ecosystem services. It also plays a key role in maintaining the elasticity of such services, that is, the capacity of a system to absorb alterations and maintain its basic capacity to provide services for human well-being.

"Biodiversity is the life insurance of life itself".

(UNDP)

Did you know that...
Agrobiodiversity refers to the diversity of domestic and wild species which are relevant to food and agriculture. Many of the domestic crops used in traditional diets are more nutritious than species that have been introduced or than commercial varieties. Based on biological diversity, agriculture provides various sources of energy, protein, fat, minerals, vitamins and other key micronutrients to food security and nutrition.
(Food and Agriculture Organization of the United Nations, 2007).

characteristics that make them resistant to such changes. When genetic diversity is lower, it is very likely that a large part of these individuals will eventually be eliminated due to a lack of the necessary characteristics to make them resistant to change.

Plants: *ceiba* and *matilisguate*



Images: <http://www.mayasautenticos.com/>

LEVEL 2. Diversity of species

It refers to the variety of species or living organisms that exist in a given location. For example, the Ceiba (*ceiba pentandra*) and zapotón (*pachira aquatica*) trees, white-tailed deer (*odocoileus virginianus*), spotted paca (*cuniculus paca*), tapirs (*tapirus*) and other species that inhabit the region.

Animals: racoon and white-tailed deer



Images: <http://www.mayasautenticos.com/>

LEVEL 3. Ecosystem diversity

It refers to the variety of existing ecosystems. In the region, they vary from wetlands and coastal ecosystems to deserts, tropical forests, extensive savannah grasslands, mangrove forests and high altitude Andean habitats. In

the marine setting, Caribbean coral reefs are diverse and important on a global scale: 10% (26,000 km2) of the world’s coral reefs are found in the western Atlantic Ocean, mainly in the Caribbean, and 90% of their species are endemic to the region (UNEP, 2016).



Cloud forest



Gallery forest



Mangrove



Dry forest (Tropical rain forest)



Pine-oak forrest (Páramo)



Coral reef

Photos: Partners for Resilience Guatemala | Erick Coc | <http://es.dreamstime.com/>

Did you know that...

An endangered species is an organism that is at risk of disappearing from the face of the Earth if its current situation, in relation to its population or habitat, does not improve.

However, a species can be considered functionally extinct when its population is not viable, since there are too few individuals alive to maintain the necessary level of genetic diversity or survivors are too far away to be able to meet and reproduce.

Therefore, although they are not extinct, the species is practically non-existent.

Finally, those species that could soon be endangered, are called a threatened species.

(IARNA, URL and IIA, 2006; <http://curiosity.discovery.com/question/how-is-extinction-defined>)

In the region, we can find a great variety of plant AND vertebrate and invertebrate animal species, including:

Over **20,000** plant species



White Nun



Scarlet macaw

1,300 bird species

249 mammal species



Manatee



Green iguana

245 reptile species

201 amphibian species



Black-eyed leaf frog



White fish

1,187 fish species

According to the UNEP regional and sub-regional classification and the IUCN global Red List database, the region is home to 13,835 species and 12% of them are endangered (UNEP, 2016)

Images: <http://www.mayasautenticos.com/> | <http://www.cichlidae.com/> | <http://lesecaillesdedatri.over-blog.com/> | <http://www.zootropic.com>

Restoration

Therefore, in general terms and to the extent possible, ecological restoration seeks to return an ecosystem to the natural state it possessed before it was altered through various actions, either via natural phenomena, such as fires and hurricanes, or human actions such as pollution, deforestation or change of land use.

In this sense, restoration seeks not only to rescue animals and plants, but also to reestablish ecological interactions and processes that the ecosystem naturally possessed, such as its balance, as well as to regenerate the benefits and services that it provided to humans.

Habitat loss and fragmentation have become the most important threats to the conservation of biodiversity in all ecosystems, mainly on land. Therefore, it is necessary to establish urgent strategies to stop the decline and loss of biodiversity, without sacrificing the economic benefit that can be obtained from a property. It is essential to keep in mind what the restoration efforts will focus on, and also to find out what efforts are already being made by others.



Restoration process

Images: <http://lasequiaendgo.blogspot.com/> | <http://www.gettyimages.es/> | <http://es.dreamstime.com/>

Why is restoration important?

A degraded ecosystem, in addition to causing the loss of biological diversity and other ecological impacts, can also directly affect food production, water sources, air quality and, in general, people's quality of life and their development.

In response to damage, degradation and the accelerated loss of ecosystems throughout the planet, various sectors are seeking to implement action steps to support conservation processes. To this end, work is being done to promote good management practices and the recovery of degraded ecosystems as part of the restoration process.

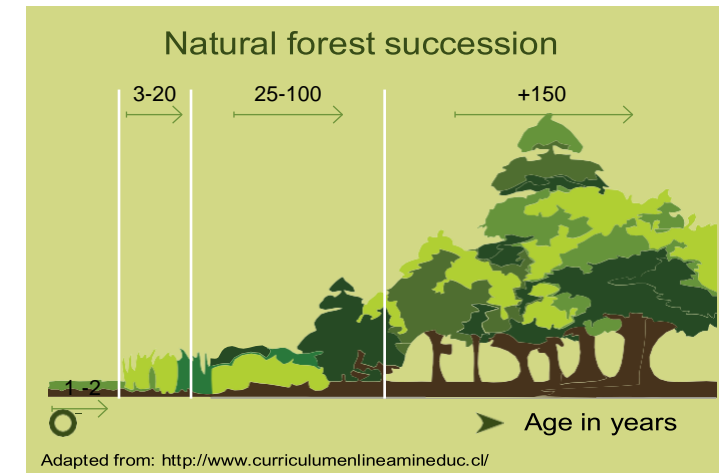
Actions for restoration

Restoration does not mean that the forest must recover on its own, it means that interventions must be made to achieve the desired results in the medium or long term. The following include the action mechanisms for the implementation of ecological restoration:

● Passive restoration (natural succession)

It is a mechanism that seeks to remove the causes of degradation to allow for the natural

recovery process to occur. An example of this would be fallow land or secondary vegetation (the land is no longer sown for one or more crop cycles) where, after reducing or eliminating productive activities (livestock or agricultural or extraction activities) the area is left to rest in order to allow for its recovery.



● Restoration plantation

Reforestation seeks to reestablish forests on cleared or logged land in areas where forests formerly existed. The aim is to ensure that the species to be planted are native to the area, taking into account previously existing species. It is important to consider the factors that caused the deforestation in order to implement mechanisms to help avoid this from reoccurring in the future.

Restoration plantation on mountainsides



Photo: Partners for Resilience Guatemala

● Pollen/seed dispersion programs

Pollen or seed dispersion is very important for the restoration processes of an area. This dispersion can be carried out by humans or

Polen dispersion



Photo: <http://es.dreamstime.com/>

animals such as bats, bees or some birds that, while feeding on fruits, transport the seeds to other places, therefore contributing to their natural reproduction.

● Soil restoration works

These are mechanisms for preventing and counteracting soil erosion (which is the gradual loss of materials that make up the soil: this can be due to wind, water, land inclination, lack of vegetation cover, etc.) and its depletion. An example of this is the construction of terraces or the establishment of living barriers.

Establishment of living barriers



Sololá

Photo: Partners for Resilience Guatemala

● Nucleation

When implementing this mechanism it must be taken into account that there are organisms that have the capacity of “creating” new living areas, improving their living conditions and attracting other types of organisms. In order to achieve this, they can use any natural element of the environment that surrounds them, forming nuclei of diversity. The implementation of this type of activity favors the natural

processes of recovery; for example, the transfer of soil from a forest to a degraded area, through which seeds, microorganisms, fungi, bacteria, earthworms, algae, etc. are introduced. Another example may be the construction of perching areas to attract birds.



● Enrichment planting

This mechanism promotes the planting of desired tree species and the opening of spaces (gap thinning). This is a very important aspect since the success of restoration projects depends fundamentally on the selection made. Therefore, the history of the site must be known (previously existing plants), so it is necessary to combine the knowledge of local people and the knowledge of people with experience.



● Analog forestry technique

This is an environmental restoration technique by which the formula of existing plant species in a forest with similar characteristics to the one in the area to be rehabilitated is “copied”. Thus, a process that allows for the farm’s residents to provide direct and continuous cooperation and for the property’s production activity to be commenced is conducted. At this stage, the initial assessments for reforestation are carried out:

- Native forest formula.
- Existing plot formula.
- Gap analysis.
- Ecological assessment.

- Landscape mapping.
- Agricultural plot mapping.
- Establishment of the databases.
- Final proposal with native and productive species.

The restoration strategy must be adapted to the agricultural and silvopastoral systems, since generating forests is not always the best way to generate local development and communities have their own agricultural traditions. It is also necessary to understand the ecosystems which are typical to the area and to determine whether there are sensitive species that can be affected by changes in the use of ecosystems (although it may not seem so, there are specific species of shrublands and secondary forests), IAFN (2010).

Restoration plan or strategy

Ideally, restoration should be planned according to the objectives set by all stakeholders involved and taking into account common needs.

Cultural, social, historical and economic factors should be considered when designing a restoration strategy. The steps to be taken are presented below:

PASO

1

Identify the area to be restored, as well as its size and level of damage. Depending on the damage, the area can be classified into three levels:

It is considered the most critical level because when an ecosystem has lost its elements and balance, it is difficult to recover its original functionality.

When the ecosystem still has some of its original components which can be used as a reference point.

When the ecosystem alteration is low, it has the capacity to recover by itself.

Level 1

Level 2

Level 3

PASO 2

The reasons and the populations for which the restoration will be done must be defined. The restoration can be carried out for various purposes, including:

- Increasing agricultural productivity and seeking pest reduction.
- Protecting water sources.
- Conserving soils, while avoiding erosion and landslides.
- Guaranteeing the services and benefits provided by ecosystems.
- Maintaining wildlife populations and availability for hunting.
- Being part of an incentive program for reforestation.
- Promoting territorial planning.
- Promoting biological diversity.
- Participating in local, national or global conservation programs.
- Participating in rural development programs.
- Mitigating the effects of Climate Change.

PASO 3

In order to define the restoration strategy, it is necessary to be familiar with the animal and plant species, as well as the soil and water characteristics, as this would provide information on the area's conditions. Furthermore, it would be good practice to jointly draw up a historical calendar to list the animal and plant species observed in the area at different times, in addition to mentioning all traditional knowledge about ecosystems.

PASO 4

A reference ecosystem should also be sought and, by comparison, the elements to be restored should be determined while taking into account the objectives of the restoration process.

PASO 5

Materials to be used in the restoration process must be defined, giving preference to those of local origin. Requirements for the implementation of the plan and the persons or entities that will be responsible for its maintenance or follow-up should also be established. The success of the restoration processes depends on the commitment and participation of all actors.

PASO 6

Data collection can be used to measure the effectiveness of actions being implemented; also, the information generated is important to systematize the experience, which will make it possible to keep records, make necessary adjustments or modifications in a timely manner and avoid errors in future experiences. Factors such as degradation, presence of new species and the time required for succession should be measured during the restoration process to evaluate progress.

Local involvement in restoration measures



Photos: Partners for Resilience Guatemala



Putting it into
PRACTICE

Activity

1

As I traveled around the ecosystem I found...

Purpose of this activity:

Through this activity participants will:

- Reinforce their knowledge on a particular ecosystem.
- Carry out research on ecosystems in other countries.

**Materials**

- Cards on the components of the ecosystem (notes on a sheet of paper)

Instructions

1. Ask students to help you select an ecosystem in their country and make sure everyone is clear about the types of animals, plants, and other elements that live there.
2. Ask participants to form a circle and stand in the middle.
3. Explain that you will tell a story and that each time you mention you saw a plant or animal, they will have to form teams according to the number of plants or animals you saw, in addition to imitating such plants or animals. For example, I found a group of five monkeys on a trip. They will form groups of five and imitate monkeys.
4. Students who fail to join a team must abandon the game.
5. As the story progresses, you should change the elements and quantities. The students should form teams according to your story.
6. You can add to the story elements that do not belong to the ecosystem in question, but in that case, those who form groups must abandon the game.
7. Little by little, the group of participants will be reduced, but the game must continue until there are only two students left who will be the winners.

Reflection

Remember to reflect on the activity. What would happen if, as in the game, the elements of the ecosystem were lost? Take the opportunity to reinforce the concepts or aspects that you observed were not very clear during the game.

Activity

2

What belongs to this ecosystem?

Purpose of this activity:

Through this activity participants will:

- Research and implement the knowledge gained to distinguish one ecosystem from another.

**Materials**

- Sheets of paper, paperboard or other materials (one for each of the ecosystems that students have decided to work on)
- Scrap paper (used on one side and usable on the other)
- Crayons and/or markers

Instructions

1. Participants should be divided into groups and they should randomly select the ecosystems they will be working on in advance. Give them at least one week to research their most important characteristics.
2. You can set aside different days for the participants in each group to prepare a small presentation on their assigned ecosystem.
3. When all the groups have presented on their ecosystem, define a day for the final activity.
4. On the day of the final activity, have each group meet and ask them to prepare a scenario of their assigned ecosystem on the paperboard or sheet of paper. They must omit some of the ecosystem's elements. They must also remember to write the ecosystem's name in large letters above the scenario.
5. Next, each group will prepare 10 cards with characteristics regarding the ecosystem. For example, to indicate the average

temperature within the ecosystem, they can draw a thermometer showing the temperature; they can also draw animals or plants.

6. When everyone has finished preparing their cards, collect them, mix them up and put them in a box. Place the ecosystem scenarios somewhere where everyone can see them.
7. Next, ask each participant to take out one of the characteristics and decide which ecosystem it belongs to by placing the card under the appropriate scenario.
8. As there will be many cards, participants will be able to take several turns until the cards have finished.
9. When everyone has participated, go over each of the ecosystems and check whether the answers are correct. Use this time to reinforce knowledge about each ecosystem.

Reflection

When they've finished the activity, take a moment to talk about the ecosystem. As part of the analysis, you may want to ask: Who knew all the characteristics regarding the ecosystems? What makes one ecosystem different from another? Is it important that they are different? Which characteristics are similar? What would happen if any of the characteristics were missing? What impact would this have?

Suggestion

This activity could be a fun way to evaluate the knowledge acquired during group presentations.



Activity 3

Understanding the fauna in our ecosystem

Purpose of this activity

Through this activity participants will:

- Identify the main characteristics of the fauna living in the ecosystem near their community



Materials

- Waste materials (cardboard, fabric scraps, paper scraps, colored wool and any materials that can be used to make a mask)
- Glue
- Scissors
- Crayons, markers or watercolors

Instructions

1. Make a list of existing fauna in the ecosystem closest to the community.
2. Randomly assign an animal to each participant and allow them to investigate general aspects about the animal, such as its main characteristics, feeding habits, the role it plays within the ecosystem, etc. Give them three days to research.
3. On the day assigned for the activity, each person should make a mask of the animal that has been assigned to them. Encourage them to be creative. Allow at least one hour for this activity.
4. When the masks have been finished, they can set up an exhibition for everyone to see. As participants stand in front of each mask, the owner should talk about the characteristics of the assigned animal.

Reflection



When you have finished touring the mask exhibition, take some time to comment on the fauna of that location. You may want to ask: Which animals did you and did you not know about? Which ones do you think are at greatest risk of extinction? What would happen if the ecosystem destruction caused them to become extinct? and What can you do to help preserve them?

Suggestions

A variation to the activity can be the creation of an animal sculpture or another type of craft which is representative of the area; for example, textiles.

Another variation is to briefly research information about the animals that existed before by consulting the elders in the community. This information could be used to develop a list to be compared with the information on current animals and reflect on the changes that have taken place and the things that can be done to support ecosystem conservation.

Activity 4

Bingo game on the benefits of ecosystems

Purpose of this activity

Through this activity participants will:

- Understand the importance of the benefits they receive from their community's ecosystems.
- Represent what they have learned in a traditional bingo game.



Materials

- Scrap paper or waste cardboard (such as advertising posters)
- Crayons or markers
- Scissors

Instructions

1. Tell participants that there will be a bingo game about the benefits we receive from the ecosystems near the community. They should take a moment to think about the game: How many images are on the card? How is it played? etc.
2. Make a list of each of the benefits in order to prepare various cards for the bingo game. Several examples of each benefit may be included.
3. Decide how many cards you will make for the game and look for ways to make them as diverse as possible. Remember that you will also have to make the bingo tokens.
4. Distribute the work in an equitable manner. You can form groups of four to six people, in order to promote everyone's participation.
5. When you finish, find some seeds or pebbles to fill in the cards and prepare to play.
6. The facilitator may be the bingo caller. Every time the caller references the picture on the card, details may be added about the benefits received from the ecosystems.

Reflection



When the game has finished, take a moment to comment on the benefits received from nature on a daily basis. Remember that some of them will be very easy to identify, such as food, water, etc.; however, others, such as climate regulation or enjoying a beautiful landscape, may not be as easy to identify. What would happen if we were to stop receiving them? Could they be replaced?

Suggestions

A variation would be to adapt it to other traditional games, such as Memory.

Activity
5

How much does it cost?

Purpose of this activity:

Through this activity participants will:

- Understand and value the importance of the benefits they receive from ecosystems.



Materials

- Notebook
- Blackboard or paper sheets
- Markers and chalk

Instructions

1. Explain to participants that every day we receive different benefits from the ecosystems that surround us and that together they will develop an inventory of such ecosystems.
2. Using the list of ecosystem services presented in the theoretical section of this module (page 5), ask participants to check at home which benefits they are receiving in order to make the list more specific. This observation exercise will be done over the course of a weekend.
3. On the agreed-upon day to go over the list, you must review each of the benefits in the lists.
4. Develop a table (Annex 1) that brings together the information collected during the observation exercise.
5. The first column must include a list of the benefits. The second column will include the number of participants receiving the benefit. The third column should list the number of relatives (including participants) benefited. The fourth column must designate an amount representing the cost of having that benefit. If you have no idea of the cost, then define a symbolic amount. Finally, the fifth column should include the total cost resulting from multiplying the individual cost by the total number of people benefited.
6. This calculation should consider everybody's data.

Reflection



When they have finished calculating, take a moment to reflect and talk about the results, emphasizing on the following: How many people are benefited by each of the ecosystem's benefits? How would it affect them if they didn't receive them? How would it affect them economically if they didn't receive each benefit? Would they have to pay more or less money to receive each benefit?

Suggestions

They can prepare comparison charts between one benefit and another, to see which ones are used the most.

Activity
6

Short stories about our ecosystem

Purpose of this activity

Through this activity participants will:

- Use acquired knowledge about the ecosystem to translate it creatively into a short story.
- Identify and value the ecosystem's characteristics.



Materials

- Sheets of paper
- Pencils
- Crayons or markers
- Newspaper pages with short stories (as many as there are working groups)

Instructions

1. Divide participants into small groups of approximately four members each.
2. Give each group a sheet of newspaper with short stories. Ask them to comment on them by asking themselves questions such as: What are the stories like? Are they short or long? Are the drawings in color or in black and white? What are the dialogues between the characters like? Etc.
3. Tell them that they will prepare a short story using the ecosystem around them and everything they have learned about it as inspiration.
4. The plot of the stories will depend on each group's creativity. Give them at least 30 minutes to start working on their story. You may need to assign 5 to 20 minute periods throughout several days to complete the short stories.
5. When all the groups have finished, allow each group to share their short story for everyone to observe their results.

Reflection

Take some time to talk about the stories they wrote and highlight the aspects related to the ecosystems, as well as their importance and conservation mechanisms.

Suggestions

Another way of carrying out this activity is through a theatrical representation of the short stories.

Activity
7

Danger in paradise,
things that affect our ecosystem

Purpose of this activity

- Through this activity participants will:
- Remember the components of the community's ecosystem.
 - List the dangers that affect the ecosystems and become aware of the importance of implementing actions to avoid losing them.



Materials

- Scrap cards
- Pens or markers
- Wool, tape
- Scissors
- Markers, chalk

Instructions

1. List the elements that make up the ecosystem near the community (animals, plants, climate, rivers, lakes, etc.) and the problems that affect it.
2. Divide the participants into two teams.
3. The first team should be made up of 1/3 of the class participants and will represent the ecosystem and its components.
4. The second team should be made up of 2/3 of the participants and represent all the hazards that threaten the ecosystem.
5. To prepare the cards corresponding to the elements of the ecosystem, write down on each card the elements that were previously listed. There should be double the number of cards than there are participants in the group.
6. On another group of cards, write down the problems that were previously listed. The number of cards should be equal to the number of participants in the group.
7. Draw a rectangle on the floor, which should be large enough to fit the people who will represent the eco system and its components.
8. The cards with the ecosystem's components shall be distributed along the inside of the rectangle's edge.
9. The hazards team will be located outside the rectangle and each member will have the hazard card they represent taped to a visible part of their body. They will move in one direction (forward) to try to reach the cards located within the rectangle corresponding to the ecosystem's components.
10. The components team will be able to defend their cards by touching the hazards players before they take the cards. Players who are touched must leave the game.
11. Every time a hazards player succeeds in taking a card without being touched, this will represent a loss for the ecosystem. Therefore, for every four cards that the hazards players touch, one player from the ecosystem team must leave the game.
12. When they have understood the dynamics of the game, allow them to play for eight or ten minutes.

Reflection



Discuss what has happened to the ecosystem. Verify which losses it has suffered, what problems have affected it and the impact this has had on the ecosystem. Take some time to comment on the actions you can implement to reduce these problems.

Suggestions

As a continuation of the activity, ask participants to study the importance of the ecosystem and how their loss would have an impact on the quality of life of the people living around it.

Activity
8

We can all do something

Purpose of this activity

- Through this activity participants will:
- Learn about the dangers ecosystems are facing and look for alternatives to help counteract them.



Materials

- Cards with each of the problems ecosystems are facing
- Notebooks
- Cards with the name of each participant
- Colored circles the size of a medium or large coin (can be made from scrap material)
- Tape

Instructions

1. Take some time to talk about each of the problems ecosystems are facing. Encourage participants to seek solutions to each problem.
2. After a few days, take some time in the classroom to have group discussions about the actions participants thought could help solve each problem.
3. Divide participants into the same number of groups as cards available. Take 10 minutes to provide at least three actions they can carry out each day to help reduce the problems ecosystems are facing.
4. At the end, each group should present to the others the ideas they have come up with.
5. Decide whether everyone agrees and develop a general list.
6. On a wall in the classroom, place the cards with the names of all participants in a column and put up a sheet of paper with the list of actions (as a reminder). Place the circles they made in a bag or scrap box so that they are available to everyone.
7. Tell them that when they arrive at school the following week, at the beginning of each day they should add a circle next to their name for each action on the list that they have completed.

Reflection



When time established has passed, take a moment for each participant to count how many positive actions they have completed. Reflect on the importance of implementing small actions every day that contribute to ecosystem conservation. Congratulate them and encourage them to continue working on them despite the fact that the activity has ended.

Suggestions

Another idea is to make boxes using small juice cartons, decorate them with the name of each participant and add an item inside the boxes for each good action participants carry out, such as seeds or pebbles.

They can extend the impact of the activity by making a presentation to other groups of people and inviting them to participate in the activity.

Activity

9

Will it ever be the same again?

Purpose of this activity

Through this activity participants will:

- Understand the importance of ecosystems.
- Identify how human actions can damage or modify ecosystems.

**Materials**

- Blank paper
- Crayons and/or markers
- Glue

Instructions**Phase one:**

1. Spend at least 30 minutes talking about the importance of the ecosystem near their community, how it benefits them, its characteristics, what they like about it the most, etc.
2. Next, give participants a sheet of paper, which should be cut in half. One half they will keep, and the other half they will use to draw what they think is the nicest part of the ecosystem. Make sure that they leave no blank spaces and that their drawings are completely painted and very well finished.
3. When they have finished, separate the participants into groups of three,

ask them to show their drawing and talk for a moment about what inspired them to do it.

4. After having shared this moment, ask them to take their drawing, crumple it up and tear it up. They will probably not like this because they will have invested time, effort, and work into it.

Phase two:

5. Afterwards, ask them to try to uncrumple each piece of paper and to piece their drawing back together by gluing it on to the other half of the sheet.

Reflection**Phase one:**

Take a moment for participants to express how they feel about having had to crumple and tear up their drawing. After they have expressed their feelings, tell them that this is exactly what is happening to the ecosystems and that many of our actions have an impact on such ecosystems by damaging them and affecting their recovery. Which of our actions can damage the ecosystems?

Phase two:

Take some time to talk about restoration and how when an ecosystem is damaged it is difficult to get it back to the way it was originally. Compare the time it took to develop the drawing with the time it takes to establish an ecosystem (hundreds of years), then the relatively short time it took to destroy the drawing with the time it takes to damage an ecosystem, and finally the time it took to repair the drawing with the very long period of time it takes to recover an ecosystem.

For example, it takes more than 200 years for the vegetation of an ecosystem to develop, not taking into account the incorporation of fauna species. However, this ecosystem can be easily damaged in a short period of time by a natural or anthropogenic phenomenon.

Suggestions

As a complement to this activity, the development of a restoration plan can be included for an area in the patio or garden within the community or somewhere else of their choosing.



Activity

10

Let's draw up a restoration plan

Purpose of this activity

Through this activity participants will:

- Understand the importance of ecosystem restoration processes.
- Analyze the impact of human activity on ecosystems.
- Develop a hypothetical management plan for a damaged ecosystem.

**Materials**

- Sheets of paper or notebook
- Pens or pencils

Instructions

1. Participants should recall the different steps and actions that can be implemented for restoration (page 18).
2. If possible, visit the nearest ecosystem. Ask participants to observe and record as much information as possible.
3. As a complement, an expert or technician from an institution related to ecosystem management and conservation should be invited to give a talk about the ecosystem.
4. Encourage participants to ask as many questions about the ecosystem as possible, for example, questions about its conservation status, the problems

it faces, actions that have been taken to help recover it, etc.

5. After this activity, divide them into groups of approximately five members.
6. Next, tell them that based on the information obtained about the ecosystem they have visited, they will design a restoration plan. Ask them to write it down in detail.
7. When everyone has finished, one by one, the groups will present the plan they have agreed upon. The other participants can ask questions or challenge what the group has decided to implement in its restoration plan.

Reflection

When everyone has finished presenting, reflect on each group's proposal and on the similarities and differences between each plan. Discuss the pros and cons of the proposals.





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Annexes

Annex 1
Table for
counting forest
benefits
corresponding
to Activity 5.
“How much
does it cost?”

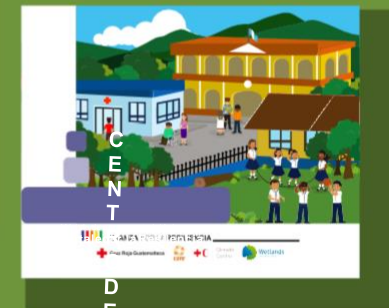
Benefit	Number of participants receiving the benefit	Number of relatives receiving the benefit (including participants)	Individual cost assigned to the benefit	Total cost of the benefit (individual cost x number of relatives)
Example: Water	4	(5+6+8+3)=22	Q10.00	Q220.00



Other resources

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Methodological Support Module for Ecosystem Management and Restoration



This kit includes **three modules**, each of which is independent and can be used in the order you consider most appropriate. There is also a **fourth module (Resilience)** which integrates the first three modules and should be used at the end to improve understanding and efficient use of the kit.

 **ALIANZA POR LA RESILIENCIA**



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