Sustainability of Ecosystems Activities

for Grade 10 Biology at the Toronto Zoo

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Teachers Copy

Students Copy

Sustainability- Teacher Copy

Introduction

The aim of the pre-activity, the Zoo activity and the post activity is to have students investigate, research and present information on the factors that effect the survival and population of an ecosystem.

Curriculum connection

Overall Expectations

- demonstrate an understanding of the dynamic nature of ecosystems, including the relationship of ecological balance and the sustainability of life;
- investigate factors that affect ecological systems and the consequences of changes in these factors;
- analyse issues related to environmental sustainability and the impact of technology on ecosystems.

Specific Expectations

Understanding basic concepts

By the end of this lesson/activity, students will:

- examine the factors (natural and external) that affect the survival and equilibrium of populations in an ecosystem;
- examine how biotic factors affect the survival and geographical location of biotic communities.

Developing Skills of Inquiry and Communication

By the end of this lesson/activity, students will:

- through investigations and applications of basic concepts:

- formulate scientific questions about observed ecological relationships, ideas, problems and issues;
- select and integrate information from various sources, including electronic and print resources, community resources and personally collected data, to answer the questions chosen;

- analyse data and information and evaluate evidence and sources of information, identifying flaws such as errors and bias;
- select and use appropriate vocabulary and numeric, symbolic, graphic, and linguistic modes of representation to communicate scientific ideas, plans, results and conclusions.

Relating Science to Technology, Society and the Environment (STSE)

By the end of this lesson/activity, students will:

- assess the impact of technological change and natural change on an ecosystem;
- identify and research a local issue involving an ecosystem: propose a course of action, taking into account human and environmental needs; and defend their position in oral and written form;
- identify and evaluate Canadian initiatives in protecting Canada's ecosystems
- explain change in popular views about the sustainability of ecosystems and human' responsibility in preserving them;
- describe careers that involve knowledge of ecology or environmental technologies, and use resources such as the internet to determine the knowledge and skill requirements of such careers.

Relevant Background Information

Extinction

For every species that is alive today, perhaps a thousand more have lived previously and become extinct. Most of these extinctions occurred before humans evolved, and the species are known to us only through fossils. The extinction of species and populations as a result of natural processes is a neutral event. Throughout the millennia of geological time, the natural extinction of certain species has tended to be balanced by the evolution of new species. Extinctions are a natural part of evolutionary processes, but through most of the history of life on Earth, biological diversity has been increasing. Periodically, however, major changes in the conditions on Earth have caused the collapse of living systems, and large percentages of species have become extinct. These species will never return. It takes millions of years for life forms to diversify again.

The current extinction crisis is unique, in that the loss of biodiversity is occurring very rapidly, and the causes of the crisis are the activities of a single species: human beings. Some scientists believe the current crisis began when humans and their domestic animals first began to colonize the various parts of the globe. Others believe it began around 1600, when human population growth exploded, and the level of per capita resource consumption began to rise dramatically in some parts of the world. Of the species that are best known, the so-called "higher animals," more than one percent has become extinct in the last 400 years and the overwhelming majority of these extinctions are anthropogenic**.** During the last 400 years also, some 490 described species of animal are known to have become extinct. Many more species are in danger of becoming extinct if we do not act quickly to conserve them

Extinction Rates

The background rate of extinction is the number of extinctions that would be occurring naturally in the absence of human influence. Estimates range from one to ten species per year for the past 600 million years. It is difficult to estimate this rate, in part because the number of species in existence is not known. The background rate of extinctions establishes a baseline from which the severity of the current extinctions crisis can be measured. The current rate of extinction appears to be hundreds, or perhaps even thousands, of times higher than the background rate. It is difficult to be precise because most of the disappearing species today have never been identified by scientists.

The background rate of extinction has been interrupted periodically in Earth's history by episodes of mass extinctions, periods in which a large percentage of the existing species become extinct in a geologically short amount of time. Mass extinction episodes represent major collapses of biodiversity and ecosystems, and they lead to fundamental changes in the make-up and distribution of life on Earth. The species that are most likely to survive mass extinctions are widespread generalists such as cockroaches.

There are five widely recognized major mass extinction episodes in the Earth's history, and many scientists believe that we have now entered the sixth. However, there is a fundamental difference. In the past, mass extinctions have been caused by climate change, extreme geological activity, huge meteors colliding with the Earth or other natural factors. These changes in the environment took tens of thousands or even millions of years to occur. The sixth great extinction episode has been precipitated by human activities, and it appears to be happening very quickly.

Types of Extinction

The word "extinction" can refer to several different phenomena. Most of the world's extinctions have been true extinctions, when a species completely dies out and leaves no descendants. A few have been pseudo-extinctions, when the original or ancestral species has become transformed by evolution into another species. All species living today, including ourselves, evolved from another species.

True extinctions and pseudo-extinctions are both a type of global extinction. Global extinction is the complete elimination of a particular species everywhere in the world. Many endemic species have a limited geographic range, such as a single island. No matter how small that area is, their disappearance from it is a global extinction if the species is not found anywhere else.

A local extinction is the extirpation of a species from a portion of its geographic range. Local extinctions mean the loss of the genetic diversity represented by that population and the removal of that species' contribution to the local ecosystem. Because members of the species still exist in other locations, local extinctions can be reversed if the original causes are addressed, and the species can re-colonize or can be reintroduced into the area. Unfortunately, local extinction is often the precursor to global extinction.

Extinction is not limited to application at the species level. Extinctions in the ancient past frequently are described in terms of whole groups of related species, such as a genus or a family. The farther back in time, the more difficult it is to distinguish different individual

species from one another on the basis of fossils, and sometimes scientists can only tell when all the members of a genus or a family disappear. In contrast, it is often useful to categorize extinctions in the recent past by distinctions that are finer than the species level, such as subspecies and populations.

Another important type of extinction is extinction in the wild. Members of a species may exist in captive breeding programs in zoos, but if there are no individuals living in their natural habitat, that species has become extinct in the wild. Similarly, a species may be effectively extinct, if members of the species are still alive, but the species has no chance of reproducing. These cases include those in which all the remaining individuals are of a single sex.

Listed below are five main causes leading to the endangerment or extinction of species:

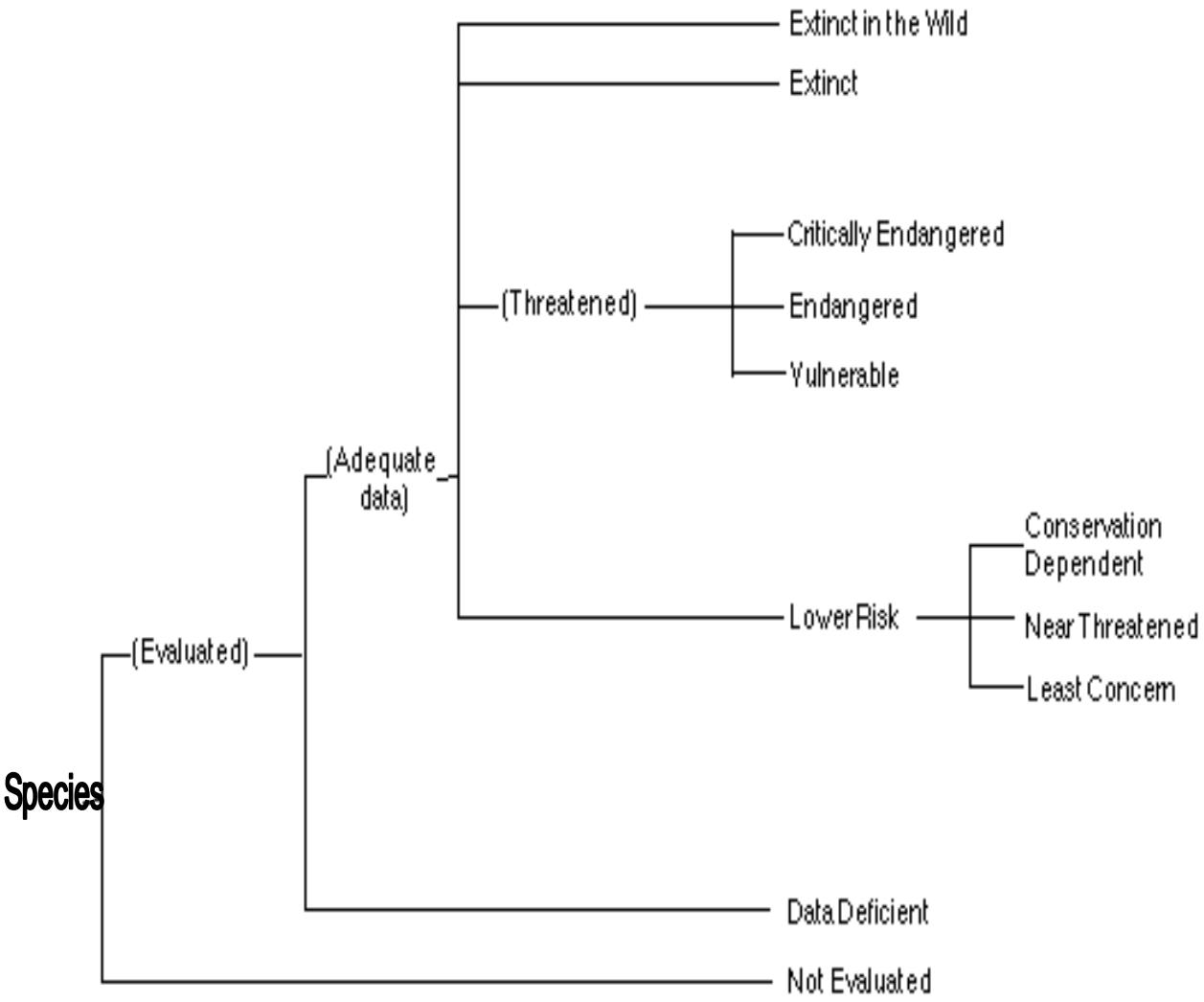
1. Habitat destruction
2. Habitat fragmentation
    - Loss of habitat, primarily due to the demands of the ever growing human population
3. Overcollecting or Overharvesting
    - Poached for pelts, skins or feathers
    - Poached for medicinal purposes or folklore
    - Over collected for food or the pet market
    - Poached for sport or trophy
    - War, which puts modern weapons into many hands, including poachers
    - Poisoning and predator persecution, victims of pesticides or herbicides
4. Invasive species
    - Introduction of non-native animals
    - Competition with domestic animals for food and water
    - Danger of disease transmission from domestic animals
5. Secondary effects cascading through an ecosystem from other extinctions.

(Robert May, 1995)

Current conservation strategies and policies in practice

- Scientific research into the behaviour, diet, reproductive physiology,
- Genetics and breeding of the species
- Endangered species breeding programs, some examples are:
    SSP - Species Survival Plan
    EEP - European Survival Plan
    ASPM - Australasian Species Management Program
- Educating of the public
- Fundraising for research anti-poaching patrols and anti-poaching legislation
- Regulation of the trade of endangered species (CITES)
- Establishment of reserves for the protection of threatened species

IUCN Risk Categories



For a complete description of the criteria used by the International Union for the Conservation of Nature and Natural Resources (IUCN) to classify threatened species go to:
http://www.iucnredlist.org/

PRE- ACTIVITY

Suggestion for co-operative learning

Students are divided into groups of three (randomly or at the discretion of the teacher) to encourage maximum learning. It is suggested that these students are kept in the same grouping for the zoo activity and the post- activity.

Part I. Mental/Anticipatory Set

Two mental/anticipatory sets have been presented; both aimed at preparing the students for the subject to be covered. These activities should be used as "warm- up" activities to introduce the students to the main portion of the pre-activity (Part II).

You may have students do both or either of the pre-activities.

Mental/ Anticipatory Set

1. Preparation/ Materials:
   Students should sit quietly at their desks and each student should have a pen and a sheet of paper in front of them.

"The Ramble"

Have students close their eyes and visualize the following:

a. "You are walking through the woods on a mild spring day. You feel the cool breeze on your face and you hear swish of the branches of the trees and the rustling of their leaves. You look up and you see patches of the deep blue sky through the green covering made by the towering trees. As you walk, you look around you; you see the waving green grass and the lovely wildflowers. Colourful butterflies are flitting from flower to flower as you walk by. You soon come across a brook running through the woods and since you are a bit tired with your rambling, you decide to sit down under a magnificent willow tree growing on the banks of the brook. The air is full of the sound of birds chirping. You see two squirrels quickly run across the ground in front of you and up a tree. How do you feel?"
Open you eyes now and write a few words to describe how you feel.

b. "Close your eyes again and imagine that you are still sitting under the tree relaxing, listening to the sounds of the water flowing over the rocks. Now that you are rested you decide to continue with your walk. As you continue walking you are suddenly aware of an eerie silence; you no longer hear the sounds of the birds or see butterflies flitting around. Suddenly the woods open up to reveal a great empty gap; there are no trees, only stumps; no grass or flowers, just dried branches; no animals, just silence. This view stretches as far as your eyes can see. Vaguely you hear a strange sound in the distance and as it gets louder you suddenly realize……. that it is the sound of a power saw. How do you feel?"
Open your eyes and write a few words to describe how you feel.

- have students share how they felt walking through the woods during the first part (a.) of their walk within their group (or to the class)

- have students share how they felt walking through the woods during the second part (b.) of their walk within their group (or to the class)

AND / OR

2. Preparation/Materials:

Space is required to perform this activity. The desks in the classroom can be moved aside and the activity can be done in the classroom itself. However the hall can be used or more appropriate and relevant, the activity can be performed outdoors (if possible). Name tags for each student and a large ball of yarn is required.

" Web of Life"

Students are assigned roles based on ecological relationships. After the roles are randomly assigned, the students are required to write their respective roles on their name tag and place it on their person so that it is visible to the other students.

One student is assigned the role of the sun and another the role of Man. The rest of the students are assigned the roles of various decomposers (bacteria, worms), producers (plants), primary, secondary and tertiary consumers (rats, snakes, hawks). (More than one student may have the same role).

The student whose role is that of the sun is given the end of the ball of yarn. Students are then asked to name something that is directly dependent on the sun (plants); the ball of yarn is then passed on to that student (with the sun still holding on to the end). The ball of yarn is then passed to the student/s who depend/s on plants for survival (rats). This process is continued until a web is formed connecting all the students to each other.

This shows the students visually the connections amongst the various components in a habitat and emphasizes the idea that all species in an ecosystem are inter-dependent.

The student/s who represent a certain species is/are then asked to let go of the yarn, this represents the idea that they have been removed form the ecosystem. Students who are directly connected to them (i.e. dependent on them) are asked to let go of the yarn. This is continued until the whole web collapses.

This activity should help the students realise that the species in an ecosystem are not only dependent on each other, but that the fate of one species adversely affects the other…… including Man.

Part II. Instructional Input

The aim of this activity is to:

- introduce students to the basic terms and concepts dealing with the subject to be covered
- have students involved in co-operative learning and the sharing of ideas
- give the teacher an idea as to any misconceptions the students may have on this subject, from the feedback given.

- assist the students to chart their progress, through the pre-activity, the Zoo activity and the post activity.

Preparation/Materials:

Students are introduced to the terms such as extinct, extirpated, threatened, endangered, and vulnerable. They can be initially asked to state the meanings of these words as they understand them, for the teacher to have an idea as to the level of understanding the students may initially have on the specific subject area. You might also ask the class, collectively, to rank these terms in order of severity. Proper definition of these terms are given for the students to take note of or students can be referred to Nelson Science 10 Page 14.

It is suggested that the students are kept in the same grouping for the Mental/Anticipatory Set activity, the zoo activity and the post- activity so as to encourage maximum learning. Students then begin an activity on endangered species using graphic organizers. See Figure I for a suggested outline. Students are to work together as a group to come up with specific information on threatened species:

What I know

- examples of endangered species
- reasons why these species became endangered
- how individuals can help in assisting the animals
- why conservation should be practiced
- examples of extinct species

Each group is supplied with chart paper and markers. Using the format given as the example, each group by discussing and brainstorming with members within their respective group, is to produce a chart showing the above information.

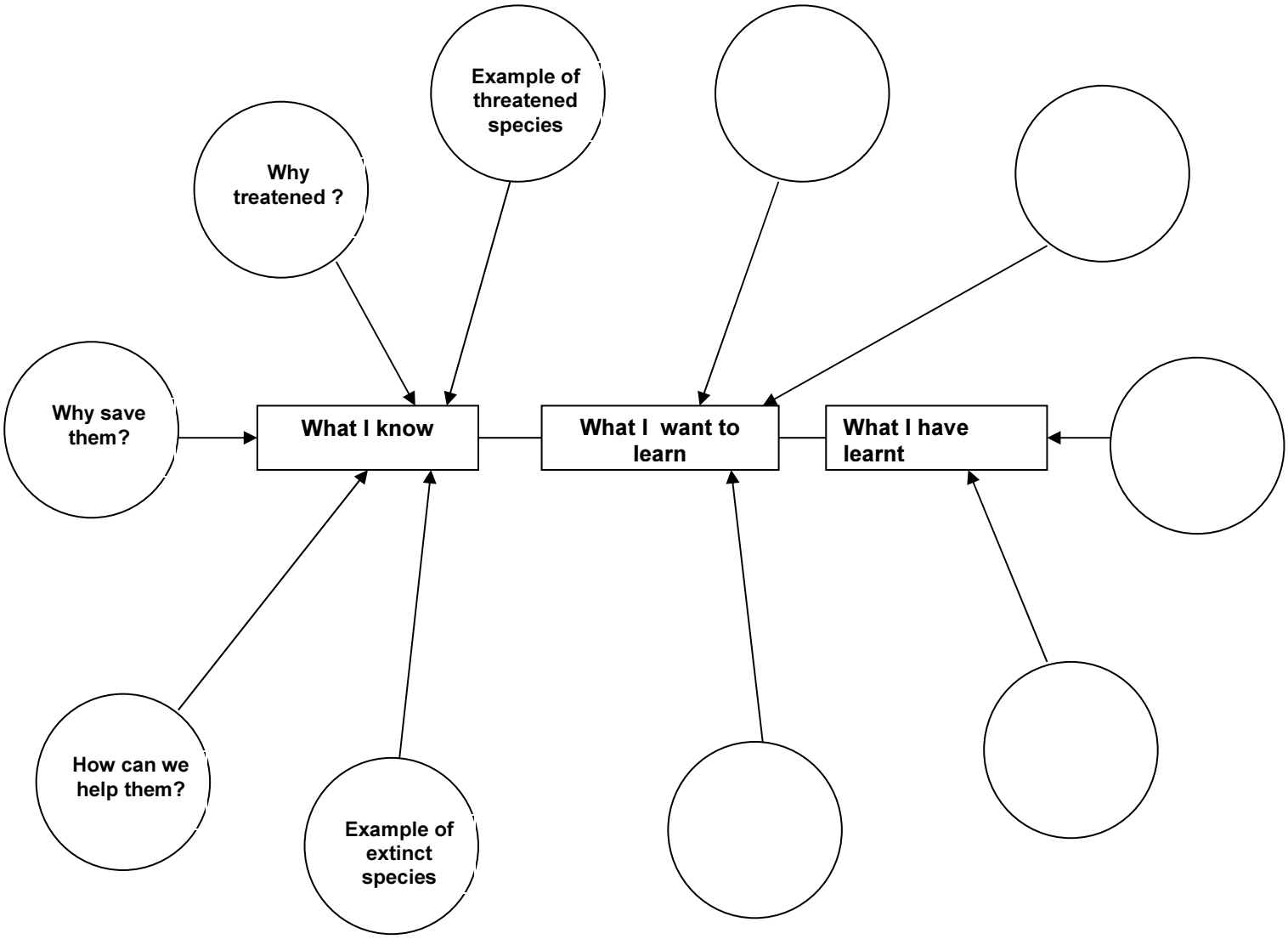
What I want to know

- each group is then asked to record on their graphic organizer the information they would like to know about the subject collectively as a group.

At the end of this activity, each group is then asked to present the information gathered as a group on **what I know** and **what I want to know**.

The charts are then posted in the classroom to be used as part of the post activity lesson, dealing with **what I have learnt**, after visiting the zoo and completing the Zoo activity.

Figure 1


Example of threatened species
Why treatened ?
Why save them?
What I know
What I want to learn
What I have learnt
How can we help them?
Example of extinct species

ZOO ACTIVITY

Activity Description

Average class size: 30-35

1. Students are to be placed in groups of three; averaging therefore 10-12 groups of three. It is suggested that the students are kept in the same groupings as in the pre-activity.

2. Each group is assigned a role.
Suggested roles to be played:
a. National Geographic Researchers
b. Sir David Attenborough and colleagues in the process of making a wildlife documentary
c. Conservation biologists
d. Anti- Poaching Patrol

3. Groups are to be divided up equally (if possible) and sent to their specific geographical region and one other (of their choice). The geographic regions comprise the following:
a. Africa
b. Americas
c. IndoMalaya
d. Australasia

4. Each group is to complete the general activity and **one** specific question activity pertaining to their predetermined "role" and geographical area of investigation. They are required to record their data and suggestions in the data record sheets provided.

5. Before arriving at the zoo and beginning the zoo activity, it is suggested that:
- the groups know of the specific geographic region they are to concentrate on
- the groups decided on the second geographic region that they will visit, apart from their specific region of investigation.
- each student has a copy of the activity that pertains to the specific geographic region that they will be investigating, for example, all students in the group/s doing Activity 1 will be visiting Africa and one other region of their choice.
- students understand and are familiar with what they are to do to complete their respective activity accurately and thoroughly.

Suggested Resources:

Websites:
http://www.conservation.org.htm
http://www.cosewic.gc.ca
http://foe.org
http://www.ran.org
http://www.projectwild.org
http://www.speciesatrisk.gc.ca

Bibliography:

The Ontario Curriculum.(1999). Ministry of Education and Training. Grades 9 and 10. Science
Endangered Species Teacher Resource Kit. Metro Toronto Zoo.
Green Teacher No. 66. Page 25
Nelson Science 10. (2001). Nelson Thomas Learning
Primack, R.1993. Essentials of Conservation Biology. Sinauer Assocites Inc., Massachusetts.
Pollack,S. (1993). The Atlas of Endangered Animals. Belitha Press.

Websites:

http://www.adhost.com
http://www.redlist.org
http://www.bbc.co.uk
http://www.amnh.org/museum/press/feature/biofact.html
http://www.enn.com/enn-features-archive/1998/09/091698/fea0916_23526.asp
http://www.iucn.org/redlist/2000/news.html
http://www.sciam.com/article.cfm?articleID=0009E9C9-E1E4-1C67-B882809EC588ED9F

POST ACTIVITY

Post-Activity

I. This activity occurs in the classroom. It is suggested that the students are kept in the same groups as in the pre-activity and the Zoo activity.
Students are then given their original chart paper showing **"What I know"** and **"What I want to know".** They are then asked to complete the chart, working in their respective groups, on the final topic for discussion dealing with "**What I have learnt".**

Students are given a fixed amount of time for this activity to be completed. Each group is then required to contribute to the class one factual piece of information on "**What I have learnt".**

II. With the information obtained in Question 5 of the Zoo activity, students are asked to use their thoughts and observations written down to express what the animal would have liked to say to humans in any form that they may wish to use.
Suggestions: song, rap, story, poem, monologue, interview

Students can again post these in the school library or around the school to inform and educate the student body of the status of threatened species.

Further Suggested Post-activities

Activity I

i) Students are placed in pairs

ii) Each pair is to choose one species (plant or animal) that belongs to any one of the following categories:
- extinct in the wild OR
- extirpated OR
- endangered

iii) Each pair, on choosing one species, is to research and compile data on that species. Using the information collected, students are to create a poster aimed at informing the public (school body) about the status of the species.
The poster created should include the following information:
- species' common and scientific name
- the status of the species
- visual or detailed description of the species

- the past range and population of the species before it became threatened.
- the present range and population of the threatened species
- reason for the species becoming Extinct in the wild, Extirpated or Endangered
- recovery procedures put in place by conservationists
- any other interesting fact about the species

iv) The posters can then be displayed in the school library or posted throughout the school, so as to educate the rest of the school body about threatened species.

Activity II

i) Have students use the library, internet, contacting their provincial or territorial wildlife agencies or other research techniques to obtain information on species that are classified as extinct in the wild, endangered, vulnerable, and extirpated at both the provincial/territorial and national levels.

Information is needed on how the species came to be classified as such and the procedures in place for its recovery.

Students can then compile a master list of the species according to the category in which they are classified and complete the table as follows:

PROVINCIAL OR TERRITORIAL

Species Name	EW	EN	VU	EX	Factors affecting animals status	Recovery procedures in place

NATIONAL

Species Name	EW	EN	VU	EX	Factors affecting animals status	Recovery procedures in place

ii) Student can post this list up in the classroom or library as a means by which the school body can be informed and educated about the species that are threatened in their Province or in Canada as a whole.

Activity III

In their groups of three have students research careers that involve ecology or environmental technologies. Information on specific careers should include:

- the level of education needed
- the specific type of knowledge and skills required
- previous experience needed in the area of interest
- amount of post-secondary education needed to become qualified
- the expected salary range
- individuals in that specific career that have made a marked contribution

Suggested careers to be researched:
Field/Research Technician
Laboratory Assistant
Research Associate/Scientist
Research Administrator
Program Manager
Wildlife Biologist
Forester
Natural Resource Manager
Environmental Consultant
Environmental Planner
Park Naturalist
Program Scientist
Wildlife Specialist
Research Assistant
Environmental Analyst
Field Ecologist
Science Specialist
Outdoor Educator

Student Activity Evaluation Form

Please let us know how useful you found these activities. When you return a completed evaluation to us we will send you an attractive poster about gorilla reproduction and endocrinology. *Please return to:*

Education, Toronto Zoo
361 A Old Finch Ave.
Toronto, ON M1B 5K7
FAX: 416-392-5948

Date: _____ Grade Level: _____

Subject: _____ Your Name: _____

School: _____

Please rate the following on a scale of 1 to 5 : 1 poor; 2 fair; 3 satisfactory, 4 good, 5 excellent

1. The activities were appropriate for the curriculum. 1 2 3 4 5

2. The language level was suitable for your students. 1 2 3 4 5

3. The tasks were clearly explained and easily understood by the students. 1 2 3 4 5

4. Did you use this activity as part of your evaluation process for students? (Y / N)

5. Did you or will you be visiting the Toronto Zoo with yours students? (Y / N)

6. Would you use these activities again? (Y / N)

7. How would you change the activity to be more useful?

8. Did you use any other Zoo teaching resource material? (Y / N) (What?)

9. Are there any other kinds of resources you would like the Zoo to provide to support your visit?

Sustainability- Student Copy

Background Information

For every species that is alive today, perhaps a thousand have lived previously and become extinct. Extinction is a natural part of the evolutionary process. Fossil records show that extinction is the norm and that individual species normally survive for about a million years before they are replaced or have evolved into another form (Wilson, 1992). Periodically however, major changes in the conditions on Earth have caused the collapse of living systems, and large percentages of species have become extinct. **These species will never return**. It takes millions of years for life forms to diversify again.

Some scientists suggest that there is a cycle of mass extinction, with a major die off every 26 million years or so. Although unsure of the total number, there is a general agreement over the existence of 6 major extinction events. According to scientists, one of the causes for the occurrence of mass extinction may have been due to asteroids crashing into the Earth, which would have resulted in a large amount of dust being scattered into the atmosphere, blocking out the sun. The collision may have even triggered volcanic activity. Another cause of mass extinction has been due to climatic changes and pressure of competition from other species.

Our present problem is quite pressing and this urgency is aptly noted by Primack (1993), who states that both scientists and the general public have realized that we are living in a time of unprecedented mass extinction. Around the globe biological communities that took million of years to develop are being devastated by human actions. Unless something is done to reverse this trend, the wonderful species that symbolize the essence of wildlife, such as elephants, tigers and grizzly bears will no longer be found in the wild. Thousands, possibly even millions, of less conspicuous plant and invertebrate species will join them in extinction unless their habitats and populations are protected - and their loss may prove even more devastating on the planet and its human inhabitants.

IUCN RED LIST CATEGORIES

Listed below are the symbols and the categories that tell the present status of a particular species. This system was set up by the International Union for the Conservation of Nature and Natural Resources (IUCN). The IUCN is now known as the World Conservation Union

SYMBOL	STATUS
EX	Extinct. A species that no longer exists.
	Extirpated. The complete removal of a species from an area, usually a specified geographical area. **
EW	Extinct in the Wild. Species remain alive only in captivity or in other human controlled situations.
CR	Critically endangered. Species is facing an extremely high risk of extinction in the wild in the immediate future.
EN	Endangered. Species whose numbers are so low, or whose habitat has been so badly destroyed, that they will become extinct if nothing is done.
VU	Vulnerable. Species that are quite numerous, but are facing a high risk of extinction.
NT	Near threatened. Species has been evaluated, but does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable, but is likely to qualify for a threatened category in the near future.
DD	Data deficient. Species where there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
NE	Not Evaluated. Species has not yet been assessed against the criteria.

** For example, the Black-footed ferret is a species that no longer exists in the wild in Canada, but occurs elsewhere. This is not an official IUCN Red List Category.

ZOO ACTIVITY

GENERAL INFORMATION TO BE GATHERED DURING YOUR TRAVELS
RECORD ALL DATA in the data record sheets

1) You will need to identify animals that are threatened.
- Locate the symbol that identifies Vanishing Species and draw it in your journal.
- What are Vanishing species?
- Locate the symbol that identifies a species that has been selected for the Species Survival Plan (SSP) and draw it in your journal.
- What is the aim of the Species Survival Plan (SSP) and how is this aim achieved?

*** Record in Data Record Sheet 1**

2. Obtain information (see Data Sheet 2) on ONE species from EACH of the two geographical areas visited, which have been identified as Vanishing species. Ensure that you and your colleagues DO NOT research the same species.

*** Record in Data Record Sheet 2**

3. Do these conservation procedures and strategies in practice actually help prevent the animal from becoming extinct? Some individuals think that these last-ditch attempts are futile since they cost money and labour and will certainly end in failure. Identify one species that you have encountered during you travels that represents a Conservation Success Story to prove to these individuals and the public that conservation in practice works.
- identify the species (give both the scientific and common name)
- list factors that contributed to its becoming endangered
- give at least two practices that resulted in its recovery.
- provide one additional piece of relevant information

*** Record in Data Sheet 3**

4. Before you can suggest conservation procedures that need to be put in place to assist in the recovery of a species, you must first identify the factors that contribute towards the endangerment or eventual extinction of the species. Locate at least 2 species and identify the causes for their threatened state. List their status according to the IUCN, possible causes of their endangerment, and check off the causes that are particular to your chosen animals. Ensure that your colleagues DO NOT list the same species as yourself; so all together as a research team you would have investigated at least 6 different species.

*** Record in Data Sheet 4**

5. Choose one threatened species of special interest to you that is located in your area of research. Observe that animal quietly for a few minutes.
- Imagine that you are that animal; that you have experienced everything that that animal has been through.
- Imagine that for one day you were given the gift to communicate with humans.
- What would you say to us? What would you want us to know about you?

- Write these thoughts down.

* **Record in Data Sheet 5.** This information will be needed for your post activity

Data Record Sheet 1: Vanishing Species and the Species Survival Plan (SSP)

VANISHING SPECIES SYMBOL	INFORMATION GATHERED ON VANISHING SPECIES
SPECIES SURVIVAL PLAN SYMBOL	**INFORMATION GATHERED ON THE SPECIES SURVIVAL PLAN (SSP)**
	

Data Record Sheet 2: Vanishing Species

Common name/ Scientific Name		
Geographical Area or range		
Habitat		
Diet		
Natural enemies		
Reasons for decline		
Procedures in place for recovery		
Suggestions for improving status of the species		

Data Record Sheet 3: Conservation Success Story

Species (Common/ Scientific Name)	
Factors that contributed to its becoming endangered	
Conservation practices that resulted in its recovery	

Data Record Sheet 4: Reasons for Endangerment

Animal	Mandrill						
IUCN Status	VU						
Causes of endangerment:							
1. Bush Meat	✓						
2.							
3.							
4. Habitat destruction	✓						
5.							
6.							
7. Use in labs							
8.							
9.							
10. Killed as Pest	✓						

Data Record Sheet 5: A Day in the Life Of…

Your thoughts and observations:

Life as a ……..

QUESTIONS ON SPECIFIC GEOGRAPHIC AREAS

Activity Sheet 1 - AFRICA

Role: Eminent National Geographic Explorers and Researchers.

Assignment: National Geographic has decided to dedicate an issue dealing entirely with the plight of endangered species on our planet. The issue will be entitled "Extinct is Forever". As Eminent National Geographic Conservation Biologists, two colleagues and yourself have been given the task to travel throughout various parts of the world (all expenses paid, of course!), to obtain and present information on threatened species; specifically on their present status and the steps being taken to remediate their situation. As experts in this area, your suggestions and insights with respect to improvements to existing conservation practices and strategies already in place will be much appreciated.

Since your assignment may put you in danger at times; encountering wild animals or even worse, poachers, it is important that you diligently record all your observations and suggestions in your scientific journal. Together with your two colleagues, you will visit one specified geographical areas (the African Rainforests) and one other, of your choice, for the collecting of your data to assist with your research.
IMPORTANT: Remember to keep your journal with you at all times and record ALL observations.

ITINERARY AND ASSIGNMENTS.

Your journey will take you to the African Continent and after conferring with colleagues, you will also decide on ONE other geographical area to visit.
Since most of the research material will be obtained in Africa, it is advisable that that be your last stop.
You will visit one of the following geographical areas:
i) Americas OR
ii) Australasia OR
iii) Indomalaya
AND you must visit:
i) the African Rainforest Pavilion (for extra information visit the Dja River Research Station in the Gorilla Rainforest pavilion)
ii) the African Savanna exhibits (if
the weather permits venturing into the open savanna)

SPECIFIC research to be obtained during your travels to Africa

The Editors at National Geographic have mentioned that they are going to include an entire article in the "Extinct is Forever" issue dedicated to the Gorilla. Working with your two research colleagues, ensure that the following specific information on the Gorillas are compiled (and any other relevant data):

1. The 3 sub-species, their location and number in existence

2. Reason for their endangerment

3. Ways by which Gorilla populations in the wild can be improved.

4. The habitat of these endangered animals plays a tremendous role in the survival of the species. Concentrating on the rainforests, as you visit the two geographical areas, research and compile data using the following guidelines: Identify the four different types of rainforests (see Dja Research Station)

5. Identify at least two animals from each of the four types of rainforests that are endangered.

6. Why do rainforests have such a rich diversity of life?

7. Why is it necessary that we preserve our rainforests?

8. Suggest ways by which our rainforests can be protected.

(Share the information you have gathered with your colleagues in your group)

This was the last stop on your travels before you return with your research data to National Geographic headquarters.
Return to your base camp at the Dja Research Station to rest and to confer with your colleagues.

- **Ensure data compiled is shared and your field journal and that of your colleagues are fully updated.**
- **Ensure that all of information needed for the issue has been obtained.**

Activity Sheet 2 – THE AMERICAS

Role: Field Ecologists involved in making a wildlife film

Assignment: As a recognised Field Ecologist you and two other colleagues have been invited to accompany Sir David Attenborough and his crew to obtain research material necessary for the making of a documentary film tentatively entitled: "Conservation in Action". This documentary is to deal with the situation facing species today concerning the possibility of extinction.

You must visit the Americas:
i) the Americas Pavilion
ii) the Americas Outdoor Exhibits (if the weather permits venturing into the open country)
and ONE of the following geographical areas:
i) Africa OR
ii) Australasia OR
iii) IndoMalaya

SPECIFIC research to be obtained during your travels to the Americas

The producers of the documentary are interested in dedicating a segment sub-titled: "The Black Footed Ferret- A Success Story?" that delves into the history and present status of the black-footed ferret.
Research the status of the black-footed ferret

1. Where were the black-footed ferrets originally found?

2. What term describes the extinction of the black-footed ferret in Canada?

3. What were the two reasons for the black-footed ferret becoming threatened?

4. What conservation procedures were put in place to prevent the extinction of the black-footed ferret?

5. What factor/s must be considered before the black-footed ferret can be re-introduced to the wild?

6. Would you consider this to be a Conservation Success Story? Give reasons to support your answer.

Activity Sheet 3 - INDOMALAYA

Role: International Anti-Poaching Patrol Team

Assignment: You are the head of an International Anti-Poaching Patrol Team working with the IFAW (International Fund for Animal Welfare). You have been asked to investigate the illegal poaching of animals. You will travel with two of your colleagues to obtain information on this situation and make recommendations for improvement of the situation.
Since your assignment is a dangerous one, it is essential that you record ALL observations, findings and recommendations in your journal. Always keep together and be careful!

You must visit Indo Malaya
i) the Indo Malayan Pavilion
ii) the Malayan Woods Pavilion (if the weather permits venturing into the jungle) and ONE of the following geographical areas:
i) Africa OR
ii) Australasia OR
iii) Americas

SPECIFIC research to be obtained during your travels to the Indo Malaya

The rhinoceros species in Indo Malaya are identified as endangered.

1. Name the three species of rhinoceros found in this area?

2. Which have you found to be the most endangered of them all and why?

3. What have you found were the causes for the rhinoceros becoming in danger of becoming extinct?

4. What are some of the conservation strategies already in place?

5. What other strategies can you and your colleagues suggest that would assist in the recovery program?

Activity Sheet 4 – AUSTRALASIA

Role: Conservation Biologists conducting research for CITES (Convention on the International Trade on Endangered Species)

Assignment: As leading scientists in your field of conservation biology, you and two other colleagues have been requested by CITES to investigate the effect of the illegal trade of certain species, which has resulted in a drastic decline in their population.

Together with two other conservation biologists you are to investigate the species that are being exploited, reasons as to why they are being exploited and suggestions as to how these illegal practices can be curtailed.

It is important that you keep your scientific journal with you at all times and record all observations. The information you have gathered will be necessary for a presentation you will be required to make at an international conference on the illegal trading of endangered species.

You must visit Australasia:
i) the Australasia Pavilion and ONE of the following geographical areas:
i) Africa OR
ii) the IndoMalayas OR
iii) the Americas

SPECIFIC research to be obtained during your travels to Australasia

One of the main subjects to be dealt with at the Conference is the problem of the illegal pet trade. This has resulted in a drastic decline in the populations of certain species. It will be necessary for you to gather as much information as possible on species that are being affected by the illegal pet trade.

You will investigate the sea horse as a case study.

1. What is the present status of the sea horse?

2. What were the contributing factors that resulted in the sea horse reaching this status?

3. What strategies have been put in place to encourage the recovery of these animals?

4. List two other animals that you know of that have become threatened due to the high demand for them as pets. Suggest additional strategies that can be put in place to assist in the recovery of these animals.

Answer Key

(to questions based on specific geographic area)

Activity Sheet 1 – AFRICA

Role: Eminent National Geographic Explorers and Researchers.

Assignment: National Geographic has decided to dedicate an issue dealing entirely with the plight of endangered species on our planet. The issue will be entitled "Extinct is Forever". As Eminent National Geographic Conservation Biologists, two colleagues and yourself have been given the task to travel throughout various parts of the world (all expenses paid, off course!), to obtain and present information on threatened species; specifically on their present status and the steps being taken to remedy their situation. As experts in this area, your suggestions and insights with respect to improvements to existing conservation practices and strategies already in place will be much appreciated.

Since your assignment may put you in danger at times; encountering wild animals or even worst, poachers, it is important that you diligently record all your observations and suggestions in your scientific journal. Together with your two colleagues, you will visit one specified geographical areas (the African Rainforests) and one other, of your choice, for the collecting of your data to assist with your research.
IMPORTANT: Remember to keep your journal with you at all times and record ALL observations.

ITINERARY AND ASSIGNMENTS.

Your journey will take you to the African Continent and after conferring with colleagues, you will also decide on ONE other geographical area to visit.
Since most of the research material will be obtained in Africa, it is advisable that that be your last stop.

You will visit one of the following geographical areas:
i) Americas OR
ii) Australasia OR
iii) Indomalaya
AND you must visit:
i) the African Rainforest Pavilion
ii) the African Savannah exhibits (if the weather permits venturing into the open plains)

SPECIFIC research to be obtained during your travels to Africa

The Editors at National Geographic have mentioned that they are going to include an entire article in the "Extinct is Forever" issue dedicated to the Gorilla. Working with your two research colleagues, ensure that the following specific information on the Gorillas are compiled (and any other relevant data):

1. The main species, their location and number in existence
   i) Western lowland gorilla
   ii) Eastern lowland gorilla
   iii) Mountain gorilla

2. Reason for their endangerment
   i) loss of habitat
   ii) hunted by humans as a source of meat
   iii) illegal trade of young gorillas as pets
   iv) skull, hands and feet used as good luck charms

3. ways that Gorilla populations in the wild can be improved.
   i) illegal trade monitored by CITES
   ii) involved in the Species Survival Plan
   iii) captive breeding and reproductive research
   iv) educating and informing the local population about the gorilla
   v) secure and protected habitat

4. The habitat of these endangered animals plays a tremendous role in the survival of the species. Concentrating on the rainforests, as you visit the two geographical areas, research and compile data using the following guidelines: Identify the four different types of rainforests (see Dja Research Station)
   i) African
   ii) Neotropical
   iii) South Asian
   iv) Northwest coast

5. Identify at least two animals from each of the four types of rainforests that are endangered.
   See Website:
   http://eelink.net/EndSpp/endangeredspecies-mainpage.html

6. Why do rainforests have such a rich diversity of plant and animal life?
   During the ice ages the low temperatures did not reach the rainforests which allowed the evolution of numerous species (mass extinction did not occur)……this resulted in the long term development of a complex and diverse ecosystem.
   Rainforests also have the ideal conditions for plant growth:
   Rainfall = 10m/yr
   Temperature = $27^{O}C$, this provides many niches for a variety of species.
   As a general rule in most ecosystems species diversity increases with proximity to the equator.

7. Why is it necessary that we preserve our rainforests?
   They are important for weather regulation world-wide
   Half of the world's plant and animal species are found there
   Wild species should be allowed to continue to exist.

8. Suggest ways by which our rainforests can be protected and not exploited.
   i) develop sustainable logging practices
   ii) buy wood certified by the Forestry Stewardship Council
   iii) write to government official who have the potential to make the needed changes

(Share the information you have gathered with your colleagues in your group)

This was the last stop on your travels before you return with your research data to National Geographic headquarters.
Return to your base camp at the Dja Research Station to rest and to confer with your colleagues.

- **Ensure data compiled is shared and your field journal and that of your colleagues are fully updated.**
- **Ensure that all of information needed for the issue has been obtained.**

Activity Sheet 2 – THE AMERICAS

Role: Field Ecologists involved in making a wildlife film

Assignment: As a recognized Field Ecologist you and two other colleagues have been invited to accompany Sir David Attenborough and his crew to obtain research material necessary for the making of a documentary tentatively entitled: "Conservation in Action". This documentary is to deal with the situation facing species today concerning the possibility of extinction.

You must visit the Americas:
i) the Americas Pavilion
ii) the Americas Outdoor Exhibits (if the weather permits venturing into the open jungle)
and ONE of the following geographical areas:
i) Africa OR
ii) Australasia OR
iii) Indomalaya

SPECIFIC research to be obtained during your travels to the Americas

The producers of the documentary are interested in dedicating a segment sub-titled: "The Black Footed Ferret- A Success Story?" that delves into the history and present status of the black-footed ferret.
Research the status of the black-footed ferret

1. Where were the black-footed ferrets originally found?
   Prairies of Central and Western North America, from Mexico to Southern Saskatchewan and Alberta

2. What is he term used to describe the extinction of the black-footed ferret in Canada?
   Extirpated

3. What were the two reasons for the black-footed ferret becoming threatened?
   i) the decline in the population of prairie dogs, due to extermination as a pest, which are the black-footed ferret's prey
   ii) contracting of canine distemper

4. What conservation procedures were put in place to prevent the extinction of the black-footed ferret?
   Recovery Implementation Team Breeding Program. In 1987, Wyoming Game and Fish Department started a black-footed ferret breeding program with 18 ferrets. Toronto Zoo applied to become involved in the breeding program and was accepted in 1990. In 1992, the first ferrets arrived in Toronto.

5. What factor(s) must be considered before the black-footed ferret can be re-introduced to the wild?
   i) The maintenance of an adequate prairie dog population in the wild, since ferrets prey on prairie dogs.
   ii) Ensuring that the black-footed ferret has been trained adequately to be released into the wild
   iii) Secure range that is not subject to agricultural or urban "development".

6. Would you consider this to be a Conservation Success Story? Give reasons to support your answer.
   Answer dependent on student's observations

Activity Sheet 3 – INDOMALAYA

Role: International Anti-Poaching Patrol Team

Assignment: You are the head of an International Anti-Poaching Patrol Team working with the IFAW (International Fund for Animal Welfare). You have been asked to investigate the illegal poaching of animals. You will travel with two of your colleagues to obtain information on this situation and recommendations for its improvement.
Since your assignment is a dangerous one, it is essential that you record ALL observations, findings and recommendations in your journal. Always keep together and be careful!

You must visit the Indomalaya:
i) the Indomalayan Pavilion
ii) the Malayan Woods Pavilion (if the weather permits venturing into the open jungle)
and ONE of the following geographical areas:
i) Africa OR
ii) Australasia OR
iii) Americas

SPECIFIC research to be obtained during your travels to the Indomalaya

The rhinoceroses in Indomalaya are identified as endangered.

1. Name the three species of rhinoceroses found in this area?
   Indian rhinoceros
   Sumatran rhinoceros
   Javan rhinoceros

2. Which have you found to be the most endangered of them all and why?
   Javan - none in captivity and only 60 in the wild.
   Current habitat is tiny and in a volcanic area.

Rhinoceroses	Number in the Wild	Number in Captivity
Indian	2400	140
Sumatran	300	16
Javan	60	0

3. What have you found were the reasons for the rhinoceros becoming in danger of extinction?
   loss of habitat

poaching for the animals' horn for medicinal purposes
possible diseases from domestic, foraging animals

4. What are some of the conservation strategies already in place?
   fundraising
   reproductive research
   Species Survival Plan (SSP)
   Protection of wild populations and habitat

5. What other strategies can you and your colleagues suggest that would assist in the recovery program?
   Educating the population
   Anti-poaching patrols and anti-poaching legislation
   Legislation preventing the trade of the rhino horn
   Establishing a reserve for the protection and study of the habits of the rhinoceros
   Restoring suitable habitat

Activity Sheet 4 - AUSTRALASIA

Role: Conservation Biologists conducting research for CITES

Assignment: As leading scientists in your field of conservation biology, you and two other colleagues have been requested by CITES (Convention on the International Trade on Endangered Species) to investigate the effect of the illegal trade of certain species, which has resulted in a drastic decline in their population.

Together with two other conservation biologists you are to investigate the species that are being exploited, reasons as to why they are being exploited and suggestions as to how these illegal practices can be curtailed.

It is important that you keep your scientific journal with you at all times and record all observations. The information you have gathered will be necessary for a presentation you will be required to make at an international conference on the illegal trading of endangered species.

You must visit Australasia:
i) the Australasia Pavilion and ONE of the following geographical areas:
i) Africa OR
ii) the Indomalaya OR
iii) the Americas

SPECIFIC research to be obtained during your travels to the Indomalaya

One of the main subjects to be dealt with at the Conference is the problem of the illegal pet trade. This has resulted in a drastic decline in the populations of certain species. It will be necessary for you to gather as much information as possible on species that are being affected by the illegal pet trade.

You will investigate the sea horse as a case study.

1. What is the present status of the sea horse?
   IUCN listed as Vulnerable

2. What were the contributing factors that resulted in the sea horse reaching this status?
   i) use in traditional Chinese medicine
   ii) sold in aquarium trade
   iii) sold as a food item

3. What strategies have been put in place to encourage the recovery of these animals?
   i) captive breeding programs at Zoos
   ii) educating of the general public
   iii) nutritional research programs
   iv) controls on internationals trade

4. List two other animals that you know of that have become threatened due to the high demand for them as pets. Suggest additional strategies that can be put in place to assist in the recovery of these animals.
   i) Hermit crabs
   ii) Malayan bonytongue
   iii) Parrots