THE DEVELOPMENT OF THE KHAO PRA TAEW NATURE STUDY HANDBOOK FOR TOURISTS IN PHUKET PROVINCE



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Thesis Entitled

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I do hope this research will be useful to tourist and everyone who interested in the future.

Supitcha Kiatprajak

THE DEVELOPMENT OF THE KHAO PRA TAEW NATURE STUDY HANDBOOK FOR TOURISTS IN PHUKET PROVINCE.

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ABSTRACT

The objective of the research was to develop a nature study handbook of Khao Pra Taew Wildlife Conservation Development and Extension Center, in Phuket province, Thailand, for foreign tourists. This research developed a nature study handbook validated the quality and the satisfaction of nine academics and seventy-nine foreign tourists towards the nature study handbook. The research was divided into three steps, firstly constructing by setting concepts, objectives, information and format. Secondly, the handbook was used three times with thirty-nine tourists, divided into a group of three persons, of six persons and of thirty persons. After that, the quality of the book was assessed by 9 academics, 3 each from the fields of forestry, media and tourism. Thirdly, the quality of the book was evaluated using a pre-test and post-test accidental random sampling technique; there were forty foreign tourists interviewed at this stage. The data was analyzed using t-test. The satisfactory assessments of the tourists and of the academics were determined by means and mode.

The results of the research could be concluded as follows:

- 1. The academics were satisfied with the nature study handbook, rating it at a good level.
- 2. Test achievement results for tourists were higher after they had had time to study the nature study handbook, which was statistically significant at a level of 0.05
- 3. The tourists were satisfied with the nature study handbook giving it a very good level.

The conclusion was that the Khao Pra Taew nature study handbook that was designed by the researcher increased the knowledge and created satisfaction for the tourists.

KEY WORDS: THE NATURE STUDY / HANDBOOK / KHAO PRA TAEW

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การพัฒนาคู่มือศึกษาธรรมชาติเขาพระแทว สำหรับนักท่องเที่ยวในจังหวัดภูเก็ต (THE DEVELOPMENT OF THE KHAO PRA TAEW NATURE STUDY HANDBOOK FOR TOURISTS IN PHUKET PROVINCE)

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ศษ.ม. (สิ่งแวดถ้อมศึกษา)

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บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนาหนังสือคู่มือศึกษาธรรมชาติในพื้นที่สถานีพัฒนาและส่งเสริม
การอนุรักษ์สัตว์ป่าเขาพระแทว อำเภอ ถลาง จังหวัดภูเก็ต สำหรับนักท่องเที่ยวชาวต่างชาติ และประเมินคุณภาพของ คู่มือโดยผู้เชี่ยวชาญ รวมทั้งหาประสิทธิผลของคู่มือศึกษาธรรมชาติดังกล่าวในด้านผลสัมฤทธิ์ทางความรู้และความ พึงพอใจของนักท่องเที่ยวต่อคู่มือศึกษาธรรมชาติ การวิจัยแบ่งออกเป็น 3 ขั้นตอนใด้แก่ ขั้นที่ 1 การสร้างหนังสือ คู่มือ ขั้นที่ 2 การพัฒนาหนังสือคู่มือโดยทดลองใช้ 3 ครั้ง กับนักท่องเที่ยว 3 คน 6 คน และ 30 คน ตามลำดับ หลังจากนั้นทำการประเมินคุณภาพหนังสือโดยผู้เชี่ยวชาญ 9 ท่าน ซึ่งมีความเชี่ยวชาญ 3 ด้าน คือ ด้านสื่อ ด้าน เนื้อหา และด้านการท่องเที่ยว ด้านละ 3 ท่าน ขั้นที่ 3 ประเมินประสิทธิผลของคู่มือโดยใช้รูปแบบการทดลองแบบ กลุ่มเดียววัดผลก่อนและหลังการทดลอง กลุ่มตัวอย่างคือนักท่องเที่ยวชาวต่างชาติในจังหวัดภูเก็ตจำนวน 40 คน วิเคราะห์ข้อมูลโดยใช้ t-test ค่าเฉลี่ยและฐานนิยม

ผลการวิจัย<mark>ได้ข้อสรุปดังนี้</mark>

- หนังสือคู่มือที่สร้างขึ้นได้รับการประเมินจากผู้เชี่ยวชาญในเกณฑ์ดีทั้งในด้านกุณลักษณะของหนังสือ คู่มือ เนื้อหา และการนำเสนอ
- 2. คะแนนผลสัมฤทธิ์ทางการเรียนรู้ของนักท่องเที่ยวกลุ่มทดลองหลังการอ่านหนังสือคู่มือศึกษาธรรมชาติ มีคะแนนสูงกว่าคะแนนก่อนการอ่านหนังสืออย่างมีนัยสำคัญทางสถิติที่ระดับ 0.05
- 3. การประเมินความพึงพอใจต่อหนังสือคู่มือศึกษาธรรมชาติของนักท่องเที่ยวอยู่ในระดับดีมาก สรุปได้ว่า หนังสือคู่มือศึกษาธรรมชาติ ที่ผู้วิจัยสร้างขึ้นสามารถเพิ่มความรู้ และสร้างความพึงพอใจให้แก่ นักท่องเที่ยวได้

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CHAPTER I INTRODUCTION

1. Rationale and Justification

By nature, human beings are adventurous. They are keen to explore and to discover new things. The fact that people work hard, compete with one another, and struggle to survive in a society surrounded by pollution, causes the need to escape from these things by going away or taking a trip. Going from one place to another and having various kinds of activities creates traveling. At present, traveling by air, land and sea is easy, convenient and comfortable. There are a lot of facilities available, enabling us to travel all over the world.

According to statistics provided by the 2001 Tourism Authority of Thailand, 10,132,509 tourists traveled to Thailand in 2001 and 10,872,976 tourists traveled to Thailand in 2002. It is remarkable that the travelers increased 740,467, or 7.31 percent in one year. (Tourism Authority of Thailand 2001: www.tat.or.th/stat/index02.htm) Tourism activities vary significantly; elephant rides in the woods, trekking, Rafting, cliff hanging and canoeing are examples. The statistical trend indicates that tourism will continue to grow in the future.

One of the most popular provinces for tourism in Thailand is Phuket Province. Phuket is well known among tourists as the "Pearl of the Andaman Sea" due to its beautiful and incomparable scenery, white sand beaches, crystal – clear sea water, and abundant natural resources. It also has effective tourism management and is renowned as the only island of Thailand that is also a province. This combination of unique characteristics draw a lot of tourists to visit. Phuket Island is comprised of 32 small and big isles and the number of tourists has been increasing for each year. In 2001, there were around 3.7

million visitors. This shows a growth rate of 9.5 percent over the year 2000. (Phuket Provincial Administration Council 2003: 3)

According to the Tsunami evidence happened on the 26th December 2004, the rate of visitors drop down for awhile, however, many organizations, many volunteers and many people have come to help to resuscitate the seashore and many damaged places since the end of December. Phuket and Khao Pra Taew became more popular and well know. At present day, there are many tourists visit the seaside as it used to be and there are more tourists visit the Khao Pra Taew Wildlife Conservation Development and Extension Center because it was one of places that support people when Tsunami happened, so this place became more famous and popular.

Tourism is not only one of the main sources of national income, it also makes the country well known to other countries. On the other hand, if tourism accelerates to the point where it cannot be controlled or managed, it could have a negative impact on the environment. In fact, in some areas tourism has already caused damage and the image of tourism has deteriorated. The deterioration of not only the ecology system but also the environment of the tourist sites has been triggered by the development of infrastructure, public services and various kinds of facilities. These have been built to support the growing number of tourists and the various forms of tourism activities. Tourism without a sense of awareness can create problems and impact the natural environment with pollution, littering, exploitation of natural resources and power with selfishness.

Ecotourism is one form of conservation tourism which has been introduced by the Tourism Authority of Thailand in conjunction with the National Park, Wildlife and Plant Conservation Department. It has become increasingly popular among tourists. Ecotourism in Phuket has grown more popular in tandem with the expansion of tourism of Thailand. There is an increasing number of this kind of tourism in almost all of the areas whose resources will support it. Moreover, many tourist agencies whose services include

ecotourism acknowledge that the number of tourists that participate in ecotourism have increased each year in the areas of woods trekking, canoeing, snorkeling, diving in the deep and shallow seas and bird watching. However, these agencies have not recorded the number of tourists, so the figures cannot be accounted.

Phuket is famous not only for the beauty of its beaches, but also for its fertile and dense rainforest. The water supply that helps sustain people's lives in the Thalang district comes from this rainforest, known as Khao Pra Thaew. The mountainous lines of Khao Pra Taew extend from the north to the south, covering the areas of Tambon Thep Krasatri, Tambon Sri Suntorn and Tambon Pa klog. Khao Pra Taew has its highest peak of 450 meters above sea level with an area of 13,925 rai (or approximately 4 percent of the area of Phuket island). It is considered the fertile forest sheet, covering an area of approximately 12,000 rai under the authority of 2 major state agencies. They are Khao Pra Taew Wildlife Ban Hunting Boundary, established in 1980 and Khao Pra Taew Wildlife Conservation Development and Extension Center which has been changed from Khao Pra Taew Wildlife National Park, established in September 1977. This is an area where tourists and other interested parties visit often. As seen from October 2001 to September 2002, 55,901 tourists visited this location. It is considered an excellent place to study and understand the ecology system of tropical primitive forest and flora and fauna. Although a great number of animals are now extinct from this forest sheet, there are still a large number of animals dwelling and surviving in Kwuan Khao Pra Taew, including more than a hundred kinds of birds. Even though the forest of Khao Pra Taew has a small forest sheet compared to rainforests in other areas, it was still fertile with various kinds of flowers and was considered a good example of dense rainforest in the south. Lang Khao palm or Chao Muang Thalang palm was a very rare and distinct plant which was found here. Khao Pra Taew was the only place known where this plant was disseminated naturally.

Khao Pra Taew Wildlife Conservation Development and Extension Center provides 3 trails for nature study trekking and for the study of Khao Pra Taew's natural environment. They are as follows:

- (1) A short range natural trail around the Tone Sai Water Fall at a distance of 300 meters.
- (2) The natural trail of the Tone Sai Water Fall at a distance of 2 kilometers.
- (3) The natural trail of the Tone Sai Water Fall Bang Pae (Pa Clog) Water Fall at a distance of 4 kilometers.

From the researcher's study, it was found that the natural surroundings of these 3 nature study trails vary greatly. They have a high potential for representing the overall state of the tropical dense rainforest and the virtual distinction of characteristics and flower plants. A majority of the tourists will trek through the forest and study its nature following marking signs at individual spots along the three hundred meter and the two kilometer trails. For the four kilometer trail, the tourists are required to contact the official at the office and trek along with him or her to learn how to communicate with nature. Moreover, in the compound of the Khao Pra Taew Wildlife Conservation Development and Extension Center, there is a recreation center where we can find an exhibition room, guest house, restaurant and soft drinks parlour, resting pavilion, rest room, electricity and plumbing systems. Therefore, development of communication materials that will help visitors learn about the ecology system of Khao Pra Taew Forest will not only entertain the tourist while studying nature along the trails, it will also enhance the awareness of the foundation of a forest ecology system. This can make an impression about nature on the visitor and possibly create a fondness and sense of conservation for tourism resources. With a sense of awareness about the careful treatment of natural resources, visitors can help reduce the damage performed by human beings.

The researcher is interested in developing printed communication tools in the form of a nature study handbook for tourists and a supplement on the awareness of environmental conservation with the hopes of encouraging and implanting a sense of awareness in tourism conservation. The process of bringing environmental studies into practice in accordance with the current situation and environment can help the persons concerned be aware of and keep abreast of environmental problems, learn and gain experience about environmental problems, create social value in conservation of environmental quality, persuade people to participate in environmental prevention and development and acquire skills in locating and resolving problems. Cooperation in tackling these problems may also be gained. (Temduang et.al 1996: 184) By increasing awareness and encouraging people to recognise the problems encountered at present, and by having tourists get in touch with nature, it will hopefully result in the conservation of tourist resources, the sharing of responsibility for natural resources, and a balancing of the exploitation of natural resources. The station at Khao Pra Taew Wildlife Conservation Development and Extension Center provides travel brochures to Thai tourists, school children and other student groups. This is apart from related books at the Station that are written in Thai. It is a pity there are no books in English that can give information to tourists, since a majority are foreigners. Therefore, the researcher is interested in developing a nature study handbook in English with the objective of determining its usefulness. The nurture of the Khao Pra Taew forest sheet taken into account by the researcher that it will be beneficial to people, should it be developed to be used further.

2. Objectives of the Study

- 2.1 To develop an English version of the nature study handbook in Khao Pra Taew Wildlife Conservation Development and Extension Center for foreign tourists
 - 2.2 To study the achievement of learning from the nature study handbook.
- 2.3 To assess the foreign tourist's satisfaction with the nature study handbook.

3. Research Questions

- 3.1 In what level the tourists are satisfaction on nature study handbook.
- 3.2 In what level the quality of nature study handbook be evaluate by the expert.
 - 3.3 What does the tourist advice after learning the nature study handbook.

4. The Research Hypothesis

The utilization of the nature study handbook will increasing the knowledge of the tourists on the natural condition of Khao Pra Taew rainforest at the level of 0.05.

5. The Scope of the Research

- 5.1 The nature study handbook was created for the nature study trails at Khao Pra Taew Wildlife Conservation Development and Extension Center.
- 5.2 The target group for this research was foreign tourists who visit the Khao Pra Taew Wildlife Conservation Development and Extension Center and the foreign tourists who travel nearby Khao Pra Taew and in Phuket province

6. Primary Assumption

- 6.1 The target group read the handbook and answers the questionnaire truthfully.
- 6.2 The learning achievement from the handbook was measured by comparing the scores before and after the use of the handbook.
- 6.3 Scores received after usage of the handbook will be determined as the outcome of the learning process.

7. Technical Term Used

The nature study handbook referred to a booklet that the researcher created for the purpose of studying the ecosystem, environment, and flora and fauna at the Khao Pra Taew Wildlife Conservation Development and Extension Center. The objective of the handbook's creation is to educate the foreign tourists about the natural condition of the Khao Pra Taew rainforest.

The nature study trail referred to the 3 nature trails at Khao Pra Taew Wildlife Conservation Development and Extension Center where tourists can learn and study from the nature study handbook.

The nature study hiking referred to hiking along the designated trails in order to learn about the natural condition of the forest as seen along the designated trails, including the compound around that area.

Tourist referred to foreign tourists who travel in Phuket including the area of Khao Pra Taew Wildlife Conservation Development and Extension Center, nearby the Khao Pra Taew and in Phuket Province.

Khao Pra Taew Wildlife Conservation Development and Extension Center referred to the area of 13,925 rai situated in the mountainous lines of Khao Pra Taew, Khao Rong and Khao Yai in Tam Bon Thep Krasat Tri, Tam Bon Sri Sunthorn and Tam Bon Pa Clog, Talang District, Phuket Province, established in September by the Department of Forestry as Khao Pra Taew Wild – Life National Park. It had currently changed its name into Khao Pra Taew Wildlife Conservation Development and Extension Center where people came for recreation and nature study, promoting and disseminating knowledge through use of the nature study handbook.

8. Significance of the Research

8.1 There was a nature study handbook for foreign tourist to study or hiking in Khao Pra Taew Wildlife Conservation Development and Extension Center.

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- 8.2 It was bring to increasing knowledge on Khao Pra Taew forest of foreign tourists who participated in the experiment.
- 8.3 It was bring to the diversity of the nature study handbook development style, so that it will help the interpretative personnel to improve the interpretive media development.



CHAPTER II LITERATURE REVIEW

To prepare for the creation of the Khao Pra Taew Wildlife Conservation Development and Extension Center nature study handbook, the researcher reviewed a large number of documents and reports on these topics:

- 1. Khao Pra Taew Wildlife Conservation Development and Extension Center
- 2. The Khao Pra Taew non-hunting area
- 3. General Information concerning the rainforests
- 4. Conceptual ideas about the means to access nature
- 5. Thailand Nature Study Handbook
- 6. Principles and guidelines about the design and effectiveness of handbook oriented printed matters
- 7. Process of developing a nature study handbook

1. Khao Pra Taew Wildlife Conservation Development and Extension Center

1.1. Roles and Responsibilities

Khao Pra Taew Wildlife Conservation Development and Extension Center was originally named "Nature and Wildlife Development and Conservation Section, Wildlife Branch, Office of Natural Resource Conservation, Royal Forest Department."

It was founded in accordance with the government's desire to locate a nature forest for public use. The forest was to be fertile, beautiful or distinct, not too large, and close to the public. It was intended to be a rare forest sheet that the public could access without interfering with the balance of nature. Therefore, a small - sized forest sheet or a part of the forest rim was provided for public

access to exploit for the purposes of nature study, recreational activity, sight seeing, and appreciation of nature.

1.2 Overview

In accordance with the government's policy to turn the Phuket Province into a tourist hub in the southern part of Thailand, the Department of Forestry was assigned the task of developing tourist sites concerning forestry and wildlife. Officials were sent to survey sites in Phuket, and in April of 1977, found that Kao Pra Taew Wildlife National Park met their requirements. It was fertile with various kinds of flora and wildlife, and an origin of major streams and rivers of Phuket. The area of Tone Sai Water Fall in particular has been used as a recreation site. Should it be arranged to be exploited with multi – purposes by means of developing it into a tourist hub in the form of a wildlife park, it will be beneficial to the tourist industry and the protection of natural resources. Therefore, the Royal Forest Department has assigned officials to work at Khao Pra Taew National Park in July 1977. In order to safeguard and protect forest and wildlife more efficiently, the government declared the mountainous area of Pra Taew; an area of 13,925 rai or 22.28 square kilometers which covers the areas of Tambon Thep Krasatri, Tambon Sri Sunthorn and Tambon Pa Klong, Thalang District, a hunting – free zone. This was in accordance with the 2503 B.E. Wildlife Reservation and Protection Act dated July 8, 1980. It was changed into "Khao Pra Taew Wildlife Conservation Development and Extension Center" under the supervision of Office of Wildlife Conservation, Department of Wildlife and Plant National Park.

1.3 Geographic Condition

Khao Pra Taew extends lengthwise from north to south in the Thalang district. The southern part is the high mount distinct. The mountainous lines have an elevation of approximately 400-450 meters above sea level. Khao Pra Taew is composed of small but steep brooks which enforce the fast flowing current of water. When it rains, the stream lines merge together with various

other streams in the mountain range to form the Tone Sai and Bang Pae waterfalls.

At the bed of the streams a partially emerged section of granite can be seen above the water's surface. These stones slow down the water's current and allow absorption into the earth. In the sloping area, small pebbles formed by cracking stone result in a yellowish mud covering over the mountainous earth and a brownish humus covering over the surface of the earth.

1.4 Climate Condition

Khao Pra Taew is situated at the equator (8 degrees latitude) in a zone called the tropical zone. Its climate is therefore divided into 2 seasons: the rainy and the dry seasons. The rainy season will last 8 months, from April till November, and summer will last 4 months, from December till April. The average annual temperature is around 28 degrees Celsius with an average maximum temperature of 31.4 degrees Celsius and an average minimum temperature of 23.8 degrees Celsius. During the rainy season, it rains approximately 180 days a year with an average rainfall of 2,350 – 2,700 millimeters. The range depends on the ongoing monsoons. (Khao Pra Taew National Park, 1995: 17)

1.5 The Nature Study Trail

The nature study trail of Khao Pra Taew Wildlife Conservation Development and Extension Center consists of 3 routes. Each one has its distance and purpose as follows:

- (1) The nature study trail at the area around the Tone Sai waterfall is 300 meters long (may increase to 600 meters in the future) and is designed for tourists having not much time, but intending to study nature around the waterfall, the ecology system and the history of the Tone Sai waterfall.
- (2) The nature study trail of the Tone Sai waterfall is 2 kilometers long and is frequently used for nature studying. This trail has been made in order to display the overall condition of the wilderness of Khao Pra Taew. The trail

runs across several major points of interest such as the rainforest, stream, Kerriodoxa or Lang Khao palm communities and Fig tree etc. The Wildlife Development and Conservation Station provides 14 points of nature study along the trail. Each point provides a signpost describing the point of interest. The trail takes approximately 2-2.5 hours to hike.

(3) The nature study trail between the Tone Sai waterfall and the Bang Pae waterfall is 4 kilometers. This trail has been cut in order to pave the way to study the origin of the Tone Sai waterfall and the Bang Pae waterfall. The trail cuts from Khao Pra Taew Wildlife Conservation Development and Extension Center to the Bang Pae waterfall whose origin is absorbing water at the middle of the trail. From this point, the stream water flows along the two banks of the Tone Sai waterfall on the west and the Bang Pae waterfall on the east. The forest condition along the entire trail is fertile with plants. In addition, the fertility of the forest in the past and evidence of big tree logging for economic gain can be seen. Apart from that, self adaptation and rebuilding of the forest can be seen as well. This trail is accessible from the Khao Pra Taew Wildlife Conservation Development and Extension Center and takes approximately 3-4 hours to trek.

2. The Khao Pra Taew Non-hunting Area

The Khao Pra Taew non-hunting area is an area for protecting animals and the forest. It is cover the same area as Khao Pra Taew Wildlife Conservation Development and Extension Center, but different by the commission, using and managing. The Khao Pra Taew non-hunting area will response the forestry rule, protecting and subjugation.

According to the government's desire to locate a nature forest for public use in Phuket in April of 1977. After setting the Khao Pra Taew Wildlife National Park in July 1977, they found out that the forest was so fertile with various kinds of flora and wildlife, beautiful or distinct, not too large, and close to the public.

Therefore, the ministry of agriculture and cooperatives announced the Khao Pra Taew forest to became Khao Pra Taew non-hunting area on the 8th July 1980.

3. General Information Concerning the Rainforest

Rainforests are not leaf shedding. They are green all year long and generally found at the tropical or equatorial zone between the 20th latitude north and south. They are dense forests with more diversity of plant species than other plant societies. The distinct plants at the upper part are well over 30 meters above the topmost. Rubber tree species are a prominent plant of the rainforest.

The main characteristics of a rainforest are humidity, both in the earth and in the air, and rainfall. The rainfall must be over 1,600 millimeters per year, and must continue for at least 8 months of the year. Moreover, the soil absorbs the humidity in temperatures generally over 20 degrees Celsius monthly.

Naturally, plants are one of the components of the rainforest and classified into separate parts. Trees in the lower part consist of plants covering the earth and various kinds of shrubs not exceeding 2-4 meters. Perennial trees are medium sized with a 30-40 meters height and with their tops situated like a roof over the forest. Large tree's tops surge over the others and their height is around 45-60 meters. Plants of the rainforest are not shedding, but green and very humid all year.

The lower plants of the rainforest need high humidity and low sunlight. They grow well under the shade of a big tree. The view of the lower part plants looks like a garden of paradise with shade, beautiful, colourful flowers and fruit from individual trees. The lower part can be divided into 2 parts as follows:

(1) Plants covering the surface of the earth; namely various kinds of fern, creeping plant, many kinds of shrubs such as *Bauhinia acuminata*, *Araceae*, *Dracaena conferta*, and many baby plants.

(2) Plants at 2 – 6 meters high; namely wild banana, various kinds of palm, such as *Kerriodoxa elegans*, *Intsia palembanica* and *Alstonia scholaris*, Jaggery palm *or Caryota urens*. Moreover, *Salacea wallichina*, *Luntana camara*, *Bauhinia harmsiana*, and many kinds of bamboo can also be found in this area.

The distinguished upper part plants are the plants in the Dipterocarpaceae species such as Hopea odorata or Ironwood. These species can inseminate and grow well in this kind of forest. They are generally found in shrubs at 200 – 600 meters above sea level. They are not shedding leaf plants and their tops can be divided into 2 levels as follows:

- (1) The medium size tops which are 30 40 meters high; namely Artocarpus sp., Meliacear, Myristicaceae, Bouea microphylla, Castanopsis javanica A. DC., Cynometra melaccensis Meeuwen, Canarium denticulatum, Cinnamomum sp., Ptericymbum javanicum R. Br., Olive, Diospyros mollis, Mangifera foetida, Morinda elliptica, Lagerstroemia spp., Didymospermum caudata Wendl.&Drude, and Orania sylvicola.
- (2) The large trees whose tops surge over the others at a height of approximately 35 50 meters; namely the *Dipterocarpaceae* species, Malacea teak or *Intsia palembanica Mig.*, *Alstonia scholaris*, *Maliaceae*, *Shorea laevis*, *Hopea avellanea*, *Parkia Speciosa*, *Boraginaceae*, *Shorea Foxworthyi Syming*, *Scaphium scaphigerum*. These trees mostly have large straight trunks and several of them have significant economic value.

The forest community of Khao Pra Taew Wildlife Conservation Development and Extension Center is classified as a rainforest in which trees of economic value in the Dipterocarpaceae family are abundant. Less valuable are the distinguished trees with surging tops found in the upper part; namely Artocarpus sp., Meliacear, Myristicaceae, Bouea microphylla, Castanopsis javanica A. DC., Cynometra melaccensis Meeuwen, Canarium denticulatum, Cinnamomum sp.,

Ptericymbum javanicum, Olive, Diospyros mollis, Mangifera foetida, Morinda elliptica, Lagerstroemia spp., Didymospermum caudata Wendl.&Drude, and Orania sylvicola Moore, Alstonia scholaris, Maliaceae, Shorea laevis, Hopea avellanea Heim, Parkia speciosa, Boraginaceae, Shorea foxworthyi, Scaphium scaphigerum. Moreover, there are many kinds of ferns in Khao Pra Taew such as Adiantum cappillusveneris, Dryopteridaceae, Davallia denticulata (Burm) Mett., etc.

The endemic plants in the region are the *Kerriodoxa elegans* or Lang Kao palm or Chao Muang Talang palm. Khao Pra Taew is the only area in the world where this species has been found to naturally disseminate its complete reproduction.

4. Conceptual Idea of Nature Interpretation

4.1. Definition of Nature Interpretation

Havold Wallin (1965) said nature interpretation is to arouse tourist's interest in an individual object in the same way as an interpreter does. Some of the interest are satisfaction or affection in beauty; understanding in the components, diversity and the relationship of the environment; enthusiasm; a keen interest in learning, etc. Therefore, nature interpretation is one of the contribution in the development of tourist's understanding in nature.

Tilden (1987:8), father of nature interpretation, has defied the meaning of nature interpretation that it is one of the activities in educating with the purpose of disclosing or elaborating the definition and the relationship of nature by means of traditional things: shown by seeing and interpreting.

(Tilden, 1977) also defied that "An educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, or by illustrative media, rather than simply to communicate factual information". He admits that definitions are too limiting when trying to describe interpretation, and so offers two concepts that expand upon the overall definition. The

first is that "interpretation is the revelation of a larger truth that lies behind any statement of fact." The second is that "interpretation should capitalize on mere curiosity for the enrichment of the human mind and spirit"

Aldrige (1972) said nature interpretation is an art of explanation about the significance of the relationship between human being and environment for tourist or public to be aware of the significance of that mentioned relationship and to encourage tourist and public to be aware of and participate in conserving nature resource and environment.

Alen Hagar (1974), an American researcher in resource, said nature interpretation is to interpret or transform facts into something understandable or maybe said that in any recreational area, any methods or techniques that enable the systems of nature and culture to be comprehended and entertaining could be considered nature interpretation

Sharpe (1976: 3-23) has defied nature interpretation in short that nature interpretation is the service for visitor to the area of national park, wild life conservation zone and other recreation centers. Though visitor comes for relaxation and entertaining, he can perceive what has happened to nature resources and culture of the visited area by these resources such as the stories of geology, animal, plant, ecology, history and archeology, interpretation, the linkage of interpretation between visitor and those resources.

Surachet Chetamas (1988: 26) said that nature interpretation is the selection of using methods and techniques in transferring facts of nature and cultural heritage to the form of being easily understandable by tourist in order to entertain tourist and raise awareness of the significance of the environment and conservation.

Niwat Ruengpanich (1989:26) said that nature interpretation is an important service that helps facilitate and generate acknowledgement to the

public concerning about the development of nature and environment in national parks.

Picha Pitayakajornwut (1994: 34) said that nature speaks its own language which is not or easily understandable for tourist or visitor. The main purpose of nature interpretation is to create interpreter by an individual consisting of object, tool of nature interpretation in order that the language of nature can be easily understandable to the visitor. Every category of activities of nature interpretation should not be conducted in the way that the nature interpreter has the direct contact with visitor of national park, but should use component of category which is not alive such as exhibition along the pavement around the communication area, the exhibition hall in the area of tourist service center, distribution leaflet, map of nature study trail and others.

Knudson (1995: www.pinyondesign.com) defied that interpreters are translators of the natural and cultural environment that help their audiences to better understand and enjoy the resources being interpreted. The purpose of interpretation is described as helping people to gain a sense of place, to respond to the beauty of the environment, or to the significance of their surroundings.

4.2 Nature Interpretation Method

Thomas A. Stille (2002: www.pinyondesign.com) said that Methods for interpreting the demonstration garden could be categorized into two areas-staffed and unstaffed. Staffed and volunteer services include guided tours, information desk services, roaming interpreters or trained groundskeepers to answer questions and help the visitors understand and appreciate what they are experiencing. Trained volunteers will be essential for this demonstration garden if staffed services are an important part of the interpretive program.

Self-Guided Services: Self-guided services are interpretive opportunities that the public can use without an interpreter present. The cost per visitor often seems quite low but preparation of materials will require a large initial investment of time and

materials. Included in this category are signs, labels, brochures, information kiosks and more high-tech methos including outdoor audio message statements, recorded radio and telephone information messages, etc.

Interpretive Methods:

- (1) Plant Labels: Label correctly all plants is the first priority in any garden situation. Keeping records of where plants come from, when they were planted, where they were planted, the size and developing a computerized system of plant accessions.
- (2) Brochure: There is a need to create something for people to take home that includes general thematic information about the garden and specific recommendations that are illustrated in the garden. These facts and information are best written down and taken home for future reference materials, the brochure could contain a map of the garden.
- (3) An information center/kiosk: As people enter the garden there is a need to provide an interpretive focus. This place could be staffed and contain the brochure and other related information. An orientation map of the garden is essential which explains the mission and function of the garden, previews what people will see in the garden and also directs them to areas that they may have specific interest in.
- (4) Self-guided tour brochures are relatively inexpensive to produce and are flexible for making changes. They can be used in conjunction with interpretive signs or with numbered posts. They are used extensively in park situations. These brochures are limited by the amount of information that can be included and availability for visitors in the garden. They must be constantly produced and available at all times.
- (5) Interpretive signs and panels: Most public gardens have installed interpretive panels and a hierarchy of signs to direct visitors through the garden and provide interesting and valuable information about the demonstration garden, its plants and its gardens.

In summary, nature interpretation is to use methods or techniques in transforming facts concerning nature and cultural heritage in the way that can be easily understandable to the tourist for entertainment and to raise the awareness of the relationship between environment and conservation.

5. Nature Study Handbook in Thailand

In the arrangement of the nature study handbook; definition, the importance, the process of interpretation production and methods of creating the nature study handbook are as follows:

5.1 The Definition of the Nature Study Handbook

Handbook means a book or a script that provides information about a particular subject as a supplement of a text in order to facilitate an individual's learning or performance, or to advise a method of implementing a particular instrument. (The Royal Institute Dictionary, 1999: 256)

Nature Study Handbook is a book exclusively published meaning a publication used for a particular purpose, such as an annual report, an official handbook, or a product handbook. It is usually compact at approximately 5 x 7 inches, but may be smaller or larger depending on design, cost effectiveness, appearance, or easy handling. (Sukhothai Thamathirat Open University, 1985: 219-229)

Nature Study Handbook is a publication for study used as a key for inquiry, explanation, resolution or as a quick reference. It is a publication produced for users to access a particular piece of information easily. (Gochai and Somporn Sarigabutra, 1969: 1)

According to the Royal Institute Dictionary (1982: 126), the word "handbook" means a book written to be used as a supplement of a subject or to facilitate the study of an individual subject. Kanya Sirikul adds to this that the arrangement of the handbook in a book form can help explain more details and provide picture illustrations in order to attract people's interest and enhance understanding.

Zehr, et al. (1994: 49-52) said handbooks normally come in small sizes. They are less than $8\frac{1}{2}$ x 11 inches with an eight or more page depth depending on the elaborateness of the subject matter and picture illustrations.

Moreover, handbooks are an educational printed matter used as a reference to seek out, when query occurs; more explanation, or resolution, or to gain some quick knowledge. It is a printed matter written to ease understanding. (Gochai Sarigabutra and Somporn Sarigabutra, 1978:1)

Vijit Arwakul (1991: 83) said a handbook is a book for official use depending on a job description. It may provide regulations, standing operation procedure or details about things that need to be done.

Sukhothai Thammathirat Ope University (1985: 219 – 229) stated that a handbook is an exclusive book printed for a particular task such as an annual report, an official handbook, or a product. It is frequently created in small or large size depending on design, economy, beauty or handling.

Preecha Chang Kwan Yern, et al. (1980: 127) said a handbook is a book used in tandem with doing an activity. It provides guidelines for a user to fulfill a particular activity.

The Tourism Authority of Thailand states that a handbook is an interpretive publication provided in the area of eco – tourism. It is most suitable for tourists in sensitive areas.

A handbook is a supplementary book, not a text book. It helps us understand something better and varies in details. (Ananthana Angkinant, 1992: 131) The size of a handbook is generally less than 8 x 11 inches and approximately 8 pages or more thick depending on the elaboration of the content and picture illustration. (Referred in Daraneeporn Apapornpathana, 1990)

In summary, a handbook is a book whose content can be used as a supplementary or a text that can describe a particular story and provide picture illustration to attract the user's interest. The format of a handbook varies according to the objectives of the author, in order that the reader following it can gain knowledge in accordance with what the author has detailed in it.

5.2 The Example of Nature Study Handbook in Thailand

From the researcher's study, the following nature study handbooks in Thailand were reviewed:

- (1) The Nature Study Handbook of Khao Sok National Park
 (Waterfalls & Gibbon Calls: Exploring Khao Sok National Park) by Thom Henley.
- (2) The Handbook of Exploring Khao Yai National Park on Wheels by Nature Conservancy Club.
- (3) The Nature Study Trail Handbook of Tung Tiew, Krabi Province by Phillip D. Round et. Al.
- (4) The Handbooks of Adventure to the Park, Doy In Thanont National Park Handbook by Sarakadi Publishing.
- (5) The Handbooks of Adventure to the Park, Nam Nao National Park Handbook by Sarakadi Publishing.
- (6) The Handbooks of Adventure to the Park, Phu Kradung National Park Handbook by Sarakadi Publishing.
- (7) The Handbooks of Adventure to the Park, Khao Yai National Park Handbook by Sarakadi Publishing.
- (8) The Handbook of Pang Sida National Park, Sa Kaew Province by Sujittra Boonyakajorn.
- (9) The Handbook of Phu Luang National Park by Hasachai Boonnearng.
- (10) The Five Nature Study Trails Handbook of Khao Yai National Park by Khao Yai National Park Conservation Foundation. (on the trail)
- (11) The Nature Study Handbook of Phu Kradung National Park by Wild Nature Publishing.

(12) The Nature Study Handbook of Huai Kha Khaeng wildlife Sanctuary by Phet Manopawit (on the trail).

(13) The Nature Study Handbook of Khao Sanam Prieng wildlife Sanctuary by Paitoon Tonpayom (on the trail).

The researcher also reviewed 3 of related thesis name list as follows:

- (1) The Historical and natural Interpretation guide book for Ecotourism in Phu Hin Rongkla national park of Chalong Nuichim
- (2) The nature and local Interpretation guide book in Bueng Boraped non-hunting area of Arunothai Korwanich
- (3) The nature trail guide book in Tonpariwat wildlife sanctuary for the youths of Punwipa Daramat

From the study of thirteen nature handbooks in Thailand describing national parks and nature trails in Thailand, the researcher learned that two of them are written in English and another eleven books are in Thai. Eight of thirteen are the handbook for the national park, another four are specific to the nature study trails and another one is for studying the trails by car. There are descriptions about each of them divided by the publishers as follow.

Three of the National Park handbooks were from the Sarakadee Publishing, there were three national park handbook which are *NamNow National Park*, *Phukradung National Park and Doi Intanon National Park*. The styles of writing were similar to each other. They were written in narrating alternating academic information with a guide for the readers to follow. These three handbooks were not for the nature study trails. The contents introduced the national parks, the interesting places in the parks and nearby, the nature study trails, some interesting activities available for the visitors to do in the parks, and introductions to other nearby national parks. The presentation covered all necessary information in the national park area. Moreover, the books were insinuated with the interesting tips, details, and knowledge in the frames of each pages. The conspicuous points of these handbooks were the real photographs

combine with the drawing, the interesting things in the frames, clear tables and explanation pictures, and most of all the professional information and design.

Another two handbooks were from the Wide Nature Publishing that were *Phukradung National Park and PhuLuang National Park*. The contents and information were rather different depending on the author, described as follows.

In *Phukradung National Park handbook* was written in the narrating style informing the readers of the ways that the author went along the tail of the national park, but no map was shown in this handbook. The author divided the trails into the trail to waterfalls and the trails along the cliff, describing and leading the readers from one interesting point to others. After that, the author presents the interesting wildlife found in the parks; mostly birds and plants, and the scenery of the peak of the mountain. It ended with the information about the accommodations and facilities that the reader could contact.

In *Phuluang National Park handbook* was written in the narrating style which was more documentary than the Phukradung one. However, this handbook was not the handbook belong to the nature study trail as well. The author described the trail that he went by not along the nature study trails exclusively but anywhere he went in the national park. It was more specific and explained more about the trees, especially orchids, fern, *Rhododendron* and few species of Lichen.

Another two handbook of PSP Traveler Publishing were the handbooks for studying the national park. There were about the *Khao Sok National Park and Pangseedha National Park*. The handbooks emphasized the basic information about the national parks including the history and the location of the place, the climate and how to get there. Moreover, the books also explain the maps of the national parks, the interesting points in the parks and the visiting places of the overland trip and by boat trip. The presentation of the interesting places in the national park was describing style, informing the traveler who the author was; they went to visit the park both on land and by boat trip. Some parts of the writing were the conversation between the author and the forest officer who was the leader of the trip. Therefore, this handbook

included both the academic information style of writing and writing by the author's experiences. The handbook emphasized the interesting points of the park, for example; the waterfalls, the wildlife station, and the educational and entertaining activities that the visitor can do.

The waterfalls and gibbon calls: exploring Khao Sok National Park handbook by Limmark Advertising & Printing was the handbook for the national park, rather than the handbook for along the trail. This one was an English nature study handbook which was written by the expert Thom Henley. The writing was narratative in the academic information style. It provided an introduction to the place, information about the history, and the details about interesting plants and animals that the readers can find in Khao Sok National Park. The author didn't include his experiences into the story, and the presentation of the contents was not along the nature study trail. However, the information was very well accumulated and studied from both literature review and from the author experiences.

The nature handbook for the Tung Teaw Nature Study Trail by Khao Nor Chuchi Lowland Forest Project was written in the describing more than the narrating style, starting the book by introducing the history and the importance of the place. The book is a guide to the nature study trail, therefore the contents were written to parallel with the study point, starting from the first study point until the end at the eighteenth point, describing as if the reader will be leaded by the guide, telling about anything along the trail that the readers will find or meet with them when walking on this nature study trail. The information was about the plants, animals and some other interesting thing along the trails. The pictures used in this handbook were all drawings.

Another one was *The handbook belong to five nature study trails of Khao Yai National Park* published by Foundation of Khao Yai National Park Protection. This handbook was written and presented everything belonging to the nature study points along the five trails. The content begins with the history of the national park, preparations before hiking, animal tracks, the meaning of nature study, and interesting and important birds and animals, before describing all five of the nature study trails.

Some stories written in this handbook were rather academic information, including the international names and scientific names of plants and animals, and the style and information differ from each other depending on the authors. The pictures presented were both real photographs and some drawings. For the presentation of the nature study trails, the author wrote and described from point to point, giving some of the their experiences and some other important information.

Another 2 handbooks of Seub Foundation were *The nature study handbooks belong to the Khao Sanampreang and Khao Hindang nature study trails*. These 2 handbooks had unique styles of writing which were not only rather academic information which seemed like a teaching handbook, but also like the traveling books as well. The handbooks emphasized the nature study trails, therefore the information started with the history of the place and then detailed the nature study trails until the end. Beautiful drawings used in these handbooks persuaded the reader to follow and enjoy when they using them.

The last one was *The Handbook for Exploring Khao Yai National Park on Wheels*, it was written in English and published by the British Embassy. This one was a handbook for the traveler. The information was written in conclusion about the history, climate, general knowledge of the forest, animals and other important details that all of the visitor should know. It was short but very clear. The author present the trails by describing things along them at every point that the visitor can encounter, and the author also gave clues and directions, for example; (right), (left), (at k.m. 33) and etc. Some interesting information was presented by photographs, for example; the seasonal changes were present by the pictures of trees in each season.

In addition to these thirteen nature study handbooks in Thailand that researcher has reviewed, there are also a few related subject theses were reviewed. All of the theses work were rather academic information more than those thirteen nature study handbooks of professional publishing. The details will be as follows.

In studying *The development if historical and natural interpretation guide* book for eco-tourism in Phu Hin Rongkla National Park of Chalong Nuichim, it was found out that this guide book the author developed was for the study point of the national park, and that the information in the handbook covered all the history of the place, and the interesting places in the national park, divided into six main parts. These were about Lan Hin Tack, Rongrean karnmung kantahan (Soldier school), Kunghannam (Water mill), Sumnakumnajrat, Pa chutong, Lan Hin Pum. The written style described the study points with the author's experiences, opening the questions and answer in the academic information referred to the experts.

In studying *The development of nature and local life interpretation guide book in Bueng Boraped non-hunting area of Arunothai Korwanich*, this guide book was a guide book belonging to boat trips for interpreting both the nature study and local life styles. The style of writing combined academic style with the experience telling style, describing the history of the place, rules and preparations before travel and then a description of the study trail by boat. The information referred to the study points, presented the life styles, interesting animals such as birds and fishes, and interesting plants and their uses. Sometimes the author set the questions in frames and then answer with the details in the content. The pictures used in this guide book were both real photographs and some cartoons and drawings.

In studying *The preparation of pilot nature trail guide book in Tonpariwat wildlife sanctuary for the youths of Punwipa Daramat*, is a nature trail guide book belonging to the nature study trail of Tonpariwat Wildlife Sanctuary, emphasizing the rainforest ecosystem. The writing style was more academic style than traveling guide. Some of the interesting information and important things were presented in the frames. Each study chapter ended with questions to ask the user to assess understanding, because the purpose of this nature trail guide book was for youths. The pictures used in this handbook were both the real photographs and some cartoons and drawings.

From the studied of these nature study handbooks in Thailand and the other related theses, the researcher concludes in the table as follows:

Table 1 The diversity of the size of the nature study handbook.

Size	Name of the nature study handbook and thesis
	1. PSP publishing Khao Sok National Park
5.75 x 8.25 Inch	2. PSP publishing Pangseedha National Park
3./3 x 8.23 Inch	3. Waterfalls and Gibbon calls: Exploring Khao Sok National Park
	4. Nature study trail handbook of Tung Teew
5 x 8.25 Inch	1. Sarakadee Publishing Phu Kraduang National Park
3 x 8.23 men	2. Sarakadee Publishing Doi Intanon National Park
5 x 8.25 Inch	1. Sarakadee Publishing Namnow National Park
3 x 8.23 men	2. Five Nature study trails handbook of Khao Yai National Park
4.5 x 8.25 Inch	1. Sueb Foundation Khao Sanampreang nature study trail handbook
4.3 x 8.23 men	2. Sueb Foundation Khao Hindang nature study trail book
4 x 7.5 Inch	1. Wide nature publishing Phu Luang National Park
4 X 7.3 IIICII	2. Wide nature publishing Phu Kraduang National Park
3.75 x 5.5 Inch	British embassy publishing Handbook for exploring Khao Yai
3.73 x 3.3 IIICII	National Park on Wheels
4.5 x 8 Inch	The Historical and natural Interpretation guide book for Ecotourism
4.3 x 8 mcn	in Phu Hin Rongkla National Park of Chalong Nuichim
5 x 7 Inch	The nature and local Interpretation guide book in Bueng Boraped
S X / IIICII	non-hunting area of Arunothai Korwanich
5 x 7.25 Inch	The nature trail guide book in Tonpariwat Wildlife Sanctuary for the
3 x 7.23 Inch	youths of Punwipa Daramat

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Table 2 The diversity of the contents and writing style of nature study handbook.

Content	Writing style	Name of the nature study handbook and		
Content	writing style	thesis		
	Rather	1. Waterfalls and Gibbon calls exploring		
	academic	Khao Sok		
	information a	2. Sarakadee Publishing Doi Intanon National		
	170	Park		
		3. Sarakadee Publishing Namnow National		
115		Park		
Belong to the		4. Sarakadee Publishing Phu Kraduang		
n <mark>ati</mark> onal pa <mark>rk</mark>	Ś	National Park		
	General and	1. PSP publishing Pangs <mark>ee</mark> dha Nati <mark>on</mark> al Park		
	traveling	2. PSP publishing Khao Sok National Park		
	information	3. Wide nature publishing Phu Luang		
		National Park		
1121		4. Wide nature publishing Phu Kraduan		
16		National Park		
	1.0	1. Five Nature study trails handbook of Khao Yai		
	J 100 cm	National Park		
	Rather academic	2. Sueb Foundation Khao Sanampreang nature		
Belong to the	information	study trail handbook		
nature study		3. Sueb Foundation Khao Hindang nature study		
handbook		trail handbook		
	General and	British embassy publishing Handbook for		
	traveling	exploring Khao Yai National Park on Wheels		
	information			

6. Interpretive Printed Handbook Design

6.1 Methods of Writing Interpretive Printed Matter for Dissemination

Zehr, et al. (1994:7-11) has supplied the methods of writing printed matter oriented for public dissemination. It should be easy to read and understand. The language used should be lively, condensed and clearly understandable, and should provide stories written to interest and attract the reader to continue reading. This can be achieved by the introductory subject which is the most crucial part. Occasionally, using the local language and various wise sayings are helpful, but one thing that cannot be neglected is emotional concern and feed back from the reader. The procedure for writing should include the study of topics, laying out of the theme, drafting and reviewing of the draft before publication.

6.2 Process of Producing Interpretation Printed Matter in the Form of a Handbook

The process of producing interpretation printed matter in the form of a handbook is as follows:

- 6.2.1 Writing a Manuscript When writing a good manuscript, the writer should be knowledgeable on the topic and should write a standing outline based on a systematic structure. The writer should then select an appropriate method of writing and suitable language for the presented matter which will then be analyzed thoroughly according to established goals or objectives. These items should be considered as follows:
- (1) Consider the extent of the content in order to determine scope, and try to design the matter accordingly.
- (2) Consider your objectives when determining the language, method of writing and subject matter of your handbook. Ensure these choices are in keeping with the desired objectives.

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(3) Study the fundamental information before writing an outline. A writer should be knowledgeable on the topic and have an idea of what he intends to write prior to starting.

- (4) Categorize the information. Establish the major points of view and develop them into complete sentences.
- (5) Write an outline. Outlines may be written in 2 ways: In the form of topics which could be written in words or short phrases, or in the form of a sentence which would make a complete statement.

Suchart Nawakawong (1987:135) proposed the process of creating a handbook as follows:

- (1) Study secondary sources of information, including documents, printed matter, text, reports, thesis and research.
- (2) Create a handbook for trial with a group having similar characteristics to the target group.
 - (3) Revise the handbook.
- (4) Bring the revised handbook to try out again with the tryout group.
- 6.2.2 Manuscript Correction Correct the draft which will be considered in accordance with the modality of the interpretation. Review the context truthfully, as would the reader, in accordance with the objectives of the production. Ensure the characteristics of the language are consistent and suitable for the type of interpretation.
- 6.2.3 Preparing the Manuscript for Printing Review and prepare the manuscript with both content and pictures, in addition to detailing the printing.
- 6.2.4 Publishing Publishing is the last stage of the production process for printed media. This consists of several steps. Each step is equally important, and must correlate with the others. Publishing costs can be high or low depending on the material technique used.

Pathom Nickmanont (Referred in Warin Binhasen, 1990: 44) stated that the cover and size of a handbook should be designed to be beautiful and attractive to the reader. It should include good subject matter and use straight forward statements which are easy to read and comprehend. Other necessary components that will enhance the book's attractiveness include: the size of the letters, which should be large enough to be suitable for all ages of readers; pictures and illustrations, because they will help the reader understand and remember the information; good use of spacing, to ease the reader's eyes at regular intervals. Steps used to create the nature study handbook are as follows:

- (1) Select the topic and study the content.
- (2) Assess the learner in order to learn their needs.
- (3) Set up the objectives of the nature study handbook.
- (4) Gather and arrange the content by collecting data according to the designed objectives.
- (5) Try out the nature study handbook by having an expert assess the accuracy of the content. Then, try out the revised version with a learner who has similar characteristics to the target learning group. Revise the handbook to be published.
- (6) Have the handbook published. Design the size of the nature study handbook and take it to use with the target group.

7. Development Process of the Nature Study Handbook

A nature study handbook can be used as a source of information for teachers, school children and tourists. More importantly, the nature study handbook will contribute to a better understanding of natural resources. In writing a nature study handbook, it is not necessary to rely on the expert to be the user of the handbook because they already possess the skills and knowledge provided by the handbook.

There are 3 steps to create a nature study handbook as follows: (Referred in Athitaya Lowpattana, 1996: 31-32)

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7.1 The layout of the draft of the nature study handbook. These questions will assist in decision making regarding the outline of the nature study handbook.:

- (1) What are the objectives of a nature study handbook? The objective should be to learn what the user would like to gain from it. For example: Use the nature study handbook to resolve the problem, use the nature study handbook to supervise a practice or to read before operations, etc.
- (2) Who are the users of the handbook? If you can decide who your target group is, you will learn their particular desires right away. Try to create a nature study handbook for multiple types of users. It is difficult to create a nature study handbook for multiple types of users, since the users are from different levels of education. Therefore, the levels of desire are different. It is difficult to cover various levels of desire in one handbook. Creating a single type user handbook will contribute to a more efficient book.
- (3) Question the user on what kind of handbook he prefers; for example, limited content with more pictures. Try to create the handbook in accordance with what the user wants as much as possible.
 - (4) Where to use the handbook
- (5) How to use the handbook. For example: If the user wants to use the handbook as a supplement to a process of operations, the writer of the handbook should have an outline of the operation process for a supplement.
- (6) Bring information to use in the handbook. Beforehand, the writer should locate what the user wishes to gain from the handbook. Then take the skills, attitude and the knowledge the user wants to use in practice into account.
- (7) Set up the scope for operations in order to learn what the user should do.
 - (8) Set up the information for each step.
 - (9) Set up the subject matter to be included in the handbook.

- 7.2 Prepare the information.
- (1) Write main and sub topics.
- (2) Arrange the sequence of those topics.
- (3) Lay out the way to put the information into each topic.
- (4) Start writing the content by using short and easy words, explaining particular definitions, giving examples, keeping the continuity of the sequence of information, etc.
- 7.3 Try out the handbook. We will try out the handbook on these matters:
 - (1) The subject matter of the handbook.
 - (2) The modality of the handbook.

8. The Conclusion for Khao Pra Taew Nature Study Handbook Development

After studying the aforementioned handbooks, the structure of the Khao Pra Taew handbook was determined to be as follows:

- (1) Directions for using the handbook. Some of the handbooks reviewed included directions for using the book because they had specific signs, pictures and tables throughout the book that required an explanation. Therefore, the reader needed to learn how to use the book before using it. Some of the directions were written in the introduction section and some of them were written in the directions section.
- (2) Preparation for studying. This part of the nature study handbook will include park rules, what to bring and what not to bring onto the trails, what to do and not to do, and interesting stuffs that readers should know and learn before going into the forest.
- (3) History and origin of the site. Most of the nature study handbooks reviewed included a history of the place to provide interested readers with the area's history, how it came to be, important natural elements that should be respected, what to be careful of, what the place looks like and related stories.
- (4) Map of the trail and description of each nature place. This section will include a map of the nature trail and a map of the area as well. Each place has its own

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unique nature study points and environment or surroundings. Therefore, the map of each place will be different. The maps provided in the nature study handbook will contain each nature study point, a picture of the point, a short description of the point, guidelines and other information. Also in this section, a list of interesting places will be shown; namely the waterfalls, the mining trail and how people traveled in the past, and the nature study trail where interesting places are found.

- (5) Points of interest, including distinguishing traits of that point, such as plants rarely found at other sites. This part will show the society, dynamic system and fertility of that forest. It will highlight rare plants, possibly found only at a particular site, such as Bua Pud lotus, Pra RA Hu palm and Palm Lang Kow, etc. It will also include the types of animals that live in the area, the ecology system, the interdependence of the animal, its life cycle, its living and its dwelling, etc.
- (6) Special activities. This section will describe activities that visitors can enjoy in the area, such as nature studying, hiking, trekking, camping, cycling and others.
- (7) Neighborhood of the nature study site, including lodging, facilities and travel to the area. Services and facilities both in and around the national park area and neighboring compound will be described in this section. This will include accommodations, hospitals, dining places, banks, and other pertinent facilities. For each, the name, location and contact telephone number will be provided. Also, the location of the national park, the major routes relating to that area, the appropriate season or period of time to access the site, and suggestions for things to carry for only one day or for an overnight stay will be included.
- (8) Scientific and English Names for some living things that can be found in the area; namely birds, mammals, reptiles and amphibians.

In addition, health and safety recommendations for tourists concerning matters such as shock from heat stroke; disease; poisonous animals such as bees, wasps, hornets, snails, ticks, etc; and diseases caused by mosquitoes as a carrier such as malaria or hemorrhagic fever will be included. At the end, there will be a list of should – do's and should – not – do's in the area.

Some handbooks provide a conclusion with supplementary information on a single page. This page includes a list of symbols representing certain definitions, and provides an explanation of various color highlights that are used throughout the book to make something stand out. Additionally, there is a subtitle under each picture, and information about whether or not the subject matter is in compliance with the real condition of the site. Some books seem like travel handbooks in that they provide travel related suggestions and information such as the climate, visiting time, interesting plants and animals which can be found in the area etc.

Some books may mainly contain the knowledge along the trails with environmental study such as the Nature Study Handbook of Khao Sok National Park (Waterfalls & Gibbon Calls) by Thom Henley and The Nature Study Trail Handbook of Tung Tiew, Krabi Province by Phillip D. Round et. al. Also handbooks from other countries seem to contain much more information, for example, the history of the place, people, geology, environment, important plants and animals, facilities, and where to stay. Specific handbooks were also found which specialize on an activity, such as the handbook for hiking, the handbook for cycling, etc.

The English and Thai handbooks vary depending on their target user. Specifically, the activity the user is interested in and whether the user is Thai or foreign. Having reviewed various handbooks in Thailand, it is obvious that the English handbooks provide more depth and detail on their subject matter, especially the ones written by foreigners, such as the nature study handbook of Khao Sok National Park (Waterfalls & Gibbon Calls) by Thom Henley. There is a linkage between natural knowledge and survival, with an explanation of each distinguished point of interest and each nature study station. There is also an index of animals in the back of the book.

From studying of the handbook, it is found that the nature study handbook, written according to the landmark of nature study in the area of the site, is the interpreting of natural condition and environment arranged in the area of national park, wildlife conservation, Wildlife Conservation Development

and Extension Station, Nature Study Center and other conservation areas related to the furnished nature study trail and appropriate to the condition of the site in accordance with individual purposes and different interest. The handbook has been designed with thorough and comprehensive subject matter, and is very much worth using. Tourists can gain multi – faceted knowledge from it. It can enhance awareness and understanding in natural resource conservation with the subject matter summarized as follows:

- History and origin of the site
- Preparation for the study, dos and don'ts
- Map of the trail and the detail of each station
- Special activities like the observation of birds or animal stampedes
- Accommodations, facilities, and other travel information with a list of names and telephone numbers

And other subjects that the researcher will discover in the next process.

CHAPTER III RESEARCH METHODOLOGY

This research study had been conducted to create and assess the effectiveness of a nature study handbook for foreign tourists visiting the area around Khao Pra Thaew Wild Life Conservation Development and Extension Center. The target group divided into two parts, first one the target group of trying out and another one was the target group for experiment. The experimented Target group consisted of forty tourists from the accidental sampling. The processes of this research study had been done as follows:

- 1. Construction of the nature study handbook
- 2. Construction of tool for evaluating the nature study handbook
- 3. Development of the nature study handbook
- 4. Evaluation of the nature study handbook

1. Construction of the Nature Study Handbook

The nature study handbook for tourists visiting Khao Pra Thaew Wild Life Conservation Development and Extension Center was constructed for gaining the knowledge about the Khao Pra Taew rainforest which the construction as follows:

1.1 Study the Primary Information

The documents, articles, magazines and internet information were complied on the following topics to create the handbook: the concept and contents of the rainforest, Khao Pra Taew Wild Life Conservation Development and Extension Center, rainforest ecosystem, the various topmost levels of the rainforest, various kinds of distinct plants, major factors contributies to the creation of the rainforest, the state of the rainforest at Khao Pra Thaew, the state of and some distinct plants life such as the Lang Khao palm, vital statistics such as annual

rainfall and sea level, and the meaning of nature interpretation, nature study handbook in Thailand, Principle and guideline for development of printing media.

Moreover, the study concerns about the background of Khao Pra Taew, forest type of Khao Pra Taew, and the environmental of this area. From the study, it had been found that the environment of Khao Pra Thaew is fertile and the plants grown there were rare and interesting to study. It is in the heart of Phuket province and surrounded by the communities. That's why people should learn more about there and if the people who live in that area learned more about that place, it would be so nice to help to save and protect the last rainforest of Phuket island. From this stages, the following conclusions were made:

- 1.1.1 The main forest type of the study area was rainforest with high diversity and rare species of plants such as *Kerriodoxa elegans* palm tree, *Dipterocarpeae sp.*, many kind of ferns, *Cinnamomum sp.*, and many of high value woods.
- 1.1.2 Khao Pra Taew provides the role of water regulation to Phuket province, especially the Talang district. From the study found out that many streams in Talang district origin from this mountain at the middle of the 4-kilometer trails, from the invisible water divided into 2 lines of 2 sides of the mountain and form many other small streams in the area.
 - 1.1.3 Three nature study trails were surveyed:.
- (1) The natural trail of the short range around the Tone Sai Water Fall at the distance of 300 meters.
- (2) The natural trail of the Tone Sai Water Fall at the distance of 2 kilometers. This trail is a famous trail in the area. There are 14 nature study point trough out the trail, which highlight community and some important plants and animals. The trail is a loop that starts and ends at the office.
- (3) The natural trail of the Tone Sai Water Fall Bang Pae (Pa Clog) Water Fall at the distance of 4 kilometers.

- 1.1.4 The rainforest ecosystem is very diverse and very important for the earth because it help to balance the temperature, raindrops, world climate and much more other duty. Therefore, it was very interesting for anyone to learn and understand how to help to protect the rainforest that was fewer amounts everyday.
 - 1.1.5 The interesting contents are as follows:
 - (1) History and origin of Khao Pra Taew
 - (2) The important and interesting points and places.
 - (3) The suggestions and information of the office for tourists.
- (4) The information, details and interpretation along the nature study trail.
- (5) Plants and animals that can be found in the area including their scientific names.

1.2 Field Visit

In order to explore the three nature study trails of the nature study areas, the researcher went to survey by walking with the forest ranger officers several times through out the trails. In this study we look at various major points, taking pictures in order to lay out the scope of contents for the handbook. This process took sometimes to be done because some pictures need to cover the year round such as the *Kerriodoxa elegans* life.

1.3 Study the Tourist's Opinion Concerning About Nature Study Handbook.

In this step, researcher study 20 foreign tourists which divided into 3 age groups: below 25 years old, between 26-35 years old above 35 years old. The questionnaire was collected from the tourist in Phuket province by accidental random sampling technique. From this study, the process was concluded as follows:

Created the tourist questionnaire for study the interested and suggestion of the foreign tourists, which will consists of the following:

1. Basic information about the tourist, including name, nationality, age, level of education, etc.

2. Appropriate format and size of the handbook.

The researcher asked for the opinions concerning appropriate format and size of the handbook.

3. The handbook's subject matter and context.

The researcher surveyed the degree of interest of the various aspects of the rainforest to determine proper coverage of the story.

4. Opinions and added remarks.

Additional impressions will be gathered by requesting the tourists final remarks.

The Result of the Nature Study Handbook Need Survey

From the study, most of the sample group were men of the age older than 35 years old. The purpose of coming to Phuket were being the general tourist and 90 % of them were interested in walking along the nature trail in the forest area. 65 % of them had been to some other national parks but just only 10 % of them used to read nature study handbook about the protected area or national park in Thailand. Besides, 95 % of them wanted the nature study handbook to be produced.

The size and the paper that the sample group interested in were 5x8 Inch or 4x6 Inch and the paper should be white paper. Then, the contents that the sample group interested were as follows:

General information of Khao Pra Taew

Introducing of the place = 100%

History of the place = 75 %

Maps of the place = 95%

Some knowledge for prepare to = 80%

walk along the trail

Rules and suggestions = 80%

What to and what not to bring = 60%

Beware and be careful = 75%

The contents

The nature study trail = 85%

Kerriodoxa Elegans = 80%

Rainforest = 80%

Interesting geology and the environment = 75%

Interesting trees = 80%

Interesting animals = 90%

Other ideas and suggestion gave were the researcher should put something about the rainforest ecology so people can realizes the threats and importance of the rainforest.

1.4 Defining the Objectives on the Handbook

From those study the researcher continues the next steps as follows:

1.4.1 General objectives

To provide foreign tourist with knowledge and understanding about the natural condition of Khao Pra Taew rainforest and suggesting the learning activities.

1.4.2 Specific objectives

- (1) The tourist had information about the history and general features of Khao Pra Taew.
- (2) The tourist had information on do and don't for preparing themselves on the nature trails.
- (3) The tourist had knowledge about the unique and interesting species of plants and animals in Khao Pra Taew rainforest.
- (4) The tourist had knowledge about how to help to protect and save the forest and environment .

Therefore, each parts and subject would have the concept as follows:

 Table 3 The definition of scope of Content.

Topic	The Concept
1. The History and	Khao Pra Taew is not only important in the history record
general features of Khao	during the time of war between Thailand and Burma but also be
Pra Taew	a very important forest for Talang district.
	It promoted as an officially reserved area. Although villages,
	roads and plantations now surround this land, it is an example
	of the luxuriance and greenery of the tropical rainforest of the
	south. There are provided 3 nature study trails for people who
	are interested in studying the nature which can do all year
	round.
2. The Rules, be careful	The rules of Khao Pra Taew are similar to the rules of the
of and Do and Don't on	national parks; no hunt, do not collect seeds or plants outside
th <mark>e nature study trail</mark>	the forest and etc.
	The hikers should be quiet, don't throw any garbage, when
	seeing something broken-tell the office.
	The accidents can be happened no matter when, so the hikers
	should be careful of and don't try to do something extraordinary
	or risk activities.
3. Unique and interesting	The most unique and interesting plant here is Kerriodoxa
plants and animals in	elegans palm tree, with the extra look of silver back of the
Khao Pra Taew	leaves and has not been found anywhere else in the world.
rainforest	Moreover, there are many other interesting trees in this
	rainforest that attract the botanists or people to come to see such
	as the big fig tree, very long rattan palm, many kind of bamboo
	and ferns.
	Although, there are not many of big animals left in this place,
	there are still many interesting animals, birds and insects. For
	example, fig wasp, termite, waterfall crab, spiders, snake and
	reptiles, leech and etc.
	Moreover, one thing that easily found in the rainforest that are
	hundreds of mushrooms and fungi.

Table 3 The definition of scope of Content. (cont.)

Topic	The Concept			
4. How to help to protect	There are many ways to help to protect the rainforest, here are			
and save the rainforest	some as follow:			
	Do not buy the products that cause destruction of the			
	rainforests.			
	Learn more about the rainforests.			
//_^	Spread the words to others on the importance of the rainforests.			
(/_ ()	Make changes to ward a lifestyle having less impact on			
	nature life cycle of the tropical rainforests.			

The framework of the handbook and the details of the subject matter would be adapted to the real location it has been surveyed thoroughly by the researcher.

1.5 Drafting the Nature Study Handbook

The Khao Pra Taew Nature Study Handbook had constructed according to the steps and the surveyed from the foreign tourist, and it had the following characteristics:

1.5.1 Drafting the size of the handbook

Its size was equaled to half of standard paper size of A4 with the length of 21 centimeters and 14.8 centimeters. It was printed by 4 colour print on 80 gram paper. Its size of letter written was Book Antiqua 14, 12 and 11 in black, dark blue and dark red colour with bold for the important statement to easily find. Using the real pictures displays. The book contains 53 pages, which were introductions, contents, texts, table, pictures and bibliography; the cover was not included. The style of writing was a prose style, the content was arranged by starting at the general information of Khao Pra Taew following by the preparation before walking and then what to learn in the Khao Pra Taew forest.

1.5.2 Define the structure and the pattern of the handbook

In this part, the researcher designate the contents to be 3 main parts, each part would have subject as follows:

Part I General information about Khao Pra Taew

- History of Khao Pra Taew
- Calendar of visiting time
- Climate
- Map of Khao Pra Taew
- Around the center, officer and contact information
- The nature study trail map and details

Part II Before walking

- Safety first and what to wear in the rainforest
- Be careful of
- Do's and Don't's
- What to bring and not to bring
- Amazing exploration

Part III What to learn from Khao Pra Taew

- Questions to consider
- Let's find out the answer
 - Place and diversity of the rainforest
 - Important plants of Khao Pra Taew
 - Heritage palm; *Kerriodoxa Palm Tree*
 - Supermarket of the forest; Fig tree
 - Rattan palm
 - Giant grass; Bamboo
 - Ferns
 - Some interesting animals
 - Fig wasp
 - Waterfall crab; Phricotelphusa limula
 - Termite mound
 - Spiders

- Cicadas
- Snakes and reptiles
- Leeches life
- Fungi and Mushroom
- Topography of Khao Pra Taew
- The relationship in the food chain
- Help to save the forest
- Bibliography

From all of the construction process, it was concluded in the chart

below:

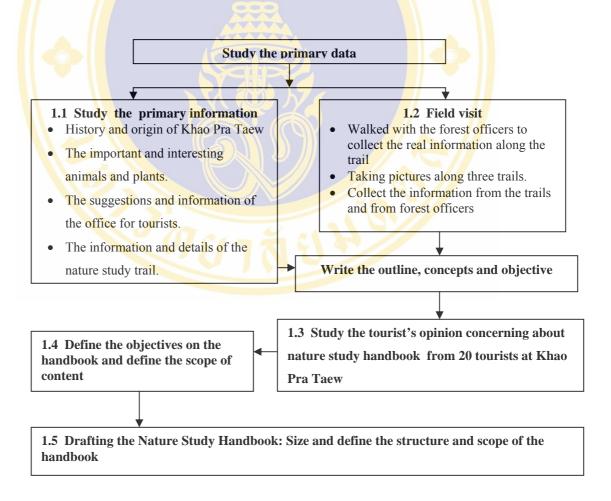


Chart 1 The Conceptual Framework of the Construction of Nature Study Handbook.

2. Construction of Tool for Evaluation of the Nature Study Handbook

The process of drafting the assessment form was 3 steps as follow:

- (1) Studied the characteristics that make up an effective assessment form both in contextual scope and as a model for assessing.
- (2) Designed the assessment form of the nature study handbook taken into account the efficacy of the framework of the handbook, the illustration, context, wording, benefit exploitation and other comments.
- (3) Consulted the thesis supervision board to ensure the nature study handbook's assessment form covers all of the areas mentioned. Revise the form as needed.

2.1 Construct the Form for Handbook Assessment for Experts

The assessment form of the nature study handbook for the experts consists of:

Part 1 Personal information

Part 2 Assessing the format of the handbook, management, content and language

Part 3 Other comments

The criteria for assessment is divided into 4 scales: very good, good, average and need improvement.

Comparatively scoring into 4, 3, 2 and 1 respectively.

2.2 Construct of the Pre-test and Post-test Form

The learning achievement test consists of:

Part 1 Personal data

Part 2 25 multiple choice questions.

The researcher would conduct the mentioned assessment in accordance with the objectives stated for the nature study handbook. The characteristics of the finding assessment form would consist of 25 multiple choice questions. The

criteria for the assessment was that the right answer gets 1 point and the wrong one or no answer gets 0 point.

The assessment form would be created according to the objectives stated on the contextual analysis of Benjamin S. Bloom's theory. This theory measure 2 dimensions: one was knowledge and the other was comprehending to the process of the trial in order to find out the accuracy and structure taken into account under the consideration of the expertise in context, verifying the assessment form whether it corresponds to the contextual objectives or not in order to develop it into assessing with the scoring as follows:

- The question that corresponds to the objective gets +1
- Doubtful whether the question, may or may not correspond to the objective gets 0

Table 4 The contents creating the questionnaire.

Contents	No. of questions
1. General information about Khao Pra Taew	5
2. General information about the rainforest	5
3. Unique and interesting plants	4
4. Unique and interesting animals	3
5. Understanding of the Ecosystem	4
6. How to be the good eco tourists	2
7. Natural resources conservation	2
	25

The reliability of the Learning Achievement would be test in the third try out which was determine by KR20 (Kuder – Richardson Formula 20). The acceptable value of reliability was between 0.6-0.8 (Boonthum Kitpreedaborisooth, 1999:208)

KR-20

$$r^{tt} = \left(\frac{k}{k-1}\right) \left(1 - \frac{\sum pq}{S_x^2}\right)$$

Where $r^{tt} = Reliability$

k = Number of items

 S_x^2 = Variance of total scores

p = Proportion of correct (passing) responses

q = Proportion of wrong (not passing) responses or (1-p)

$$r_{tt} = \left(\frac{25}{24}\right) \left(\frac{29.14 - 5.41}{29.14}\right)$$

Variance

$$S^{2} = \left(\frac{n\Sigma x^{2} - (\Sigma x)^{2}}{n(n-1)}\right)$$

$$S^{2} = \left(\frac{30(7240) - (438)^{2}}{30(30-1)}\right)$$

$$= \left(\frac{217,200 - 191,844}{870}\right)$$

$$= 29.14$$

The results demonstrated that the test of learning achievement of 25 items, it was in the standard criteria, and the whole test had reliability value equaled to 0.847

2.3 Construct the Satisfactory Assessment Form for Tourist

The process of drafting the assessment form was 3 steps as follow:

- (1) Studied the characteristics of how to create the assessment form of the reader's satisfaction in the nature study handbook.
- (2) Drafted the assessment form of the satisfaction of the nature study handbook regarding the model of the framework of the nature study handbook, content, the illustration, model of the language and other comments
- (3) Consulted the board of advisory committees or experts for the deliberation of the assessment form of satisfaction and then have it revised.

The assessment form of the nature study handbook's satisfaction by tourist consists of:

<u>Part 1</u> Assessing the tourists satisfaction with the nature study handbook.

Part 2 Suggestions

The assessment of the satisfaction in the nature study handbook is performed by questionnaire asking for the favour in the framework of the nature study handbook, content, the illustration and model of the language. The criteria for assessment differentiate into 4, 3, 2 and 1 respectively.

In the opinion or comments on the nature study handbook, it was an open – ended question in order to reach the prospect and behavior of the use of the nature study handbook.

3. Development of the Nature Study Handbook

3.1 The first try out

<u>Try out 1</u> one by one with 3 tourists \square revised

This stage the researcher collected the questionnaire from the tourist in Phuket one by one at the time. The questionnaire was a dept interview with open

question divided into 4 subjects which was Contents, Graphic and design, Language and the others.

3.2 The Second Try Out

Try out 2 small group with 6 tourists
$$\square$$
 revised

This stage the researcher collected the questionnaire from the tourist in Phuket in a small group at the time. The questionnaire was the same as the one using at trying out 1

3.3 The Third Try Out

<u>Try out 3</u> trying out with 30 tourists revised

This stage the researcher collected the questionnaire from the tourist in Phuket. This process the researcher tried out the learning achievement test and also the satisfaction questionnaire. The learning achievement was tested. The results was found out by the reliability and percentage.

3.4 Assessment of the Constructed Book Quality by Experts

Nine experts whose skills are different was invited to join the critical assessment as follows:

- (1) 3 experts in forestry
- (2) 3 experts in media publishing
- (3) 3 experts in eco tourism; managers inviting foreign tourist to exploit the location

After assess the assessment form from the experts, the score would be calculated by mean score and mode. The criteria would be 1 to 1.75 was "should be proved", 1.76 to 2.50 was "Fair", 2.51 to 3.25 was "Good" and 3.26 to 4.00 was "Very good".

The development of the natures study handbook process could be concluded in the chart below:

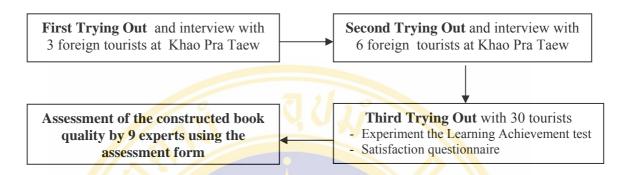


Chart 2 The Conceptual Framework of the Development of Nature Study Handbook.

4. Evaluation of the Nature Study Handbook

4.1 The Sample Group

Sample group in the experiment were divided into 2 which the first one is a group for trying out 3 times; 39 foreign tourists in Khao Pra Taew Wild Life Conservation Development and Extension Center. Another group for the real experiment which are 40 foreign tourists in Khao Pra Taew Wild Life Conservation Development and Extension Center and in nearby area mostly in Talang district at Phuket province. Accidental sampling technique was employed for sampling the sample group of 40 in Phuket by choosing the people who were interested in hiking along nature trails or people who were interested in the nature.

4.2 The Evaluation Tools

- 1) The Khao Pra Taew nature study handbook
- 2) Learning achievement questionnaire.
- 3) Satisfactory assessment form.

4.3 The Experimental Methods

The experimental method design was one group pretest-posttest design.

$$R \longrightarrow T_1 \longrightarrow X \longrightarrow T_2$$

Where: R means target group for the trial

T1 means test prior the studying of the nature study handbook

T2 means test after the studying of the nature study handbook

X means reading the nature study handbook created by the

4.4 Data Analysis

After the data was collected, it was analyzed by t-test formula statistic. The statistic was employed to determine as follow:

(1) Comparison of the difference of average score of learning achievement before reading (pretest) and after reading (posttest) with t-test formula as follow (Puengrat Thaweerat, 1998:165):

$$t = \underbrace{\frac{\Sigma D}{\sqrt{N\Sigma D^2 - (\Sigma D)^2}}}_{N-1}$$

Where: ΣD = Total sum of the difference between average scores of pre-test and post-test

 ΣD^2 = Total sum of the difference between average scores of pre-test and post-test, squared

N = Total number of tourists

Results:

$$= \frac{411}{\sqrt{\frac{40(4935) - (411)(411)}{39}}}$$

$$= \frac{411}{\sqrt{\frac{197400 - 168921}{39}}}$$

$$= \frac{411}{27.02}$$

$$= 15.21$$

- .
- (2) Satisfactory assessment of tourists and the Constructed Book Quality by Experts was determined by mean and mode, the score would be calculated by mean score and mode. The criteria would be 1 to 1.75 was "should be proved", 1.76 to 2.50 was "Fair", 2.51 to 3.25 was "Good" and 3.26 to 4.00 was "Very good".
- (3) Conclusion of research results and recommendations for development of the Khao Pra Taew nature study handbook for tourists.

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CHAPTER IV RESULTS

The researcher developed the Khao Pra Taew Nature Study Handbook for Tourists by studying the learning behaviour of tourists and evaluating the satisfaction of tourists toward the book. The quality of the Khao Pra Taew Nature Study Handbook was evaluated by 9 experts. The sample group for the real experiment was 40 tourists who came to Phuket and were interested in hiking. The results of this research can be concluded as follows:

- 1. The results of construction of The Khao Pra Taew Nature Study Handbook
- 2. The evaluation of The Khao Pra Taew Nature Study Handbook

1. The Results of Construction of The Khao Pra Taew Nature Study Handbook

1.1 The Assessment Result of the Constructed Book Quality by the Experts

The satisfactory assessment of the Khao Pra Taew nature study handbook was done by the 9 experts. The standard criteria was employed for evaluation both in mean and mode which the mode were very good, good, fair and should be improved, the criteria of mean would be 1 to 1.75 was "should be proved", 1.76 to 2.50 was "Fair", 2.51 to 3.25 was "Good" and 3.26 to 4.00 was "Very good". The experts were divided into 3 fields that was the multimedia experts, the content experts and the tourism experts, which was 3 of each. The results were in the tables 5, table 6 and table 7 as follows:

Table 5 The quality assessment of the book characteristic by the media experts.

Subject	Very good	Good	Fair	Should be	Mean	Mode
	(4)	(3)	(2)	proved (1)	$(\bar{\mathbf{x}})$	
Design of the book						
1. The cover is proper and interesting	7 1	3			3.00	Good
2. Size of the book is suitable	2	1			3.66	Very good
3. Book reforming	•	3	1		3.00	Good
Total	2	7		A	3.22	Good
Comp <mark>lem</mark> entary pictures and font	MA .			U- \		
1. Layout of pages and pictures is		3		\	3.00	Good
proper			\	A \	11	
2. The paper used in the book		2	1		2.66	Good
3. Size and font are easy to	2	1			3. 6 6	Very good
understanding	Step K	1				
4. Pictures relevant to the content	1	2			3.33	Good
5. Pictures help reader to understand	1	2		A	3.33	Good
the content					7	
Total	4	10	1	3///	3.20	Good
Language	~	11	193			
1. Language is easy to understand		3			3.00	Good
2. Complete and proper	1 4 4	3			3.00	Good
3. The fonts are relevant to the	1	2			3.33	Good
complementary pictures						
Total	1	8			3.11	Good
Color						
1. Use of font color		3			3.00	Good
2. Color of the pictures		3			3.00	Good
3. Proper font		3			3.00	Good
Total		9			3.00	Good

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Table 6 The assessment result of the constructed handbook by the contents experts.

Cubicot	Very	Good	Fair	Should be	Mean	Mode
Subject	good (4)	(3)	(2)	proved (1)	$(\bar{\mathbf{x}})$	
Content						
1. The Content relevant to the	71 4	3			3.00	Good
objectives	a a	11				
2. Correct and accurate content	1	2			3.33	Good
3. Appropriate length	2	1	1		3.66	Very good
4. Knowledge enhancing	1	2			3.33	Good
5. The content is in sequence		1	2		2.33	Good
6. Attractive content and story	\\/2	1		\	3.66	Very good
7. Persuades the reader to understand		3	0		3.0 0	Good
and aware of the forest environment		λ_{λ}				
8. Pictures are relevant to the content			2	1	1.66	Good
9. Relevant pictures help the reader	1	1	1		3.00	Good
understand the content	TA			/	//	
10. Content is complete and relevant		3			3.00	Good
Total	7	17	5	1	3.00	Good
Language			7	-///		
1. Easy to understand	W	3	133		3.00	Good
2. Appropriate language	N	3			3.00	Good
Total		6			3.00	Good

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Table 7 The assessment result of the constructed handbook by the tourism experts.

	Subject Subject	Very	Good	Fair	Should be	Mean	Mode
		good (4)	(3)	(2)	proved	$(\bar{\mathbf{x}})$	
Co	ntent				(1)	(A)	
1.	The content relevant to the	2	1			3.66	Very good
1.	objectives	2				3.00	very good
2.	Correct and accurate content		11			3.66	Very good
3.	The appropriate length	1	2			3.33	Good
3. 4.	The content is in sequence	0	3			3.00	Good
		Ă					Good
5.	Attractive content and story		2	1		2.66	
6.	Persuades the reader to understand		2	1	\	2.66	Good
	and aware of the forest environment				1	11	~ .
То		5	11	2		3.16	Good
Bo	o <mark>k reforming</mark>	700)\				
1.	The cover	IPY	3			3.00	Good
2.	The size of the book	2	1			3.66	Very good
3.	Book reforming	2	1		/_	3.66	Very good
To	tal	4	5		A	3.44	Good
Co	mple <mark>mentary pictures and font</mark>						
1.	Paging and pictures	3			5///	4.00	Very good
2.	The paper using in the book	U	3	133		3.00	Good
3.	Size and font of the letter	3	9 4			4.00	Very good
4.	Pictures are relevant to content	2	1			3.66	Very good
To	tal	8	4			3.66	Very good
Co	mplementary pictures and font mplementary pictures help to derstand the content	3				4.00	Very good
То		3				4.00	Very good
La	nguage						
1.	Easy language	1	2			3.33	Good
2.	Appropriated language		3			3.00	Good
3.	The fonts are relevant to the	2	1			3.66	Very good
	complementary pictures						
To	tal	3	6			3.33	Good

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1.1.1 The Assessment Result by Multimedia Experts.

The majority of media experts consented that its average was at level of good 3.00 as shown in the table 4. The others comments were some word art was not so clear to read, complementary pictures, vocabulary using and the size of letter and they gave the recommendation as follows:

- (1) The page should left the space of the middle of the book, should be close in the left or right hand side.
- (2) The color of word art using as the main contents should be the color that easy to read and understand.
- (3) The contents was very interesting but the language using was high academic, so it's was difficult to understand. Therefore, it should be analyzed and synthesized easily for consumption.
- (4) The picture on the cover should be showing the important of the place or anything related to the place.
- (5) Some pictures should be made to be bigger for being more understand like the pictures in the nature study trail map. Some pages had got too many pictures and too small, so the researcher should delete some less important pictures and make others bigger.

1.1.2 The Assessment Result by Content Experts.

The majority of content experts consented that its average was at level of good 3.00 as shown in the table 5. The subject that should be proved was the picture relevant to the content, and they gave the recommendation as follows:

- (1) All of the scientific name should be in the Italic style.
- (2) Some of the name and specific name still be incorrect, should be review once again.
- (3) Pictures should relevant to the content, and some important pictures should have the described words
 - (4) Should check about the calendar once again.
- (5) The maps of the place was too formal, should have the other map that easier to understanding for tourist.

1.1.3 The Assessment Result by Tourism Experts.

From the table 6, the majority of tourism experts consented that its average was at level of very good 4.00. They gave the opinion and suggestions as follows:

- (1) Checking the vocabularies, some words was too difficult.
- (2) The page should left the space of the middle of the book, should be close in the left or right hand side.
- (3) Some of word art was to pale, should change the color to be more vivid.

After had got all comments from all experts, the researcher review and correct the nature study handbook following the comments.

1.2 The Nature Study Handbook

The Khao Pra Taew Nature Study Handbook had improved according to the steps, and it had the following characteristics.

- 1) Its size was equaled to half of standard paper size of A4 with the length of 21 centimeters and 14.8 centimeters.
 - 2) It was printed by 4 colour print on 80 gram paper.
- 3) Its size of letter written was Book Antiqua 14, 12 and 11 in black, dark blue and dark red colour with bold for the important statement to easily find.
 - 4) Using the real pictures displays.
- 5) The book contains 53 pages, which is introductions, contents, texts, table, pictures and bibliography; the cover is not included.
- 6) The style of writing was a prose style, the content was arranged by starting at the general information of Khao Pra Taew following by the preparation before walking and then what to learn in the Khao Pra Taew forest.
 - 7) The learning topic o Khao Pra Taew nature study handbook composed of Part I General information about Khao Pra Taew
 - History of Khao Pra Taew
 - Calendar of visiting time
 - Climate

- Map of Khao Pra Taew
- Topography of Khao Pra Taew
- Around the center, officer and contact information
- The nature study trail map and details

Part II Before walking

- Safety first and what to wear in the rainforest
- Be careful of
- Do's and Don't's
- What to bring and not to bring
- Amazing exploration

Part III What to learn from Khao Pra Taew

- Questions to consider
- Let's find out the answer
- Place and diversity of the rainforest
- Important plants of Khao Pra Taew
- Heritage palm; Kerriodoxa Palm Tree
- Supermarket of the forest; Fig tree
- Rattan palm
- Giant grass; Bamboo
- Ferns
- Some interesting animals
- Fig wasp
- Waterfall crab; Phricotelphusa limula
- Termite mound
- Spiders
- Cicadas
- Snakes and reptiles
- Leeches life
- Fungi and Mushroom
- The relationship in the food chain
- Help to save the forest
- Bibliography

2. The Evaluation of the Khao Pra Taew Nature Study Handbook

2.1 Sample Group

Sample group in the real experiment were 40 foreign tourists in Khao Pra Taew Wild Life Conservation Development and Extension Center and in nearby area mostly in Talang district at Phuket province. Accidental sampling technique was employed for sampling the sample by choosing the people who were interested in hiking along nature trails or people who were interested in the nature. The forty sample persons were able to classified as shown in the table belows:

Table 8 The number and percentage of the sample group's gender.

Gender	Persons	Percentage (%)
Male	17	42.5
Female	23	57.5

Table 9 The number and percentage of the sample group's age.

Age	Persons	Percentage (%)
< 26 years	14	35%
26-35 years	21	52.5%
> 35 years	5	12.5%

Table 10 The number and percentage of the sample group's nationality.

Country/nationality	Persons	Percentage (%)
Europe Germany, Holland, France, Spain, Italy, England, Denmark, Poland, Belgium, and Lithonia	24	60
Asia	4	10
America and Canada	11	27.5
Australia	1	2.5

Table 11 The number and percentage of the sample group's educational level.

Educational Level	Persons	Percentage (%)
High school	7	17.5%
University	27	67.5%
other	6	15%

Table 12 The number and percentage of the sample group's occupation.

Occupation	Persons	Percentage (%)
Student instructor	12	30
Government	1	2.5
Private sector	18	45
other	9	22.5

It can be concluded that the sample group was mostly (*=mode) female, age between 26 to 35, university education level, and occupation in the private sector.

2.2 The Learning Achievement Result

The Khao Pra Taew nature study handbook was experimented with the sample group which was 40 foreign tourists in Phuket. The sample group was given the questionnaire before reading the book. The learning achievement of the tourists result before reading the Khao Pra Taew nature study handbook found as follows:

Sample group had mean score
$$(x)$$
 = 13.625
Standard deviation = 18.035

The researcher had let the sample group read the Khao Pra Taew nature study handbook for an hour, subsequently, the same questionnaires were done, the result as follows:

Sample group mean score
$$(\bar{x})$$
 = 24
Standard deviation = 5.307

The mean scores of two times were tested the difference with the t-test, and it was found out that the t-value was 15.21 which was much higher than the t-value from

the table that was 2.04 which shown in the table 7. Therefore, there was statistically significant difference between before reading the nature study handbook and after reading the nature study handbook.

Table 13 Comparison of the Mean scores of learning achievement scores of the tourists between pretest and posttest:

Sample group	N	$\overline{\mathbf{x}}$	S.D.	t-test = 15.21
Pre-test	40	13.625	18.035	
Post-test	40	24	5.307	Significant level = 0.05

df = 39 Statistically significant level at 0.05, t = 2.04, the t-value from calculation was more than t-value table.

The result of the correct answer of learning achievement of pre-test and post-test of the sample group was as present in the table 14:

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 Table 14 Score of Learning Achievement of Pretest-Posttest of the sample group.

	Results			
Contents	Number of	Number of		
Contents	right answer of	right answer of		
	pretest	posttest		
General information about Khao Pra Taew	•	•		
1. What province is the Khao Pra Thaew Wildlife con servation development and extension station settle at?	22	40		
2. When did Khao Pra Thaew become to be the Wildlife conservation development and extension station?	26	40		
3. When you walk around the Khao Pra Thaew station, what is the rock you will often meet?	5	39		
4. How tall of the highest peak of Khao Pra Thaew?	12	40		
5. If the trees in Khao Pra Thaew rainforest were cutting down, what can be happened?	29	39		
General knowledge about rainforest		//		
1. What kind of forest that has the most bio-diversity?	30	40		
2. What is the area of Rainforest on earth?	39	40		
3. What can be happened, if many trees of the rainforest were cut down?	30	36		
4. How much of the annual rainfall that you can find the rainforest?	15	40		
5. How important of the rainforests?	40	40		
Unique and interesting plants 1. What is the unique characteristic of Kerriodoxa palm tree?	12	38		
2. How the Rattan Palm adjusts itself to get to have sunlight?	5	35		
3. What kind of the Tree which is called "The saint of the forest, the cold blooded killer"?	7	40		
4. How important of Buttress root of plants in the rainforest?	22	40		

Table 14 Score of Learning Achievement of Pretest-Posttest of the sample group.(cont.)

	Results			
	Number of	Number of		
Contents	right	right		
	answer of	answer of		
	pretest	posttest		
Unique and interesting animals				
1. What kind of animals you will find in rainforest in southern Thailand?	26	36		
2. How long is cicada's life under the ground?	6	38		
3. What have leeches been used for the specific purpose?	10	38		
Understanding of the ecosystem				
1. Who is the one of the important decomposer of rainforest?	24	38		
2. If many of fig trees were cutting down, what kind of animals may be first distinct?	9	38		
3. What is the important role of mushroom in the natural cycle?	18	40		
4. Which one is correct about the ecosystem?	33	38		
How to be the good ecotourists	\$ ///			
1. What do you think of good ecotourists should be?	38	40		
2. What you should bring while walking in any nature study trail?	27	38		
Natural resources conservation				
1. What is the main problem that makes the forest consequently disappear?	17	38		
2. Which way is the best way that can help to re-forest?	13	36		

Looking at the score of each question in the test, it was found out that before reading the handbook all the foreign tourists know on how important of the rainforest but almost all of them didn't know about the rocks, topography, unique plants and animals of Khao Pra Taew. After reading the handbook, almost all of them had the correct answer in every question, see in table 14.

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Satisfactory results on the Khao Pra Taew nature study handbook

The researcher reports the satisfactory results from the 40 general tourists in Phuket after reading the handbook and after taking the learning achievement test. The researcher constructed and improved the satisfactory assessment according to the thesis advisory committee's recommendation.

The standard criterion employed for evaluations was very good, good, fair and should be proved which is equal the marks of 4,3,2 and 1 annually. The results was shown in the Mean (\overline{X}) score. The assessment was divided into two main parts: the information, and the design of the book. The result was illustrated that the information, provided adequate information was 3.80, the length of the text used in the handbook was 3.60, the information using in the book was 3.77, the sequence or the orderly arrangement of the information was 3.80, the information motivated people to learn more about the rainforest was 3.92, the information can persuade people to become to love, understand and want to protect the rainforest was 3.92, the interesting information was 3.97, and Language used in the nature study handbook was 3.40.

The results of the design of the book, illustrated that the cover of the nature study handbook was 3.42, the size of the handbook was 3.05, the layout of the nature study handbook was 3.75, the fonts and their sizes used in this nature study handbook was 3.80, the pictures used in this nature study handbook were 3.97, and the pictures aided the understanding of the text was 3.87.

From the mean score of the satisfactory assessment, it was found out that most of the foreign tourist satisfied with the nature study handbook as can see from the table 15 that the mean of the satisfaction were upper than 3.00. See the details in table 15:

Table 15 The tourist satisfactory result on the Khao Pra Taew nature study handbook.

	Details	Very good	Good	Fair	Should be	Mean	Mode
	2 *******	(4)	(3)	(2)	proved (1)	$\overline{\mathbf{X}}$	
Inf	Formation and texts						
1.	Provide adequate information.	33	6	1		3.80	Very good
2.	The length of the text.	25	14	1		3.60	Good
3.	The text used in the handbook.	32	7	1		3.77	Very good
4.	The sequence or the orderly arrangement of the information.	33	6	1		3.80	Very good
5.	The information motivates people to learn more about rainforests.	37	3			3.92	Very good
6.	The information persuaded people to love, understand and want to protect the rainforests.	37	3			3.92	Very good
7.	Interesting information.	39	1			3.97	Very good
8.	Easy to understand language.	16	24		/_	3.40	Good
Total		2 52	64	4	(e)	3.77	Very good
De :	sign of the book The cover of the Nature Study Handbook.	20	17	3		3.42	Good
2.	The size of the Nature Study Handbook.	13	17	9	1	3.05	Good
3.	Layout of the Nature Study Handbook.	30	10			3.75	Very good
4.	Fonts and font sizes used in the Nature Study Handbook.	33	6	1		3.80	Very good
5.	Pictures used in the Nature Study Handbook (clear, interesting and etc., please suggest.)	39	1			3.97	Very good
6.	Pictures aided the understanding of the text.	36	3	1		3.87	Very good
Total		171	54	14	1	3.64	Very good

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CHAPTER V DISCUSSION

This research study was an operational research study to develop the Khao Pra Taew Nature study handbook for foreign tourists. By studying learning achievement, evaluating the results of tourists' satisfaction, and evaluating the qualities of the nature study handbook by 9 experts, these research results could be discussed as follows:

- 1. The development of the Nature study handbook
- 2. The characteristics of the Nature study handbook
- 3. Experimental results of using the Nature study handbook
- 4. Research results for extending use

1. The Development of the Nature Study Handbook

The reason for developing the Khao Pra Taew nature study handbook was to create one for the Khao Pra Taew Wildlife Conservation Development and Extension Center, since there lacked a handbook for foreigner who were interested in walking along the nature study trail and learning about the rainforest in the center's area. The researcher wanted to know how much the tourists needed a nature study handbook when they came to visit, so the researcher made a questionnaire. The questionnaire asked whether or not tourists would be interested in a handbook, and gave it to 20 tourists. The results showed that all of tourists wanted a Nature Study handbook to be constructed. Therefore, the researcher started to develop the handbook.

1.1 The Development Process

The process of developing the nature study handbook involved 3 mains steps as follows:

- (1) Primary study. The researcher studied the documents about the place and conducted the in-depth interview with 20 tourists. This made the researcher realize that the target group needed a nature study handbook. It was a great benefit for the process of the handbook construction. After these results were determined, the researcher studied more documents and walked each of the nature study trails many times to determine the content of the book. The researcher collected a great deal of information and took photographs.
- (2) To construct the Khao Pra Taew nature study handbook, the researcher designed the outline of the handbook then let the experts and thesis advisory committee examine the data. These individuals evaluated the information and provided recommendations for improvement. For the language used in the book, the researcher let a few foreigners who work as foresters, librarians and researchers review the first step. After that, the researcher let 2 Canadian teachers read trough the Nature study handbook and correct the grammar and vocabulary.
- (3) To improve the quality of the handbook, the researcher tried it out with 30 tourists. The first test involved 3 tourists who tested it individually. The second test involved 6 tourists who tested it in a small group and the third test was with 30 tourists after the pretest and satisfactory assessment. From these experimental results, the researcher was able to improve the constructed book so that the content was appropriate for the target group.

After it was implemented according to the above process, it was found that each step was very important. This was the majority opinion from the 9 experts and the thesis advisory committee. All 3 steps improved the quality of the book. The opinions varied and many recommendations were given that allowed the researcher to improve the handbook step by step. The first two times the handbook was tried out included a In-depth. interview. The researcher was lucky to meet with some teachers who came to travel in Thailand and who provided many recommendations. The third time the handbook was tried out, recommendations came from a variety of people in different age groups, occupations and educational backgrounds.

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Results of the book assessment by media experts found that a majority of them consented that its average was moderate level on the adjusting of the page, some word art was not clear to read, and complementary pictures, vocabulary use and font size could be improved as follows:

- (1) The page should left the space of the middle of the book, should be close in the left or right hand side.
- (2) The colour of the word art used for the main contents should be a colour that is easy to read and understand.
- (3) The contents were very interesting but the language used was too academic, so it was difficult to understand. Therefore, it should be analyzed and synthesized for easier consumption.
- (4) The picture on the cover should show something important about the place or something related to the place.
- (5) Some pictures should be enlarged so they will be easier to understand, much like the pictures in the nature study trail map. Some pages have too many pictures and the pictures are too small, so the researcher should delete some of the less important pictures and make others bigger.

1.2 Problems Found During the Development of the Nature Study Handbook

The researcher collected information from many sources. For example, the researcher read reference books, walked along the nature study trail, and asked some foresters who work at the Khao Pra Taew Wildlife Conservation Development and Extension Center questions. The pictures used in the nature study handbook were taken throughout the year because some plants change the year round. Therefore, the process of collecting the information and pictures took a lot of time. Moreover, the pictures needed to be of good print quality so they would not be misunderstood.

The nature study handbook was initially constructed in Microsoft Word. There were many inconveniences using this program, such as difficulty moving pictures around, limited frame, and the inability to use some fonts. Therefore, the researcher asked experts and the experts recommended Page Maker. Page Maker was better for constructing the book. After learning the Page Maker program, the researcher found that it was much easier to use this program to construct the book. To create the Nature study handbook, the researcher had to rewrite and redesign it many times.

Regarding the handbook's language, the researcher used too many specific words that made it difficult for the tourists to understand. Moreover, many of them were used in the wrong way and spelled incorrectly. Therefore, the researcher had to find experts to correct them. The researcher found 2 Canadian advisers; one from Bangkok University and the other one from Payup University. Another Forester in British Columbia came to join the process. The present nature study handbook was the outcome. The English language nature study handbook needed to be edited many times before it could be used.

One of the most important things for this nature study handbook was the correct use of scientific names in the book. Experts and forest officers found and corrected scientific names, because all of the names were important and could not be incorrect.

2. Characteristics of the Khao Pra Taew Nature Study Handbook

2.1 The Content and Writing Style

Comparing of the nature study handbook that the researcher developed with the nature study handbooks those the researcher reviewed in Chapter two, the Khao Pra Taew nature study handbook was quite similar to the Khao Sok (Waterfalls and gibbon calls) nature study handbook. It was a book for studying and learning nature. The book contains information about the place and some interesting plants and animals that could be found in the area. The book was not the handbook along the nature study trail. The size of the book was similar to the Waterfalls and Gibbon calls, the two of PSP Traveler Publishing, and Tung Teaw nature study handbook which was around 6x8 Inches. The style of written was quiet similar to the waterfalls and the

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gibbon calls and the three of Sarakadee Publishing which was the narrating in academic information of interesting things that the reader can find in Khao Pra Taew Wildlife Conservation Development and Extension Center but it was not the book belong to the nature study trail.

Comparing to those other thesis, the nature study handbook that researcher developed was similar in the style of the writing which was written with the academic information. However, those Guide books or nature study handbook were develop for the nature study trails, or nature study point but this one researcher developed was made for the Khao Pra Taew Wildlife Conservation Development and Extension Center, not belong to the nature study trail there.

However, the handbook had some differences from the other nature study handbook that the researcher reviewed in Chapter II. This includes the fact that this book was made especially for Khao Pra Taew Wildlife Conservation Development and Extension Center and the nature study handbook was also made for the academic reason. Therefore, the information in this book would mainly relate to this place. The contents of this nature study handbook differentiate it from others and also the adjusting of the contents also define the design of the handbook. The style of writing was rather a academic prose style. The contents were arranged as follows: general information about Khao Pra Taew, preparation before walking, then what to learn in the Khao Pra Taew forest.

The contents of the nature study handbook include the history of Khao Pra Taew forest, the climate and visiting time, a map of Khao Pra Taew, a map of the nature study trail, the contact information, and clues for walking along the trail. This includes what hikers could learn from this forest, like plants and animals, fungi and mushrooms, the topography of Khao Pra Taew, food chain relationships, and ways in which you could help save the forest. However, the main part was about the important plants and animals and the ecosystem of Khao Pra Taew.

The first part of the book would provide a history of Khao Pra Taew, which includes a history of the area, how important the area was, and how it became the Wildlife Conservation Development and Extension Center. The second part includes the interesting plants and animals of Khao Pra Taew Wildlife Conservation Development and Extension Center. It highlights the diversity of rainforests in general and in this area, the unique palm of Thailand, and some interesting plants in the area, such as fig tree, rattan palm, bamboo forest, and ferns. The animals found in this area seem to be viewed as unimportant, but they were very important for the ecosystem; for example, fig wasp, waterfall crab, termite, cicadas, spiders, snakes, reptiles and leeches.

Moreover, three important things should be learned from the book. The first one is about fungi and mushrooms. They could be found in any ecosystem but not many people know what they were. The second was the topography of Khao Pra Taew. It will show the kinds of rock that form the Phuket island and the kinds of soil in the area. The rock and soil in the area were one reason this forest was different. Last, the relationship in the food chain would tell the reader how all of the elements in the forest, including all plants, animals, and natural resources had their own duty in the food chain. These would lead us to know why we should help save the forests. The contents in the nature study handbook were quite deep but not difficult, which was good for people who would like to study this place. The book could be use along the 2 kilometer trail and can also be used outside the trail as well.

In this nature study handbook which was not the handbook belong to the trail, there was one nature study trail map provided for the reader. It was the 2 kilometer trail. People who were interested in walking and studying the 4 kilometer trail must contact the office and walk with a forest officer.

The information about plants and animals in the handbook was not presented in the same order as the nature study points because the researcher would like to present the whole picture of the Khao Pra Taew Wildlife Conservation Development and Extension Center and the rainforests in the southern Thailand, not just the study

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point along the nature study trail. Therefore, the researcher divided this information into 2 main sections; the plants section and the animals section; to describe some of the important and interesting plants and animals which could be found in this area.

2.2 The Conclusion of the Nature Study Handbook Size

The size of the nature study handbook was chosen because it was comfortable to take while walking along the trail. The size was similar to the Waterfalls and Gibbon calls, the two of PSP Traveler Publishing, and Tung Teaw nature study handbook which was around 6x8 Inches. It was quite similar size to the guide book of Arunothai Korwanich. The one that researcher developed was equal to half of standard A4 size paper with a length of 21 centimeters and a width of 14.8 centimeters or around 6x8 Inches. It was printed in 4 colour print on 80 gram paper. Its font and font size were Book Antiqua 14, 12 and 11 in black, dark blue and dark red. Important statements were bold to make them stand out. The pictures were all real photographs. The book contained 53 pages, which included an introduction, contents, text, tables, pictures and bibliography. The cover was not included.

3. Experimental Results From Using the Nature Study Handbook

The sample groups were comprised of general foreign tourists from Phuket as in Khao Pra Taew Wildlife Conservation Development and Extension Center and nearby areas mostly in Talang district in Phuket province.

In the step where the experiment was performed, the researcher tested the tourists' knowledge by giving them a pretest before they read the nature study handbook. The researcher then gave the nature study handbook to them to read for a few hours, or in some cases overnight. Afterward, the posttest was given. It was found that the learning achievement of the sample group before reading the book was 13.625, and the mean score of learning achievement after reading it was 24. The mean pretest and posttest scores for the sample group were the test hypothesis, and it was found that the mean posttest scores were higher than the pretest scores with a statistical significance of 0.05

From the study, it was found out that the foreign tourist didn't understand some contents in the learning achievement because they didn't know or never met with that before. Some of the contents that the foreign tourist had lower than half of full mark (40) before reading the nature study handbook as it shown in the table 14 that were rocks, topography, some of Eco-system subjects, unique plants and animals of Khao Pra Taew . It was learned that the researcher should be more concern with those subjects.

After reading the nature study handbook and did the post-test, it was found out that the scored of those contents said above were much higher. Almost all of them had got the right understanding and learn more about those contents.

The researcher couldn't follow the reading behavior of the tourists so the researcher was not able to know how the tourists studied. The researcher remarked that there were numerous reading behavior styles; for example, read roughly, read every page, read only about some interesting parts. All of these behaviours had an impact on learning effectiveness.

From the Khao Pra Taew nature study handbook satisfaction survey, it was found that most of the tourists evaluated the content positively, choosing a "good" level in the attributes of quantity, difficulty/easy, interest, and usability.

The survey results also indicated that the book contained very interesting and useful information about the area including the history of the place. Moreover, the information not only attracted people to want to learn more about the rainforest, it also persuaded the reader to understand and become aware of the environment and the forest and help to protect them.

Language use was rated as "good and clear", but some people in the sample group said that it was highly academic, so it contributed to some difficulty in understanding the nature study handbook.

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The complementary pictures were an important component because they made the book interesting and easy to read. Moreover, the pictures helped the reader to understand information when the language was too difficult. The satisfaction survey indicated that the pictures used in the nature study handbook were interesting, clear, and easy to understand. Some people in the sample group suggested that more pictures be added.

The arrangement and the form of the book were found to be interesting. This included the order of both the information and the pictures. The content of the nature study handbook was suitable for searching for information contained inside.

In conclusion, the research achieved the following objectives:

- (1) The creation of the Khao Pra Taew nature study handbook for tourists. It is now available as an effective book for tourists and anyone interested in using this book.
- (2) The determination that the book is effective. It was found that the tourists who had read the nature study handbook and taken the learning achievement pretest and posttest gained knowledge as the researcher expected. Therefore, it can be concluded that the nature study handbook enhances knowledge for all readers, truly.
- (3) The determination that the handbook is of good quality. Results of the quality assessment by tourists indicated their opinion was that the book was of good quality.

However, after the experiment the Khao Pra Taew nature study handbook was adjusted once again following the suggestion of the advisory committee about the details under the pictures, some of the scientific name, some picture need to be more clear, and adjust and rearrange some pages.

4. The Extending Use

- 4.1 This book would be a good medium for stimulating a tourist's interest and understanding of the rainforest and its plants and animals.
- 4.2 The nature study handbook is useful to: 1) people who are interested in studying about the area, 2) people who are interested in walking along the nature study trail, 3) students that can use it as a reference book, and 4) children who are interested in becoming a local junior nature trail guide. Therefore, this can increase the number of the visitor of the center.
- 4.3 Not just for tourists, this book can be useful to students who study at schools around the area to help them realize the importance of the Khao Pra Taew rainforest and the Khao Pra Taew Wildlife Conservation Development and Extension Center because they live near the forest.
- 4.4 The information in the book should be understood, but if the length of time required for learning is too short, the book should be available for a longer period of time and should be available to people who walk along the nature study trail as well.
- 4.5 Prior to reading the book, conservation and awareness about the rainforest, plants, animals and environment was difficult to practice because many of the readers thought that the forest and environment should be protected by the forestry department. However, after reading the book and having a conversation about it, the readers changed their mind, and were interested in paying more attention to and raising their awareness of the rainforest and environment.

CHAPTER VI CONCLUSION AND RECOMMENDATIONS

1. Research Conclusion

This research study was an operational research study whose main objective was to develop a nature study handbook for tourists that visit the Khao Pra Taew Wildlife Conservation Development and Extension Center at Talang district, Phuket province. The instruments for this research were the quality assessment form for experts, a test of learning achievement for tourists, and a satisfaction assessment form for tourists. Tourists in Phuket and Khaosan Road were selected as the sampling group by sampling 40 foreign tourists at the Khao Pra Taew Wildlife Conservation Development and Extension Center and in nearby area in Phuket. The research was conducted using a single group pre-test and post-test design.

After the process of collecting and analyzing the data, the results of the satisfaction assessment towards the nature study handbook for tourists and the quality assessment form for the experts were analyzed with frequency and mode. The learning achievement was analyzed by comparing the mean scores (\overline{X}) of pretest-posttest with t-test values. The research results and recommendations can be concluded as follows:

1.1 Construction and Development of the Nature Study Handbook

The nature study handbook for tourists at the Khao Pra Taew Wildlife Conservation Development and Extension Center in Talang district, Phuket province, was constructed using these steps:

1.1.1 Study the primary information

- Study the primary information about the area.
- Study the history of the area, including the Talang district.
- Study the important plants and animals that can be found in the area.

- Conduct an in-depth interview with some forest ranger officers in the area.

1.1.2 Book construction and Evaluation of the book's quality Book construction

- Set the objectives of the nature study handbook
- Write down the concept
- Determine the contents, structure and components of the nature study handbook, under the supervision of the thesis advisory committee and experts.
- Take pictures following contents and objectives decisions
- Arrange and set up the pictures and the book pattern
- Examine the completed prototype of the book under the supervision of the thesis advisory committee and experts.

Construction of tools for evaluating the nature study handbook's quality

- Design the learning achievement test form.
- Design the satisfaction assessment form for the nature study handbook

1.1.3 Development of the book's quality

Firstly, in-depth interviews were conducted with 9 tourists divided into two times 3 persons at first and second time with 6 persons regarding contents, graphics, design, language and other suggestions once they had read the book thoroughly. After collecting all of the information, the nature study handbook was improved.

Secondly, 30 tourists who visited Khao Pra Taew Wildlife Conservation Development and Extension Center and nearby places mostly in Talang district in Phuket read and then took the learning achievement test and completed the satisfaction form. It was then corrected and improved.

Finally, the handbook was printed. It contained 53 pages for the experiment.

1.2 Results of the Satisfaction Assessment of the Nature Study Handbook by Experts

Satisfaction of the nature study handbook was assessed by 9 experts divided into 3 groups of 3 experts each. The first group was comprised of media experts, the second group was comprised of contents experts, and the third group was comprised of tourism experts. It was found that the majority mean score were more than 3 which meant they were satisfied with it at a level of "good."

1.3 Learning Achievement of the Nature Study Handbook

The sample group in this research was foreign tourists who were interested in nature and hiking along the nature study trail and who were interested in the nature. The total sample group was 40 foreign tourists in Khao Pra Taew Wildlife Conservation Development and Extension Center and in nearby area mostly in Talang district in Phuket. It was done by using the accidental sampling method at each step. Most of the sample group was female, between the ages of 26 and 35, university education level, and with an occupation in the private sector.

Learning achievement was determined by comparing the test scores of tourists before and after reading the nature study handbook. The mean pretest score was 13.625, and the mean posttest score was 24. The hypothesis from the mean pretest and posttest scores used t-test values, and it was found that they were statistically significant at 0.05 level, which means that the tourists truly gained more knowledge from reading the nature study handbook.

1.4 Results of the Satisfaction Assessment of the Nature Study Handbook by Tourists

Satisfaction was assessed towards the nature study handbook by 40 tourists. It was determined that the majority mean score were more than 3 which meant they were satisfied with the nature study handbook at a level of "good."

2. Recommendations

2.1 Recommendations From This Research

- 2.1.1 This nature study handbook should be provided for students who are interested in becoming local junior guides.
- 2.1.2 The nature study handbook should be offered to tourists in exchange for a donation. The donation can be used to improve and develop the place.
- 2.1.3 To develop the quality nature study handbook, the researcher should study all contents and well understand of the book development. Some important point cannot be wrong, for example; the scientific name, educational name and some of specific name.
- 2.1.4 The development of the nature study handbook should be use the specific program of making the book such as Adobe PageMaker.
 - 2.1.5 The trails should be ready for the tourists who come to visit.
- 2.1.6 The Khao Pra Teaw Development and Extension Center should develop the 4-kilometer trail to be in use because it will allow them to close one of the paths to recover the environment and another can be opened.
- 2.1.7 It should include annual follow-up studies to check the environment along the trail, rebuild signs and pick up waste.
- 2.1.8 It should be used to encourage people to learning more about the place, rainforest, plants and animals before getting onto the trail.

2.2 Recommendations for Future Researches

- 2.2.1 It should be a research on the interpretative activities in other wildlife conservation development and extension center and in other nature centers.
- 2.2.2 It should be a research on development of handbook for studying herbs, birds, animals in the rainforest.
- 2.2.3 It should be a research on the behaviors of tourists on the interpretative activities in nature centers.



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อรุโณทัย คอวนิช. (2545). การพัฒนาคู่มือสื่อความหมายธรรมชาติ และวิถีชีวิตท้องถิ่นในเขตห้าม
ล่าสัตว์ป่าบึงบอระเพ็ด. วิทยานิพนธ์ปริญญาศึกษา ศาสตรมหาบัญฑิต, สาขาสิ่งแวดล้อม
ศึกษา บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล.

อุษณีย์ วั<mark>ฒนพันธ์. แปล. (2539). <u>ต้นไม้กับชีวิต</u>. กรุงเทพมหานคร: กระ<mark>ทรวงศึกษา</mark>ธิการ</mark>



Questionnaire

The interest of making Khao Pra Taew Nature study handbook

General information

1.	Name:		2.1	
2.	Sex ()	Male	()	Female
3.	Age ()	< or $= 25$ year	rold	() 26-35 year old
		> 35 year old		
4.	Country / National	lity 🍣		
	<mark>/</mark> /			
5.	Ma <mark>rita</mark> l status			
	() Single	() Married		() Other
6.	Oc <mark>cup</mark> ation / Care	er		
	() Student / Instr	ructor () Go	overnm	ent () Private sector
	() Others:			
7.	Purpose of your co	oming to <mark>Th</mark> ail	and?	
	() General tour	() Eco-tour	rism () Shopping () Business
	() Conference	() Other:		······
8.	Purpose of coming	g to Phuket?		
	() General tour	() Eco-tour	rism () Shopping () Business
	() Conference	() Other:	• • • • • • • •	
9.	Are you interested	l in walking alo	ong a na	ture trail in any forest area?
	() Yes	() No		
10	. Have you ever bee	en to any Natio	nal par	x or any protected area in
	Thailand?			
	() No	() Yes	What 1	province?
	Please name:			

11. Have you ever read any nature handbook about the national park or
protected area in Thailand?
For example; Waterfalls and gibbon calls (Khao Sok National park), Khao
Yai National park handbook and etc.
() No () Yes
Please
name:
About a nature study handbook
Size of the handbook (As the samples showing)
() 4 x 6 Inch () 4 x 8 Inch () 5 x 8 Inch
Paper () White paper () Crosmy paper
() White paper () Creamy paper () Other:
() Other:
About the contents in the nature study handbook
Have you ever heard of Khao Pra Taew Wildlife Conservation Development
and Extension Center before?
() Yes () No
If you answer "Yes" in the question above, do you want to go to visit that
place?
() Yes () No
Do you want the Center to have the nature study handbook, which explain
about the area, forests and the nature trails?
() Yes () No
Please put the (**) beside the main contents that you think they should be the
information of the nature study handbook and also please include anything else
you think should be included in the nature study handbook.
1. General information of Khao Pra Taew
() Introducing of the place

3.	For traveler		
	Watch and study or	birds	
	() Yes	() No	
	Wildlife tracks		
	() Yes	() No	
	Other (Your addition	onal comments or contents):	
			•••
		<mark>.</mark>	• • •
	<u> </u>	<mark></mark>	•••
01	ther <mark>id</mark> eas and sugg	es <mark>tions f</mark> or making Kha <mark>o P</mark> ra Ta <mark>ew</mark> natu	ıre
stı	udy <mark>handbook</mark>		
	7	(彼と トラィ	
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1	= \		
	6		

Thank you very much for sharing your time.

Have a nice and wonderful time!

Learning achievement questionnaire of The Khao Pra Thaew Nature Study Handbook for tourist

There as	re 2 parts of questionnaire, which is follow:
Part 1 Part 2	General information Learning achievement questionnaire
	mark the correct sign () in front of your answer or write down your in the space.
Part 1	General information
	1. Name
	2. Sex () Male () Female
	3. Age () $< or = 25 \text{ years old}$ () 26-35 years old
	() > 35 years old
	4. Country/Nationality
	5. Marital Status
	() Single () Married () Others
	6. Occupation/Career
	() Student/Instructor () Government () Private Sector
	() Others :
	7. Educational background
	8. Address:

Part 2 Learning achievement questionnaire of Khao Pra Thaew Nature Study Handbook

Please mark the sign at one of your selected answer.

- 1. What province is the **Khao Pra Thaew Wildlife conservation development and extension station** settle at?
 - a. Krabi
 - b. Phuket
 - c. Phangnga
 - d. Chaingmai
- 2. What is the kind of the forest of Khao Pra Thaew?
 - a. Evergreen hill forest
 - b. Dry dipterocarp forest
 - c. Mixes deciduous forest
 - d. Tropical rainforest
- 3. When you walk around the Khao Pra Thaew station, what is the rock you will often meet?
 - a. Sedimentary rock
 - b. Sand stone
 - c. Granite rock
 - d. Permo-carb. Rock
- 4. How tall of the highest peak of Khao Pra Thaew?
 - a. 250 meter from the sea level
 - b. 300 meter from the sea level
 - c. 450 meter from the sea level
 - d. 500 meter from the sea level
- 5. If the trees in Khao Pra Thaew rainforest were cutting down, what can be happened?
 - a. There are more space for growing up the Para wood.
 - b. People in Talang district may lack of water
 - c. There are more land for building and constructing.
 - d. Forest rangers have no works.

- 6. What kind of forest that has the most bio-diversity?
 - a. Evergreen hill forest
 - b. Tropical rainforest
 - c. Mixes deciduous forest
 - d. Dry dipterocarp forest
- 7. What is the area of Rainforest on earth?
 - a. Between the Tropic of Cancer and Tropic of Capricorn
 - b. In Africa
 - c. In the Antarctic
 - d. In the Arctic
- 8. What can be happened, if many trees of the rainforest were cut down?
 - a. Having less rain
 - b. The weather will be hotter
 - c. Some animals distinct
 - d. All above are correct
- 9. How much of the annual rainfall that you can find the rainforest?
 - a. More than 300 millimeters
 - b. More than 500 millimeters
 - c. More than 700 millimeters
 - d. More than 1,000 millimeters
- 10. How important of the rainforests?
 - a. They are the biggest areas to produce oxygen.
 - b. They are the biggest areas for traveling.
 - c. They give lots of benefit to the poachers.
 - d. They give lots of woods for building.
- 11. What is the unique characteristic of Kerriodoxa palm tree?
 - a. Greenish silver white at the back of the leaf
 - b. White at the front and back of the leaf
 - c. White coconut leaf shape of the leaf
 - d. Yellow at the back of the leaf

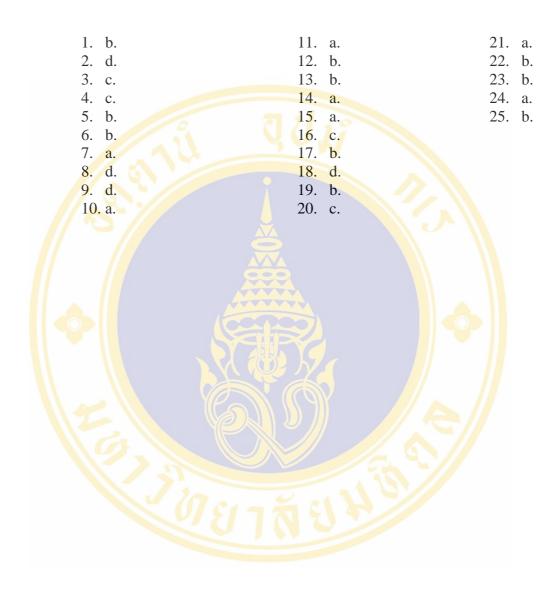
- 12. How the Rattan Palm adjusts itself to get to have sunlight?
 - a. It has a very strong root.
 - b. It has spines to hang it up high.
 - c. It has long leaves.
 - d. It has a very tall tree.
- 13. What kind of the Tree which is called "The saint of the forest, the cold blooded killer"?
 - a. Teak wood
 - b. Fig tree
 - c. Banana tree
 - d. Rattan Palm
- 14. How important of Buttress root of plants in the rainforest?
 - a. It protects stem from the storm and help the big tree to stand strong.
 - b. It is the main root to find food from the other trees.
 - c. It helps the trees to look beautiful.
 - d. It is a food for wild animals.
- 15. What kind of animals you will find in rainforest in southern Thailand?
 - a. Gibbon Malayan sun bear snake
 - b. Malayan sun Bear jungle cat fox
 - c. Raccoon fox Rabbit
 - d. Tiger Raccoon bear
- 16. How long is cicada's life under the ground?
 - a. 1-2 years
 - b. 3-5 years
 - c. 6-7 years
 - d. 9-10 years
- 17. What have leeches been used for the specific purpose?
 - a. Have been used for food
 - b. Have been used in medicine
 - c. Have been used for animals' food
 - d. All above are correct

- 18. Who is the one of the important decomposer of rainforest?
 - a. Cicada
 - b. Waterfall crab
 - c. Snake
 - d. Termite
- 19. If many of fig trees were cutting down, what kind of animals may be first distinct?
 - a. Bird
 - b. Fig wasp
 - c. Squirrel
 - d. Deer
- 20. What is the important role of Mushroom in the natural cycle?
 - a. Producer
 - b. Consumer
 - c. Decomposer
 - d. Supporter
- 21. Which one is correct about the Ecosystem?
 - a. In order to maintain the balance of the nature, none of ecosystem's elements should be depleted.
 - b. Anything can be depleted because it is not belong together.
 - c. We can use any resources on earth and produce them as manmade instead.
 - d. We don't have to care of using natural sources, because there are not run out from earth.
- 22. What do you think of good Eco-tourists should be?
 - a. When meeting with some animals, should shout out loud and call anyone to come to see.
 - b. Walking along just in the prepared trail
 - c. When finding some interesting plants, pick up their seeds and leaves
 - d. Writing down names on trees or rocks
- 23. What you should bring while walking in any nature study trail?
 - a. Books net for catching insects lighter
 - b. Books binocular camera
 - c. Camera alcohol beverages weapons
 - d. Binocular camera gun

24. What is the main problem that makes the forest consequently disappear?

- a. Illegal deforestation
- b. Nature disasters
- c. Build the building in the forest
- d. Farmers
- 25. Which way is the best way that can help to re-forest?
 - a. Asking for the budget from the government.
 - b. Everyone helps to plant.
 - c. Asking for the NGOs to work on it.
 - d. The nature always cures itself.

Answers of the Learning Achievement questionnaire

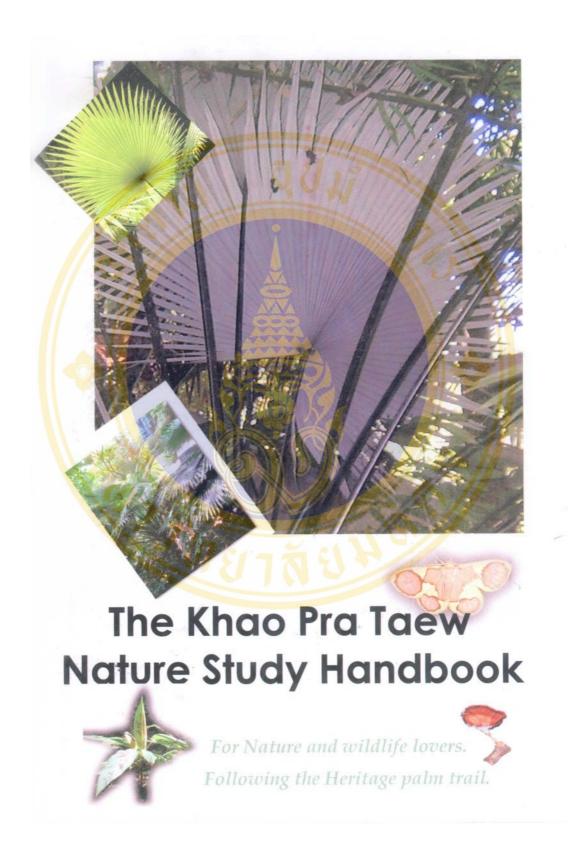


The Questionnaire of Satisfaction to The Khao Pra Thaew Nature Study Handbook for tourist

Please mark the correct sign (\checkmark) as the answer you satisfy

	Details	Very good	Good	Fair	Should be proved	Comments
Information and texts		15 0	18			
1.	Provide adequate information.		* * * * * * * * * *			
2.	The length of the text. (too long or too short, please specify)	i				
3.	The text using in this book. (too deep, too difficult to understand, too easy and etc., please suggest)					
4.	The sequence or the orderly arrangement of the information.		\			
5.	The information in this book attract people need to learn more about rainforests.					
6.	The information can persuade people to become to love, understand and want to protect the rainforests.				9/	
7.	Interesting information.				3///	
8.	Language for easy understanding.	ă	413	101		
Design of the book		14				
1.	The cover of the Nature Study Handbook.					
2.	The size of the Nature Study Handbook.					
3.	Layout of the Nature Study Handbook.					
4.	Fonts and their sizes used in this Nature Study Handbook.					
5.	Pictures using in this Nature Study Handbook (clear, interesting and etc., please suggest.)					
6.	Pictures aid the understanding of the text.					

Other ideas and Suggestions for making Khao Pra Taew Nature Study Handbook
Thoule you would for all of your more time.
Thank you very much for all of your spare time. Have a nice and wonderful day!



Introduction

This book was made for any nature lovers who wish to know and learn about one of the rainforests in Phuket province in Thailand. As we know, the rainforests in the world are in danger and are being destroyed more and more each day. Learning something about the rainforest is one way to understand the benefit of the rainforest and how it is important for humans to try to save all of the forests.

I do really hope that all of the information contained in this book will help all users better understand the value of our natural resources. Moreover, I do hope that this book will also be useful as a guidebook.

Thank you very much to anyone who pays attention to our environment and our world.

Writer Supitcha Kiatprajak

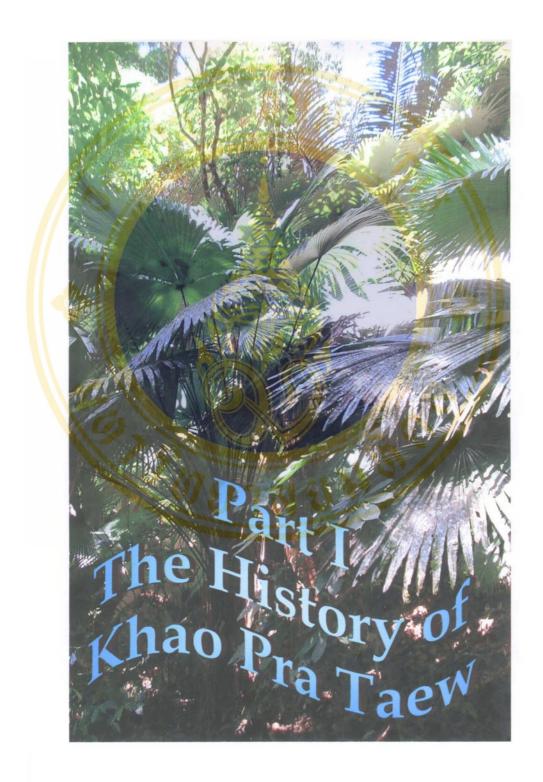


Photographer:
By writer and parents
Editor:
Audra Phillips
Wayne Chisholm

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	History of Kao Pra Taew	2
	Topography of Khao Pra Taew	4
	Calendar of visiting time	6
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	Amazing exploration!	22
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	Questions to consider?	25

Let's find out the answer

Place and diversity of the rainforest			
Important plants of Khao Pra Taew			
- Heritage palm; Kerriodoxa Elegans			
Palm Tree			
- Supermarket of the forest;			
Fig tree			
- Rattan Palm	34		
- Giant Grass; Bamboo	35		
- Ferns	37		
Some Interesting Animals			
- Fig Wasp	39		
- Waterfall Crab	40		
- Termite mound	41		
- Spiders	43		
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Help to save the forest			
Further reading			



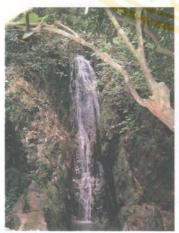
History of Khao Pra Taew

Phuket is well known as a wealthy province in southern Thailand. This wealth is gained from tin mining, and from the tourists that are drawn to the beautiful beaches. It is because of this beautiful scenery that the area is named the pearl of the Andaman. Although Phuket is well known for these beaches, it is also blessed with a lush rainforest in the Talang district.



Tone Sai waterfall

This forest is named Khoa Pra Taew. These are the final remnants of the tropical rainforests that once covered the area, and a significant historical place in Phuket province. Talang was the capital of Phuket city hundreds of years ago. This has been recorded in Thai history, during the times of war



BangPae waterfall

between Thailand and Burma. Khao Pra Taew was a great place for people to hide from their enemies.

It was also used as a place to prepare the army, which was lead by two heroines: Taothepkrasattree and Taosrisoonthorn, to defend against the invading armies of Burma.

3 General information about Khao Pra Taew

Today, however, the area of Khao Pra Taew has a less tumultuous existence. It has been chosen and promoted as an Officially Reserved Area. This conservation area takes in about 4% of the total land area of Phuket, which is about 13,925 rais, or 22.28 square kilometers; including 3 Tambons (Sub-districts), Thepkrasatri, Srisoonthorn and Paklok. As of April 1977,



Provincial Services demarcated a protected area encompassing all the forest ranges, the center of which is located in Talang district, about 21 kms. from Phuket City. Although villages, roads and plantations now surround this land, it is an example of the luxuriance and greenery of the tropical rain forests of the south.



Pond in the forest

4

Topography of Khao Pra Taew

The reserve area stretches along a range from the north to the south of Talang district. There are some mountains of medium height in the area such as Khao Phara, Khao Bang Pae, Khao Pra Thiu, and Khao Ruern Kao. The crest of Khao Pra Thaew which reaches 400 to 450 m from the sea level stands alone on the south separated from the others. The tallest peak of Khao Pra Taew is Khao



Ruern Kao which is 450 meters in height. In the interior an intricate drainage system has developed and deeply embedded itself. Streams and rivulets appear as torrents. They spring forth in a series

of stepped waterfalls descending in narrow gullies. Therefore, they

form many small streams in and around the area. Many small wells also rise from the dense forest, and form two waterfalls: Tone Sai waterfall and Bang Pae waterfall.

In the stream beds, the granite rock can be seen level with

the ground, piled one upon the other, or

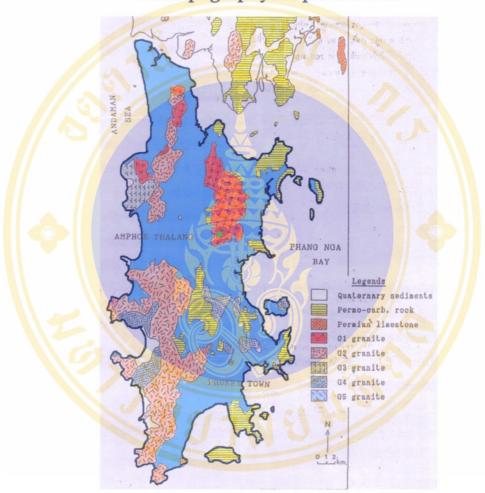


The Waterfall before the Granite Station

in flat paving stones obstructing the water, forcing the flow sharply over or, especially in dry season, infiltrating the soil and then reappearing furter down the waterfall. The granite rock gives the mountain soil a yellow colour and contains humus on the top level of soil. The granite rock is eventually broken down to create a silty-sand soil.



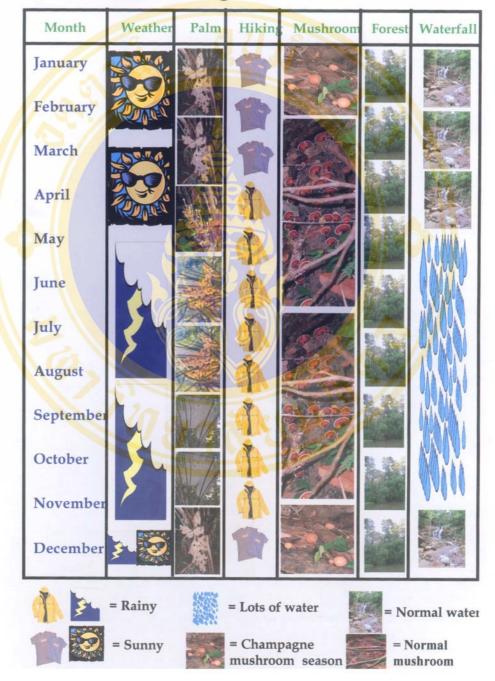
The topography map of Phuket



The rock of Phuket is almost granite rock which is formed in the cretaceous period. The granite rock of Khao Pra Taew area (in the red circle) ages around 82 +/- 4 million year. That's why the waterfall in this area are form from the granite stone and the soil is Silty-soil. In the same time, you can also find some of permo-carb. rock in the north and in the west of Khao Pra Taew.



Calendar of visiting time



7 General information about Khao Pra Taew



The Climate

At latitude 8, the climate is devided into two seasons: dry and rainy.

An average of 2350-2700 milimeters of rain falls during the eight months of the rainy season (April through November).

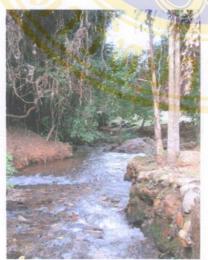
The average temperature throughout the year is 28 degrees Celsius.



Moss on a tree

Visiting Time

The best time of the year to visit Phuket is in the dry season, from December to March. But even during the rainy season, the rain generally lasts for only to two hours in heavy downpours, and there are intermittent sunny periods.



The stream in the center



The area around Khao Pra Taew



Forest area

Maps of Khao Pra Taew

Khao Pra Taew is located in Phuket province and Phuket is located 867 kms south of Bangkok. Khao Pra Taew is located at latitude 8 degrees and the station is located at 430124 N 887105 E. which means the forest station is 20 kms north of Phuket City, and 12 kms south of the airport, in the district of Talang. It is easy to reach from the main road.





From Talang junction, in case you come from the airport, turn left; the Station is located about 3kms from the main road, at the foot of the Tone Sai Waterfall.

If you come from Phuket town, turn right at Talang junction.

9 General information about Khao Pra Taew



Around the Station

Around the Station there is an information center, office building, canteen, exhibition building, bathroom facilities and a restaurant, all of which are shown on the map.



The head office

Information can be obtained at the information center and the office building. You can also obtain a guide at these facilities. If you have the time, you should visit the exhibition building, as there is a wealth of information to be discovered there.



The visitor center

The officers and contact information

The number of officers of the station is 29, and they are divided into 4 sections: 1 station chief, 3 forest officers, 2 officers and 23 workers.

There are 6 bungalows available for groups interested in studying the area, however, you must book in advance, as there are many students and groups who use the station's facilities for studying.

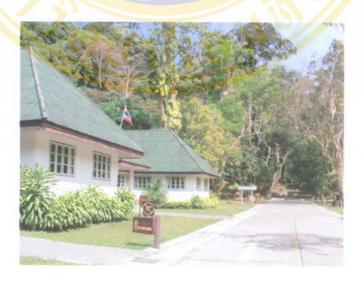
> The address and telephone number of the station: Khao Pra Taew Wildlife Conservation Development and **Extension Center**

Talang District Phuket Province 83110, Thailand Tel: 0 7631 1998

or contact:

The National Park, Wildlifes and Plant Conservation Department

Paholyothin Road, Bangkok 10900, Thailand Tel: 0 2561 4292-3 # 708,756



The head office

11 General information about Khao Pra Taew



The Nature Study Trail

This area offers 3 hiking trails. They are 600 meters, 2 kilometers, and 4 kilometers in length. These trails offer nature lovers the opportunity to be close to nature and enjoy the journey.

Around the Station Trail: this 600 meter trail is the heart of the station, and holds such highlights as the Tone Sai waterfall and Kerriodoxa Palm Trees. This endangerd palm cannot be found in any other location in the world, and so is a must see.

Tone Sai waterfall Trail: this 2 kilometer trail offers some excellent views and is a good representation of the rainforest of the southern peninsula. There are 14 station bases to study along the way. You will also pass the monosociety of *Kerriodoxa Palm Tree*, which is located about the half way mark of this trail.

The 14 study points of this trail are:

- 1. Entrance Message
- 2. Termite Mounds
- 3. Fungi
- 4. Buttress
- 5. Rainforest
- 6. Stream
- 7. Water supply for life
- 8. Granite
- 9. Decomposition process
- 10. Heritage Palm of Phuket
- 11. Lichen Moss Fern Canopy
- 12. Ficus sp.
- 13. Bamboo the giant grass
- 14. Tone Sai waterfall



Second level of Tone Sai waterfall



Fern

12

Tone Sai and Bang Pae waterfall Trail: this 4-kilometer trail begins from the station and ends at Bang Pae Waterfall. Along this trail you will see the origin of the Bang Pae and Tone Sai waterfalls. Hikers will find many amazing trees along this trail, such as the

Kerriodoxa Palm and many other of the plamae family, such as the banana and Ficus trees. Sometimes you can meet many small creatures, such as lizards and birds. Hikers will be able to enjoy clean fresh air, the fresh smell of the evergreen trees and leaves and hear the music from the hosts of this land, the birds and cicadas. There is also a small lagoon



hidden in the forest, about the middle of this trail. This place gives



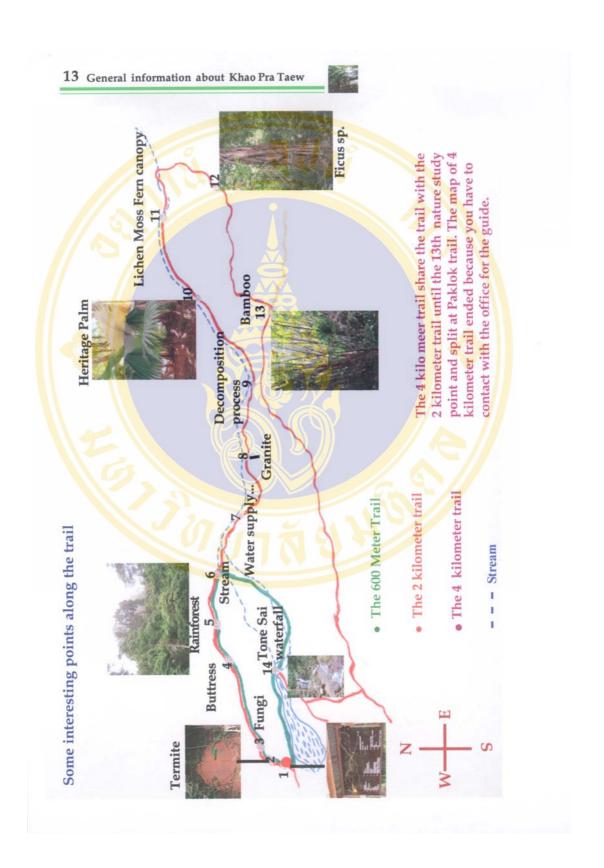
hikers a chance to take a dip in the clean, refreshing clear water. You can contact the station or ask the forest ranger to be your guide. For the 2 shorter trails, hikers can walk by themselves as there are signs along the trail. But for the 4 kilometer-trail all are advised to request a guide from the station.

There are several interesting points and markers that are explained in this book. Hikers will see them located along the

trails on their journey. However, it should be noted that the rainforest's ecosystem is in a constant state for flux and, as a result, some of these markers may not be found year round, or some may have been changed.



Supitcha Kiatprajak





15 Before Walking!



Safety first

Please follow the rules which are posted at the entrance. Although the hiking trails here are not very long or rough, it does not mean you can not be injured. Remember accidents can happen

anytime, any place and to anyone. Make sure that you are in good health, and that your body is ready for the hike ahead. Constant vigilance is the best way to avoid problems, particularly as the walk nears its end as tired legs are susceptible to pitfalls. Also please try not to bother anyone else while walking and be as quiet as possible.



What to wear in a rainforest

As the weather is divided into two seasons; those being warm and wet. It is advised that hikers wear long sleeve shirts and long pants.



Proper walking boots or sport shoes are preferable, as these will protect you from slipping, from some injuries, as well as from some of the animals.

Be advised that if you decide to wear sandals along the trail, the station will not take responsibility for any injury which you may sustain.

16

Be careful of...

People normally associate visits to tropical rainforest with hidden dangers. However, it's not so dangerous if people take the proper precautions.

Many accidents happen because of risk taking activities, such as trying to jump from the ledge of the waterfall or a fall may occur because a lack of attention.

There are some things that may occur while hiking, not to deter you but to better make you aware for your own health and safety. So, watch out for these few things:

Scratches and Cuts

These are common wounds, and happen easily when hiking. But little wounds can become infected in the tropics. The best way to avoid these is to wear a long sleeve shirt and long trousers.

If you get a small cut or scratch, keep it clean and dry. Use

an antibiotic powder or balm if it shows signs of infection. However, the antibiotic can sometimes cause the infection as well. It is recommended that you see a doctor if the infection becomes worse.



If accidents happened, please contact at the office center. Some who has mobile please bring with you, some point along the trail have signal.

17 Before Walking!



Snake bite

In the tropical rainforest, snakes are common. Many of them are largely nocturnal. Normally these animals keep away from

humans, but if you come to their territory they will fight to protect their home. To reduce your chance of even being bitten, wear boots and long trousers and try to walk in the estrablished trails.



Leeches and Ticks

Leeches are common in a Tropical Rainforest during the rainy season. The bite from a leech is not infectious and they transmit no disease. However these bites can become itchy.

Ticks seem to be more dangerous because it is possible that they carry and spread the typhus virus.

The best way to avoid them is by moving quickly and carefully. Tobacco or a smelly spray on the socks can help. Also wearing a long sleeve shirt is good protection.

Leech





Bee, Wasp and Scorpion stings

Most of bees and wasps are normally located high up in trees, and on the rocks or cliffs. Some types of wasps and hornets nest in the ground but you are not likely to disturb them if you stay to the established trails.



Scorpions normally live under the leaves on the ground. They are very shy creatures that always try to seek out dark and cool places to hide. Just be careful when you are sitting on timbers, dead trees or on the ground.

Scorpion stings can cause the following symptoms: pain, swelling and inflammation. If you see the stinger under the skin

> carefully remove it to avoid additional poison entering the wound.



Scorpion

Oral antihistamine and also pain killer tablets can help to reduce the pain, swelling and discomfort.

Mosquito Borne Diseases

Many people are scared of mosquito borne diseases, which are rarely found in this areas. Moreover, the good news is Thailand's

control programs for those in rural areas are among the best in the world. However, it's best to avoid being bitten. The peak of the biting hours are normally before and after dawn as well as dusk. Putting on some insect repellent can also help to protect you from mosquitoes.



19 Before Walking!

There are 2 mosquito borne diseases that are sometimes prevalent in Thailand:

1. Malaria: A virus carried by the mosquito Anopheles. Symptoms may not occur for days, weeks or months after infection. Symptoms usually begin with chills and headache followed by high fever that lasts several hours. Flu like



Anopheles

symptoms may occur during the nighttime, shaking may also be an affect of it. Flu symptoms can be very similar so a blood test is required to diagnose malaria.

2. Dengue Fever: A virus transmitted to humans by a day active mosquito Aedes. Symptoms come on suddenly include high fever, severe headache, joint and muscle pain. However, only one in 10,000 mosquitoes are infectious.



Aedes







Rainforest surrounding

20

Do's and Don'ts

Do's:

- √ Keep Quiet
- Take everything you bring in, back out with you after hiking along the trail
- Help to collect the garbage you may find in the forest
- If you see something strange, broken or out of place.
 Please notify an officer as soon as you can.

Don'ts:

- Do not make loud noises or shout.
- Please do not keep, tear, or collect the trees or seeds from the trail.
- Do not tease or play while hiking as the trail has some dangerously narrow spots.
- Do not write names, initials or other graffiti on the trees or rocks.







21 Before Walking!

What to bring and not to bring

What to bring

- Bottle of drinking water
- Long sleeve and light weight shirt
- Light weight hiking boots or runners
- Hat or cap
- Sunscreen
- Roll-on insect repellent or tobacco for leeches
- Special medicine for each person
- Binoculars
- Camera and film
- Small first aid kit
- Plastic bags for litter

Not to bring



Weapons



Alcohol beverages



Glasses bottle and cans



Amazing exploration; some tracks to explore!!!

Animals are extremely wary of humans as they have been preyed upon for more than 50,000 years, and continue to be taken by poachers for food, pets and animal parts. In the past, this area used to have many more animals, such as gibbons, tigers, and bears. But they have all disappeared because of civilization and the changing forest.

However, after this station was founded there are now more animals living in the forest, and hundreds of birds. But, not many visitors will have a chance to see the animals here. As you walk along the trails you may come across animal



Animal's dung

tracks or their excrement. Sometimes, you may see and hear some birds and cicadas singing in the trees, if you are quiet.

Here are some of animals and their tracks you may find here:





Barking deer or common muntjac
Muntiacus muntjac





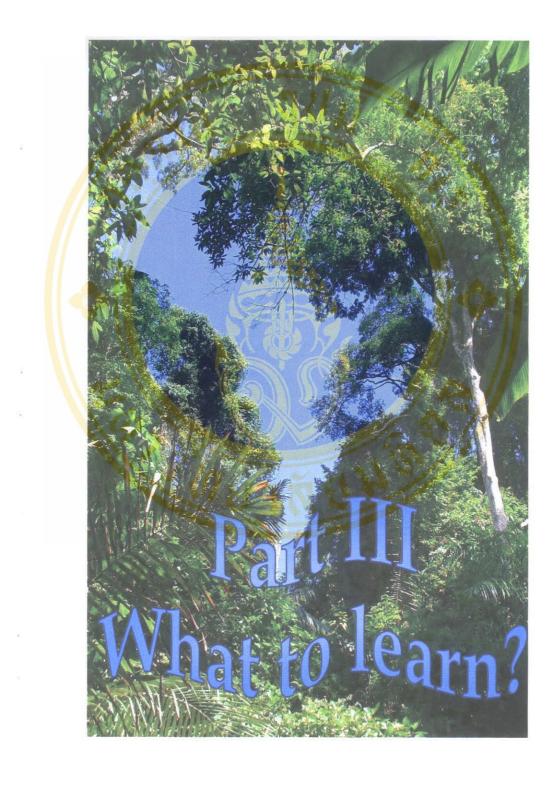








You may still meet some of other animals' tracks and dung such as civet, sunda pangolin, malayan flying lemur, common slow loris, squirrel and many kinds of birds. If you are quiet, you may see them in the trees or along the trail.



What to learn?



Question to consider?

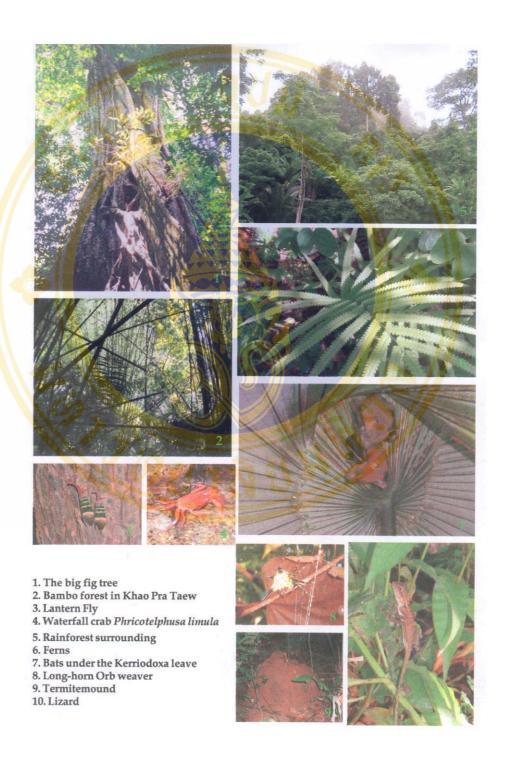
- Where is the rainforest area?
- What is the most important plant in Khao PraThaew and what are the interesting plants in this area?
- What are some interesting animals in Khao Pra Thaew?
- Do you know fungi and mushroom?
- What's in the foodchain?









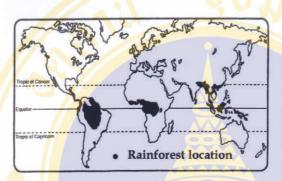




28

Where is the rainforest???

Location and diversity of rainforest



Almost all of the forests of Southern Thailand are known as tropical rainforests, including Kao Pra Taew. The Tropical Rainforest is an area of forest in the belt around the equator, the area

between the Tropic of Cancer and the Tropic of Capricorn. Tropical evergreen rainforests are wherever the annual rainfall is more that 1,000 millimeters and spread evenly throughout the year. It is believed that the diversity of life in the tropical rainforest is truly astounding. There can be more than 100 species of trees in 1 hectare of evergreen forest. Scientists estimate that 2.5 acres of tropical rainforest may contain more than 750 species of trees and 1,500 species of other plants. Rainforests are also vibrant with animal life, including many endemic species.

Rainforests regulate rainfall on a global level; this in turn affects the global climate. They are also the single greatest terrestrial source of oxygen.
Rainforests also bring us food, herbs, pharmaceuticals, and many other items that are common place in our daily lives.

29 Let's find out the answer!



Important Plants of Khao Pra Taew Heritage palm of Phuket Kerriodoxa elegans

This Palm is the heart of Khao Pra Taew and is also a World Heritage Plant. This kind of tree has been found for the first time of the world here. It is hardly found anywhere else in the world.

The World Conservation Union (IUCN) lists it as the world's most endangered palm species. It is also called Palm Langkow and Palm Chaomueng Talang. It is about 5-7 meters in height, and has fairly large round serrated fan shaped leaves. The back of the leaf is greenish silver white, which is a unique characteristic of this species. The Palm produces cream coloured

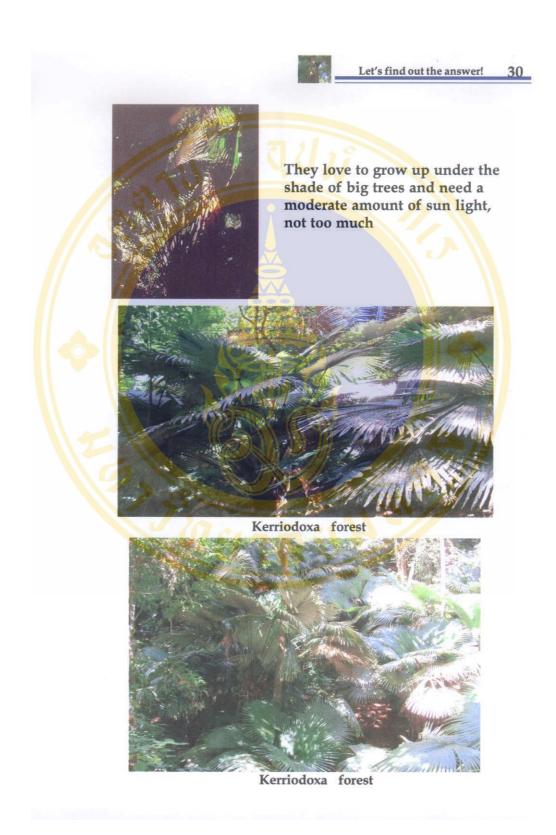




flowers during December to February. These flowers turn into yellow fruits, which become food for some of the animals. The leaves of this palm are also dwellings or homes for bats. The



bats nestle themselves under the leaves. They will bite the center of the leaves causing the leaves to droop and form an umbrella like protection from the rain and too much daylight.



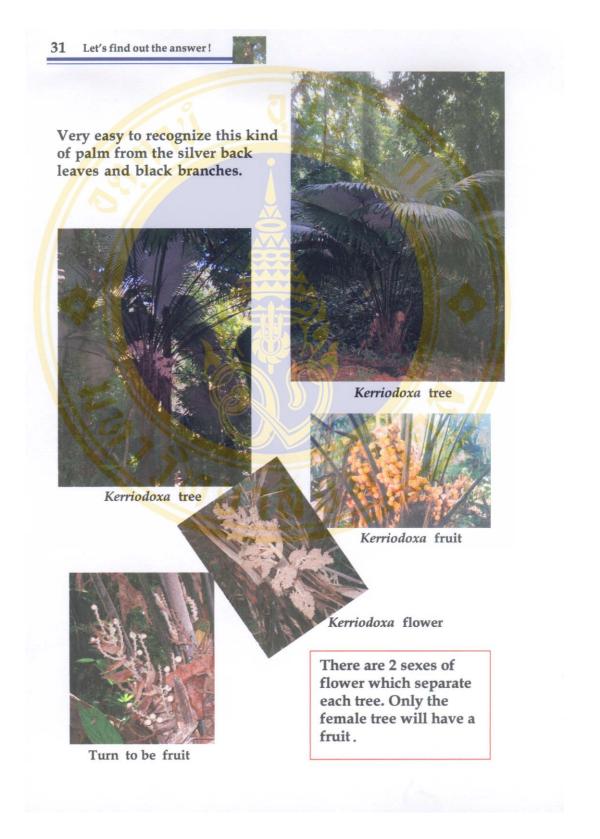


Fig Trees; Supermarket of the forest



Do you wonder where the name of this place came from? It comes from the name of the tree that has become a supermarket for the animals; it is named the Fig Tree. You can see a very large Fig Tree near the Tone Sai Waterfall.

Most people are familiar with Tarzan. The very strong man who loved to swing from the vines of trees.

The one kind of tree with vines strong enough for this is the *Ficus* spp. This type of tree sometimes has an amazing shape and many vines hanging from it. This is unique to this species.

The fig tree (Ficus spp.) is one of the most peculiar species of trees in the tropical rainforest. It produces very delightful fruit, which are gorged on by many species of birds, monkey, gibbons, squirrels, bats, and other canopy feeding animals. These fig trees are the supermarket for all animals, and in the fruit season you may have a chance to listen to them coming to shop if you are quiet - just sit back and wait for them.

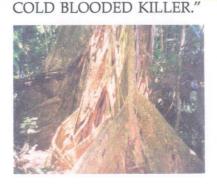


Fig tree

33 Let's find out the answer!



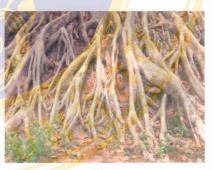
Because these fruit have tiny seeds and special sticky glue, animals have an easy time passing them through their digestive track. This causes animals to produce sticky feces, which are spread throughout the forest. When the seeds land on any branch with ample light and moisture, it will grow and send its roots down the trunk of the tree. Once the roots touch the ground and the fig can take the nutrients from the earth, the fig will grow quickly. As the tree grows, the root size will also increase, and will quickly engulf the host tree's trunk. The host tree will eventually die from lack of light. People have named this tree "THE SAINT OF THE FOREST, THE



Buttress root



Fig tree



Roots of Fig tree

Sometimes you find a big root of fig trees and other huge trees, that root called "Buttress root". As there is very thin first level of soil, the main roots are difficulty to go deep down. So, buttress roots help big trees to stand firmly in any climates.

Rattan Palm

In the tropical rainforest, one of the most common tree species is Palmae. There are several types of palm trees; some are a medium sized tree like coconut choke palm and bettlenut. Some of the



Rattan Fruit

Sometimes you can see the climbing palm tree such as the rattan tree. Its sheath and thin petiole are armed with whitish spines, whose function is that of support and climbing organs. In this trail, you may find a very long rattan

palm along the trail, but you will not be able to tell how long it is or how old!

It has a slender and cylindrical stem, and is much appreciated for making furniture, walking-sticks, umbrellas and wickerwork. Therefore, the number of these trees is decreasing in the tropical rainforest.

trees are very small.



Long trunk of rattan palm in the trail

35 Let's find out the answer!



The Giant grass; Bamboo



Are you aware that Bamboo is a grass of the Graminece family, like rice and sugarcane? There are over 1,500 species in this family. Bamboo is possibly the oldest grass on earth, dating back 60 million years.

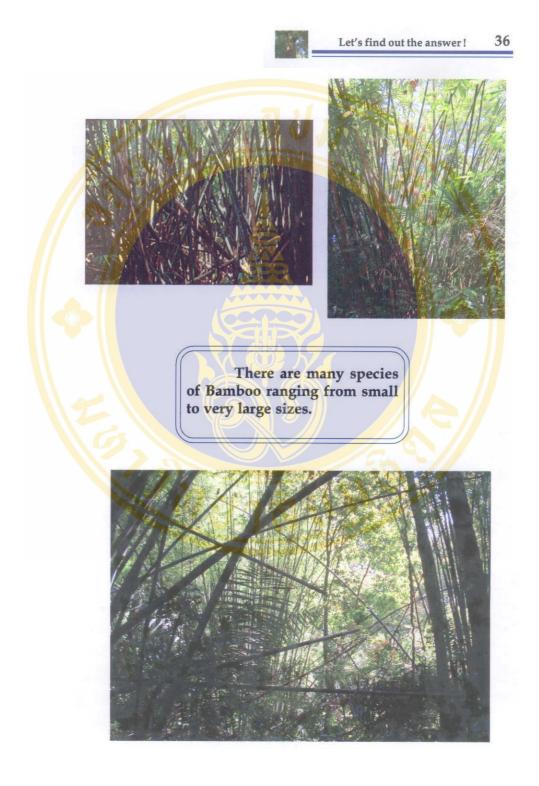
There are many kinds of Bamboo, some small, and others very large. The largest of the Bamboo family stands more than 10 meters tall, and is also very fast growing. Bamboo spreads by underground rootstocks or rhizomes, so it usually appears in large clumps.

There are 3 to 4 species of Bamboo along the trails. On the 4 km trail there is a quite rare species called "Dear-eye Bamboo". You will be able to recognize it by a special pattern that it develops. The Bamboo is a good indicator for the forest as well as the condition of the soil. When the conditions are dry and lacking humidity in the soil, you will find small bamboo. However if the soil is humid you will find very large Bamboo.



Dear-eye Bamboo

Bamboo shoots are a popular food item for some people. For this reason bamboo is decreasing in number in the forest.



37 Let's find out the answer!



Ferns

It is not known exactly how many species of Ferns exist in Kao Pra Thaew. In the Tropical Rainforests there are many kinds of ferns; ground, climbing, aquatic, and tree ferns, such as the bird nest and stackhorn ferns. Ferns are an



and stackhorn ferns. Ferns are an ancient family of plants, which appeared on earth more than three hundred and fifty million years ago, making it older than any land animal, and even the



dinosaurs. You can find ferns all over the world, but they are considered to be one of the weakest and most sensitive of flora, because they are very easily affected by changes in the environment. These delicate plants only grow in areas where there are

suitably moist conditions. Ferns prefer sheltered areas under the forest canopy, along creeks, streams and other places where there is plenty of moisture.



Dicranopteris

Unlike other plants, Ferns reproduce from spores that are located under their leaves. Some species of Fern, such as a THYRIACEAE and POLYPODIACEAE (Diplaziium esculentum SW.) or as it is called in Thai "Kuud", are edible.



39 Let's find out the answer!



Some Interesting animals at Khao Pra Taew Fig Wasps

It is impossible for the fig tree to grow without a tiny insect called the fig wasps. The fruit of the fig is not like other fruit; it is a chamber pseudo fruit, the inside of which is lined with tiny flowers. The only entrance to the chamber is at the base



of the fruit, which is covered by tiny scales. It is through this entrance that the female fig wasp forces her way inside to try and reproduce. After she gets into that chamber, there is no way to get out. So she will die after reproduction. However, the fig wasp can lay her eggs and the new generation, which could consist of both male and female, will hatch within the chamber. The new generation females mate with the wingless males. Then having become dusted with pollen during the mating ritual, break out of the fruits chamber as it

ripens and begins to rot. While females search out new fruit and begin the cycle all over again, the male fig wasp dies inside the fig, never having a chance to see the outside world.



In the tropical rainforests, all lives have their own purpose and are linked to each other and cannot survive without each other!



Let's find out the answer!

40

Colour of the Waterfall; Waterfall Crab Phricotelphusa limula

While you walk along the trail near the waterfall, you may meet some small creatures on the cliffs. These creatures are usually found in the morning, when they are trying to warm their bodies in the sunlight. This animal is the "Waterfall crab", which is small and red in colour. The abundance of these small animals helps to create the colour of the waterfall as shown in the sample pictures.







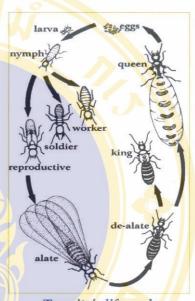


41 Let's find out the answer!



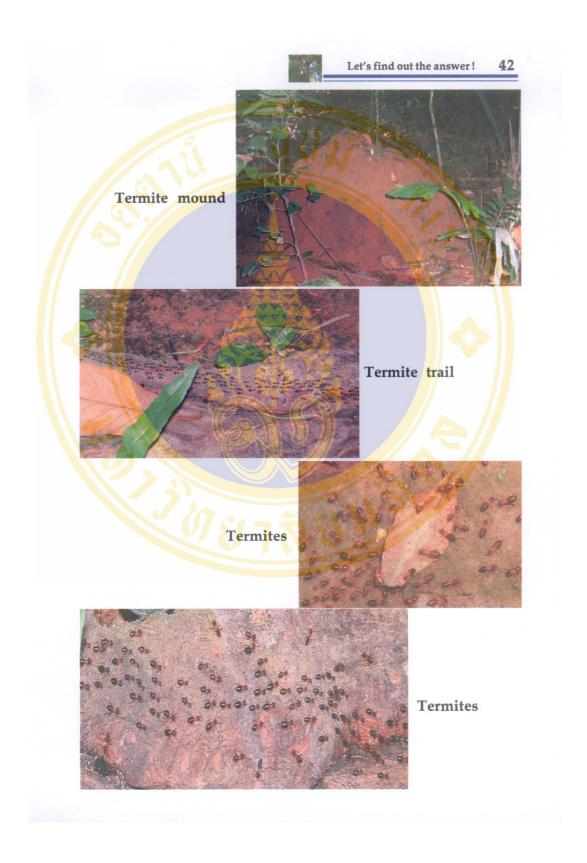
Termite mound

While walking along the trail you may see a small hill located beside the trail. That is a home for the termite, and is called a mound. Sometimes they move to a new home, and so you will see them walking in an orderly line on the forest floor. This may appear to the human eye as a thin black line drawn on the forest ground. Termites consist of seven families and approximately 2500 species, in the order Isoptera worldwide (Waller and La Fage 1987). In the mound or castle, as it is also known, you will find a



Termite's life cycle

community made up of worker, soldier, nymph and larvae. All of which have their own purpose in this mound. People may only know the termite as a destroyer, but they are also very important to the forest ecosystem. The termite, as with all of the creatures in the forest, plays an important part in the cycle of life. Termites are the hardest workers in the world. Worker termites can build their mound within a year and also have the duty of finding and transporting food to feed the Queen and King. The queen termite has a grossly extended abdomen, and her only purpose is to remain in the mound chamber and lay eggs. The soldier termite is very easy to recognize because it has a very enlarged mouth for defending and fighting off enemies, such as pangolin and bear, as well as a few other predators.



43 Let's find out the answer!



Spiders

There are about thirty five thousand known species of spider in the world; however no one knows how many more may yet be discovered. Spiders are easily found, especially since their numbers are so great in tropical



Lace weaver

rainforests. Some spiders may look scary and all are venomous, but only a few are harmful to humans. A common spider that can be found in this area is the Orb-weaver spider. In most cases of the spider species, males are smaller than females, and this hold true for the Orb-weaver, as the male is far smaller than the female.



You may see a hole on the forest floor with a web; this is the home of the Trap door spider. They are shy creatures, so it is not easy to see them outside of their home.





Giant Orb Weaver

Giant Orb Weaver

Cicadas



Cicadidae

As you walk along the trail you may hear a voice, which sounds like a church choir, or some may think that it is just noise. This sound belongs to a small insect called the "Cicada". There are many types of Cicada in this world, many of which make their homes in this forest. However as the cicada is able to blend itself into its environment, you may walk

right past them without noticing. But, as they are so abundant in this forest, if you look carefully at the trees you may see some of

them. Cicadas spend much of their lives underground, as nymphs; once they have mated, their life above ground is very short, only a few short weeks. They are the notorious singers of the forest; the songs are produced by the males to

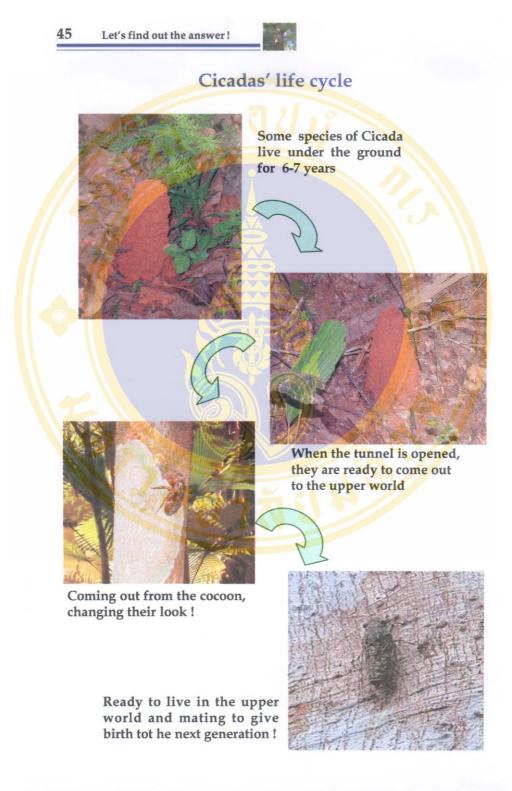




attract Lantern fly (Pyrops sp.)

the females for mating. As each species has it's own distinct call, only the female of it's own kind will be attracted. However it is not unusual to find different species co-existing due to the similarity in the calls. The cicadas are preyed upon by birds and are also carried of by wasps as food for their young.

Lantern fly (Pyrops sp.)



Snakes and Reptiles

There are some 6,800 reptile species on earth. It is easy to find reptiles in peninsula, Malaysia, Singapore and Thailand. Reptiles, such as, lizards, geckos, watermonitors, and snakes are found even in the middle of the country such as in town. Snakes are one of the most feared creatures in the world for



King Cobra

humans. Not all species of snakes are poisonous, however there are some that are venomous and quite dangerous.

As with all reptiles and snakes are cold blooded, which means that its body temperature does not stay the same at all times. Snakes will become very cold during winter days, and very hot during the warm days of summer. Because of this fact snakes usually stay in borrows; a hole in the ground where they can live during the extreme hot and cold weather. All snakes are carnivores or meat eaters. Smaller varieties of snakes will eat insects, frogs, and other very small prey. Larger ones can eat fish, birds, mice, rabbits, and other similar sized animals. They use their sharp teeth and strong jaw



White-lipped Pit-viper

muscles to catch their prey. If the prey they catch is larger than the snake's mouth, it will then dislocate its lower jaw to fit the animal into its mouth. As they are such shy creatures, you may not have a chance to see them, as they normally avoid humans.



48

Leech Life

Many people fear the small creature named the Leech. They are well known as the Blood Suckers of the Tropical Rainforests. Leeches are amazing creatures that appeared on earth approximately 160 million years



ago. They are parasites and are attracted by movement as well as warmth increased carbon dioxide levels are a sure sign for the leech that a mammal is nearby. Leeches usually have three jaws and make a Y-shaped incision. They inject an anti-clotting substance to prevent the blood from coagulating (thickening), and they will feed until they are full. The leeches bite is gentle and of no real concern. It absorbs several times its own body weight in blood before it drops off of its host. One meal can last the leech six months or more. So a few drops of your blood can feed these small creatures and become a part of the ecosystem.

Leeches have been used in medicine for a long time. Around the 19th Century, leeches were indispensable for bloodletting, a practice believed to be a cure for anything from headaches to gout.



If you are hiking the trails during the rainy season and wish to protect yourself from these creatures, an insect spray will work, as well as putting tobacco on your socks. Both of these will help to keep them away.

49 Let's find out the answer!



Fungi and Mushroom

The mushroom is one kind of fungus or fungi. There are a group of organisms and micro-organisms that are classified within their own kingdom, the fungal kingdom, as they are neither plant nor animal. Fungi draw their nutrition from



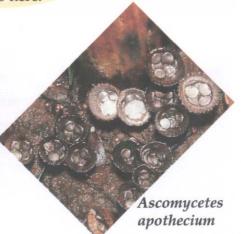
Bracket Fungi

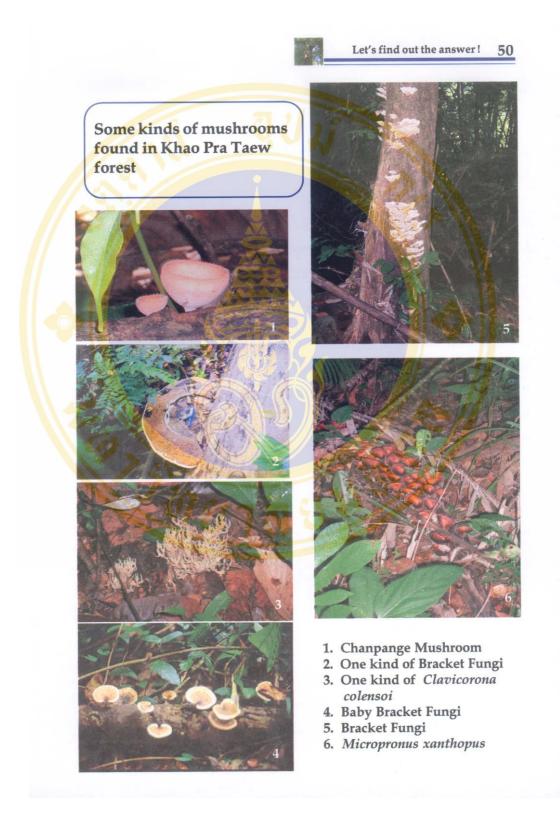
decaying organic matter, living plants and even animals. They do not photosynthesize as they totally lack the green pigment chlorophyll present in green plants. They play an important role in the natural cycle as decomposers and return nutrients to the soil - they are not all destructive. Fungi are even used for medical purposes, such as species within the penicillium genus, which provide antibiotics, e.g. penicillin.

There are many kinds of mushrooms, which appear in various styles, colours and shapes displaying the great art of the forest, as show in the the pictures here:



Microporus xanthopus



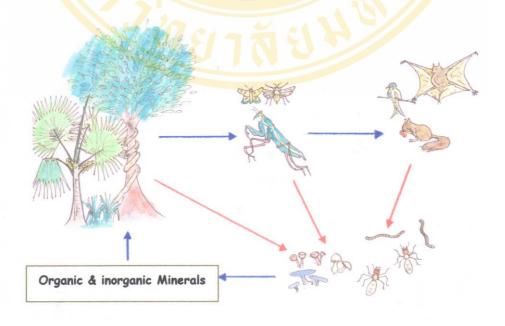


51 Let's find out the answer!



Foodchain

Woods is one of the most important parts of the food chain. As we know, plants change inorganic minerals into organic minerals by the photosynthesis process, thus their growth. Animals eat plants or weaker animals as food. They also help to spread and extend the new generations of trees. After animals and trees die, decomposers (i.e. worms, termite, bacteria, fungi and mushroom, etc.) change all of the dead material into organic and inorganic minerals and give back to the dwelling places. In order to maintain the balance of nature none of them should not be depleted. It is said that, if you damage the forest you threaten the nature ecosystem that supports life. Remove the plants, shrubs and other vegetation in the forest floor and the ancient soils lose their potency from exposure to sunlight and direct rainfall. Consider the massive erosion that occurs!



52

Help to save the forest!

Deforestation occurs each day! It is said that 500,000 trees are cut every hour in tropical rainforests. The rainforest regulates earth's climate, is a deterrent against the greenhouse effect, and



gives us oxygen. The tropical raiforest contains edible food crops and other resources that help to maintain life and prevent poverty.

We lose 20,000 to 100,000 species a year. It is estimated that we may lose 20 percent of all species on the planet within the next 30 years! Deforestation can be the single greatest cause of species extinction in the next half century! So:

- Do not buy products that cause destruction of the rainforests, but rater, purchase those that encourage sustainability and fair equity to those living in or near rainforests.
- Learn more about the rainforests.
- Spread the word to others on the importance of the rainforests.
- Make changes toward a lifestyle having less impact on the nature life cycle of the tropical rainforests.

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We are greatful for your interest in learning about our rainforest and environment.

Please help to save our forests for the next generation!

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3.) Mr. Arnuchat Panun
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Office: Tour East (Guide Association)

แบบประเมินคุณภาพ หนังสือคู่มือศึกษาธรรมชาติสำหรับนักท่องเที่ยว ในพื้นที่สถานีพัฒนาและส่งเสริมการอนุรักษ์สัตว์ป่าเขาพระแทว (สำหรับผู้ทรงคุณวุฒิด้านสื่อ)

คำชี้แจง โ	<mark>ปรดทำเครื่องห</mark> มาย √ลงในช่องที่ตรงกับความคิดเห็นข <mark>อง</mark> ท่านมากที่สุด และ
5	ะบุข้อความ <mark>ลงในช่อ</mark> งว่างที่เว้นไว้
ff.	บบ <mark>ประเมินคุณภาพหนังสือคู่มือศึกษาธรรมชาตินี้แบ่งอ</mark> อก <mark>เป็น 3 ต</mark> อน
1.	<mark>ข้อ</mark> มูลส่วนตัว 🍣
2.	การประเมินคุณภาพ <mark>หนังสือคู่มื</mark> อศึกษาธรรมชาติฯ
3.	ข้อเสนอแนะและ <mark>ความคิดเห็นทั่</mark> วไป
ตอน <mark>ที่</mark> 1 ข้อมูลส่ว	นตัว
ชื่อ-สก <mark>ุล</mark>	
วฒิทางการ <mark>ศึกษา</mark>	

ตอนที่ 2 การประเมินคุณภาพหนังสือคู่มือศึกษาธรรมชาติฯ

ตอนที่ 3 ข้อเสนอแนะและความคิดเห็นเกี่ยวกับหนังสือคู่มือ และข้อเสนอแนะและความคิดเห็น ทั่วไป

(ท่านสามารถเขียนข้อเสนอแนะ และความคิดเห็นเกี่ยวกับหนังสือคู่มือ ลงในตัวคู่มือ ณ ตำแหน่งที่ ท่านต้องการ)



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ขอขอบพระคุณเป็นอย่างสูงค่ะ

แบบประเมินคุณภาพ หนังสือคู่มือศึกษาธรรมชาติสำหรับนักท่องเที่ยว ในพื้นที่สถานีพัฒนาและส่งเสริมการอนุรักษ์สัตว์ป่าเขาพระแทว (สำหรับผู้ทรงคุณวุฒิด้านเนื้อหา)

คำชื้แจง	โป <mark>รดทำเครื่องหมาย √ัลงในช่องที่ต</mark> รง <mark>กับความคิดเห็น</mark> ของท่านมากที่สุด และ
	ระบุข้อความลงในช่องว่างที่เว้นไว้
	แบบประเม <mark>ินคุณภาพหนังสือคู่มือศึกษาธรรมชาตินี้แบ่งอ</mark> อก <mark>เป็น</mark> 3 ตอน
	1. ข้อมูลส่วนตัว
	2. การประเมินคุณภาพหนั <mark>งสือคู่มื</mark> อศึกษาธรรมชาติ <mark>ฯ</mark>
	3. <mark>ข้</mark> อเสนอแนะและควา <mark>มคิดเห็น</mark> ทั่วไป
ตอ <mark>นที่</mark> 1 ข้อมู	กล่ <mark>ว</mark> นตัว
ชื่อ-ส <mark>กุล</mark>	
วุฒิทางการศึก	HI.
910471	
ตำแหน่ง	1000000
TI TOUTE PO N	80100

ตอนที่ 2 การประเมินคุณภาพหนังสือคู่มือศึกษาธรรมชาติฯ

 เนื้อหา 1. เนื้อหาสอดคล้องกับวัตอุประสงค์ในการเขียน 2. ถูกต้องตรงกับความเป็นจริง 3. ปริมาณของของเนื้อหามีความเหมาะสม 4. ความรู้ในเนื้อหามีความเหมาะสม 5. การลำดับเรื่องมีความเหมาะสม 6. เนื้อหาและเนื้อเรื่องชวนให้ติดตาม 7. สามารถทำให้ผู้อ่านเกิดจิตสำนึกที่ดีต่อ ธรรมชาติและสิ่งแวดล้อม 8. ภาพประกอบมีความสัมพันธ์กับเนื้อหาดีขึ้น 10.เนื้อครอบคลุมหรือไม่ ภาษา 1. สำนวนภาษาอ่านแล้วเข้าใจง่าย 2. ถูกต้องและเหมาะสมด้านการใช้ภาษาอังกฤษ 3. การจัดตัวอักษรมีความเหมาะสมและสัมพันธ์ กับภาพประกอบ 	หัวข้อ	ดีมาก	ดี	พอใช้	ควรปรับปรุง
	 เนื้อหาสอดคล้องกับวัตถุประสงค์ในการเขียน ถูกต้องตรงกับความเป็นจริง ปริมาณของของเนื้อหามีความยาวเหมาะสม ความรู้ในเนื้อหามีความเหมาะสม การลำดับเรื่องมีความเหมาะสม เนื้อหาและเนื้อเรื่องชวนให้ติดตาม สามารถทำให้ผู้อ่านเกิดจิตสำนึกที่ดีต่อ ธรรมชาติและสิ่งแวคล้อม ภาพประกอบมีความสัมพันธ์กับเนื้อหา ภาพประกอบช่วยให้เข้าใจเนื้อหาดีขึ้น เนื้อครอบคลุมหรือไม่ ภาษา สำนวนภาษาอ่านแล้วเข้าใจง่าย ถูกต้องและเหมาะสมด้านการใช้ภาษาอังกฤษ การจัดตัวอักษรมีความเหมาะสมและสัมพันธ์ 				

ตอนที่ 3 ข้อเสนอแนะและความคิดเห็นเกี่ยวกับหนังสือคู่มือ และข้อเสนอแนะและความคิดเห็น ทั่วไป

(ท่านสามารถเขียนข้อเสนอแนะ และความคิดเห็นเกี่ยวกับหนังสือคู่มือ ลงในตัวคู่มือ ณ ตำแหน่งที่ ท่านต้องการ)



ข้อเสนอแนะและความ <mark>กิดเห็นอื่น</mark> ๆ	
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ขอขอบพระคุณเป็นอย่างสูงค่ะ

แบบประเมินคุณภาพ หนังสือคู่มือศึกษาธรรมชาติสำหรับนักท่องเที่ยว ในพื้นที่สถานีพัฒนาและส่งเสริมการอนุรักษ์สัตว์ป่าเขาพระแทว (สำหรับผู้ทรงคุณวุฒิด้านการท่องเที่ยว)

โ <mark>ปรดทำเค</mark> รื่อง <mark>ห</mark> มาย √ ลงใ <mark>นช่องที่ตรงกับ</mark> ความคิดเห <mark>็นขอ</mark> งท่านมากที่สุด และ
ระบุข <mark>้อความลงในช่องว่างที่เว้นไว้</mark>
<mark>แบบประเมินคุณภาพหนังสือคู่มือศึกษาธรรมชาตินี้แบ่งออกเป็น 3</mark> ตอน
4. ข <mark>้อมูล</mark> ส่วนตัว
5. <mark>กา</mark> รประเมินคุณภาพหน <mark>ังสือคู่มือศึกษาธรรมชาติฯ</mark>
6. ข้อเสนอแนะและคว <mark>ามคิดเห็นทั่</mark> วไป
r่วนตัว
VOICE THE CAND

ตอนที่ 2 การประเมินคุณภาพหนังสือคู่มือศึกษาธรรมชาติฯ

หัวข้อ	ดีมาก	ดี	พอใช้	ควรปรับปรุง
เนื้อหา				
1. เนื้อหาสอดคล้องกับวัตถุประสงค์ใ <mark>นการเขียน</mark>				
2. ถูกต้องตรงกับค <mark>วามเป็นจริง</mark>	19			
3. ปริมาณขอ <mark>งของเนื้อหามีควา</mark> มยาวเหมาะสม	M			
4. การลำ <mark>คับเรื่องมีความเหมาะสม</mark>				
5. เนื้อ <mark>หาและเนื้อ</mark> เรื่อ <mark>งชวนให้ติดตาม</mark>			AM	
6. ส <mark>ามา</mark> รถทำให้ผ <mark>ู้อ่าน</mark> เกิดจิตสำนึกที่ดีต่อ 🅌				
<mark>ธรร</mark> มชาติแล <mark>ะสิ่ง</mark> แวคล้อม				M
กา <mark>รจั</mark> ดรูปเล่ม			\\ <u>\</u>	11
4. <mark>หน้าปกสวยงา</mark> ม ดึงดูดความสนใจ				
5. <mark>ขน</mark> าดของหน <mark>ังสื</mark> อจับถือใด้สะ <mark>ควก</mark>	9			
6. <mark>การ</mark> เข้ารูปเล่ม <mark>มีค</mark> วามเหมาะสม				
การจั <mark>ดภาพประกอบและ</mark> ตัวอักษร)))			
1. การจ <mark>ัดหน้าและภาพประกอบ</mark> เหม า ะสม		Z 6		
2. กระดาษที่ใช้			///	
3. ขนาดและรูป <mark>แบบตัวอักษร อ่านง่ายและชัดเจน</mark>	613			
4. ภาพประกอบมีควา <mark>มสัมพันธ์กับเนื้อ</mark> หา				
5. ภาพประกอบช่วยให้เข้าใจเนื้อหาดีขึ้น				
ภาษา				
1. สำนวนภาษาอ่านแล้วเข้าใจง่าย				
2. ถูกต้องและเหมาะสมค้านการใช้ภาษาอังกฤษ				
3. การจัดตัวอักษรมีความเหมาะสมและสัมพันธ์				
กับภาพประกอบ				

ตอนที่ 3 ข้อเสนอแนะและความคิดเห็นเกี่ยวกับหนังสือคู่มือ และข้อเสนอแนะและความคิดเห็น ทั่วไป

(ท่านสามารถเขียนข้อเสนอแนะ และความคิดเห็นเกี่ยวกับหนังสือคู่มือ ลงในตัวคู่มือ ณ ตำแหน่งที่ ท่านต้องการ)



ข้อเสนอแนะแส	กะความค <mark>ิดเห็นอื่น</mark> ๆ			
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ขอขอบพระคุณเป็นอย่างสูงค่ะ

Analysis of Learning Achievement of Pre-test and Post-test of sample group

Difference of Pre-test and Post-test scored of the Sample Group

	Sample Group							
No.	Pre-tes	t Scores	Post-test	Scores	D_V V	\mathbf{D}^2		
	\mathbf{X}_{1}	X_1^2	X_2	X_2^2	$D=X_1-X_2$	D		
1	14	196	25	625	11	121		
2	12	144	23	529	11	121		
3	10	100	25	625	15	225		
4	20	400	25	625	5	25		
5	21	441	23	529	2	4		
6	15	225	25	625	10	100		
7	20	400	24	576	4	16		
8	16	2 <mark>5</mark> 6	20	400	4	16		
9	15	225	21	441	6	36		
10	6	36	22	484	16	256		
11	9	81	25	625	16	256		
12	14	196	25	625	11	121		
13	10	100	24	576	14	196		
14	17	289	24	576	7	49		
15	17	289	23	529	6	36		
16	14	196	25	625	11	121		
17	14	196	25	625	11	121		
18	19	361	24	576	4	16		
19	11	121	23	529	12	144		
20	15	225	24	576	9	81		
21	14	196	25	625	11	121		
21	14	196	24	576	10	100		
23	20	400	25	625	5	25		
24	14	196	25	625	11	121		
25	20	400	25	625	5	25		

	Sample Group					
No.	Pretest	Scores	cores Posttest Scores		D = X ₁ - X ,	\mathbf{D}^{2}
	$\mathbf{X}_{_{1}}$	\mathbf{X}_{1}^{2}	$\mathbf{X}_{_{2}}$	\mathbf{X}_{2}^{2}	$\mathbf{D} = \mathbf{A}_1 - \mathbf{A}_2$	D
26	10	100	25	625	15	225
27	8	64	25	625	17	289
28	15	225	25	625	10	100
29	9	81	25	625	14	256
30	18	324	25	625	7	49
31	5	25	24	576	19	361
32	10	100	23	529	13	169
33	5	25	25	625	20	400
34	15	225	25	625	10	100
35	9	24	15	225	81	576
36	16	24	24 8 64		256	576
37	12	21	9	81	144	441
38	15	24	9 //	81	225	576
39	17	24	7	49	289	576
40	10	22	12	144	100	625
	$\Sigma X_{i}=545$	1751-	$\Sigma X_2 = 960$	$\Sigma X_2^2 =$		
N = 40	$X_1 = 13.625$	$\Sigma X_1^2 = 8129$	$X_2=24$		$\Sigma D = 411$	$\mathbf{D}^2 = 4935$
	$S_1^2 = 4.603$		$S_2^2 = 1.284$	23247		

From table, it showed that the mean scored of learning achievement of the sample group after reading the book was 24.125 that more than the mean scores of learning achievement of them before reading that was 12.875. The means scores of pretest and posttest scores was statistically significant at level of 0.05. it was according to the set hypothesis. It illustrated that the tourists had more knowledge after reading the Nature study handbook.

Sample Group	N	X	S.D.	t-test = 15.21
Pre-test	40	13.625	18.035	
Post-test	40	24	1.284	Significant level = 0.05

Comparison of the learning achievement of pre-test and post-test of sample group by t-test

$$\frac{\Sigma D}{\sqrt{N\Sigma D^{2} - (\Sigma D)^{2}}}$$

$$N-1$$

$$= \frac{411}{\sqrt{40(4935) - (411)(411)}}$$

$$= \frac{411}{\sqrt{197400 - 168921}}$$

$$= \frac{411}{27.02}$$

$$= 15.21$$

Variance of Pre-test Score

$$S^{2} = \frac{n \sum X^{2} - (\sum X)^{2}}{n(n-1)}$$

$$S^{2} = \frac{40(8129) - (545)(545)}{40(39)}$$

$$= 18.035$$

Variance of Post-test Score

$$S^{2} = \frac{n \Sigma X_{2}^{2} - (\Sigma X_{2})^{2}}{n(n-1)}$$

$$S^{2} = \frac{40(23247) - (960)(960)}{40(39)}$$

$$= 5.307$$

Supitcha Kiatprajak Biography / 174

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