

# PARKS FOR LIFE

Why We Love Thailand's National Parks

By SONGTAM SUKSAWANG  
and JEFFREY A. MCNEELY



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and **JEFFREY A. MCNEELY**





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WE DEDICATE THIS BOOK TO  
HER ROYAL HIGHNESS PRINCESS MAHA CHAKRI SIRINDHORN,  
IN CELEBRATION OF HER FIFTH CYCLE AND APPRECIATION  
FOR HER STEADFAST AND INNOVATIVE SUPPORT  
FOR THE KINGDOM'S ENVIRONMENT AND CULTURE.

# F OREWORD

by **Anand Panyarachun**,  
Former Prime Minister of Thailand



Historically the Thai people have lived in harmony with nature, interacting with the environment and utilizing the country's abundant natural resources. As Thailand's economy continues to prosper, our dependence on the environment does not diminish, but increases. This book provides a timely reflection on how we are treating our ecosystems, our national parks and wildlife sanctuaries, and why they are so important to us.

Our land, trees, seas, and fresh waters are precious forms of natural capital, which we must continue to protect to provide sustainable benefits to all. Thailand currently has over 120 national parks that help protect biodiversity, provide a safe home for native plants and animals, and maintain ecological stability. The natural beauty, interesting wildlife and historical importance of our national parks attract people from all over the world and continue to provide opportunities for tourism. Importantly, the national parks contribute to people's well-being, providing peaceful and safe areas where they can relax, engage in recreational activities and get in touch with nature.

Thailand needs to carry out more study of the environment and specifically national parks to attain the relevant knowledge for their proper preservation as well as to deal more effectively with the growing environmental problems. This book will contribute significantly to our understanding and appreciation of the values of our national parks and wildlife sanctuaries, and how we can best preserve them for the benefit of future generations.

A handwritten signature in black ink, appearing to read 'Anand Panyarachun'.

**Anand Panyarachun**  
16 July 2015



# M

## ESSAGE

from **Luc Stevens**,  
United Nations Resident Coordinator  
and United Nations Development Programme  
Resident Representative



Thailand is well endowed with natural resources which form the foundation for its economic growth and cultural diversity. National parks, wildlife sanctuaries, and other types of protected areas cover about 18% of the country's total land and sea areas, serving as strongholds of biodiversity and habitats conservation for critical ecosystems and species. They provide the basis for livelihoods and food security for thousands of communities across the country. Through tourism, they generate income for the country. They are a treasure trove of genetic resources for pharmaceutical development. Forests absorb CO<sub>2</sub>, thereby reducing Thailand's carbon footprint and the warming effects to the global climate. They also offer a long-term solution for flood management and other disaster risk reduction efforts, and build the resilience of the ecosystem to the impacts of climate change.

This book will contribute to a better recognition of, and greater commitment and support to protect the country's natural capital. The book advocates for investing in protected areas management to promote inclusive economic growth that takes the real value of biodiversity and ecosystems into account in decision-making in the country's development.

Most importantly, this book pays tribute to officials, superintendents, rangers, and

communities who work tirelessly to keep Thailand's protected areas intact for future generation.

Effective and innovative management of protected areas, which creates more participation and support from communities and the wider public, will be fundamental to realising Thailand's vision of stability, prosperity, and sustainability. It will provide an important basis for Thailand's positioning towards the post-2015 development agenda.

The United Nations Development Programme (UNDP) is pleased to play its role in these endeavours, in partnership with the Department of National Parks, Wildlife and Plant Conservation, through the project "Catalysing the Sustainability of Thailand's Protected Area System" (CATSPA), with the support from the Global Environment Facility (GEF).

I wish to thank the authors for their valuable work, and to express my appreciation to the Ministry of Natural Resources and Environment, and the Department of National Parks, Wildlife and Plant Conservation.

A handwritten signature in blue ink, appearing to read 'Luc Stevens'.

**Luc Stevens**



# PREFACE

Thailand's protected areas, currently including 147 national parks, 58 wildlife sanctuaries, 67 non-hunting areas, and 120 forest parks, cover almost 20 percent of the Kingdom's territory. They are very popular with the Thai public and tourists from other countries, judging by the dense flocks of visitors that enjoy Thai nature on their holidays. But protected areas are more than just pretty places that effectively conserve wild nature. In addition to helping define Thai culture, they make many contributions to human welfare, including some that are little known despite their importance.

Many of us who are working on protected areas have been concerned that their multiple benefits have not been fully appreciated. As part of a project of the Department of National Parks, Wildlife and Plant Conservation (DNP), called "Catalyzing the Sustainability of Thailand's Protected Area System" (CATSPA), we had an opportunity to compile a broad variety of information about the kinds of benefits that our protected areas provide to the people of Thailand. This book is the result. It supports DNP guidebooks on National Parks but is not intended to replace them. It is aimed at the educated general public, the growing number of nature lovers, the many commercial enterprises that benefit from protected areas, the government agencies whose mandates overlap those of the protected areas, the politicians at all levels whose support is essential to the future of Thailand's natural patrimony, and the journalists who could help spread the messages the book contains.

We hope that a broader understanding of the multiple values of protected areas for many different stakeholders will create greater demand for the effective management of these important sites. This would enable them to continue providing the benefits currently being delivered to so many interest groups, with different benefits flowing to different groups of people. Our focus will be on National Parks, the category of protected areas that receives the greatest interest in Thailand, but we also call attention to the other categories of protected areas in various parts of the text.

Because we are aiming for a wide audience, we have avoided academic or technical language, but we have also provided citations and further reading for those who are interested in the details. These are drawn from the literature published in English, the international language for scholarly publications, many with Thai authors. Some issues remain controversial and we are hopeful that further work may clarify any remaining ambiguities. We have prepared the text in both Thai and English, first to reach the people who live here and second to help the international community understand why Thailand is making such a major contribution to protected areas. This may gain even greater significance as the ASEAN Economic Community matures.

This book has intentionally celebrated the many contributions that National Parks and other kinds of protected areas are making to the conservation of Thailand's cultural and natural heritage. In doing so, we have also given some attention to some of the challenges that protected areas are facing. Problems of wildlife and timber poaching, human-wildlife conflict, relations with surrounding lands, over-crowding, and how to provide economic benefits to rural people are all part of the story about why we love our National Parks, and need them now more than ever. DNP is making major efforts to address such issues, and our focus on the positive can help build support for such efforts.

We hope and expect that this publication will help build stronger support for Thailand's system of protected areas.

*Songtam Suksawang  
Jeffrey A. McNeely  
30 June 2015*



# A KNOWLEDGEMENTS

Writing this book has drawn inspiration from many sources. We first owe a great debt to the late Dr. Boonsong Lekagul, whose foresight has long nurtured Thailand's conservation efforts. Dr. Nipon Tangtham provided numerous stimulating ideas and helped identify useful sources of information. We are especially happy to thank the numerous photographers who have generously shared their art with us, including Bruce Kekule, Wayuphong Jitvijak, Wanchanok Suwanakorn, Kulpat Saralarm, Sakanan Platong, Utai Chansuk, Padet Boonkao, and Somsak Thitichayaporn. And Chaiya Wannalert kindly allowed us to include one of his many paintings of Thai nature. Special thanks to Superintendents of national parks and wildlife sanctuaries and many other authors for allowing us to use figures and photos from their publications. We are grateful to General Ekachai Chansri, Dan Navid, and Paul Sochaczewski for their helpful comments and suggestions on early drafts. Jules Pretty provided good advice on the benefits of protected areas to farmers and David Woodruff helped us understand the Pleistocene of Thailand. We are thankful to Dr. Sutharin Koonpol and Radda Larprun from UNDP, and staffs of the National Parks and Protected Areas Innovation Institute and CATSPA project for their support in the preparation of this book. We extend a special thanks to Pojanan Suyaphan McNeely, who has been a tireless advisor and helped maintain the quality of the book, with no detail too small for her attention..

*Songtam Suksawang  
Jeffrey A. McNeely*



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1

INTRODUCTION:  
WHAT ARE NATIONAL PARKS?



**THAILAND'S NATIONAL PARKS WILL ENSURE THAT  
WATERS CONTINUE TO FLOW, WILDLIFE FLOURISHES,  
AND THE KINGDOM'S NATURAL AND CULTURAL  
HERITAGE IS CONSERVED.**

# CHAPTER 1

## INTRODUCTION: WHAT ARE NATIONAL PARKS?

National Parks are places where people go to enjoy the many benefits of nature. These important areas are owned by the Royal Thai Government and are legally protected against any activities that would disrupt the natural and cultural values of the site. National Parks are public goods, not private property. Calling them **“National Parks”** underlines their importance in serving the public good, and indicates why private ownership of land and commercial development within these important sites are forbidden by law. Their continued prosperity depends on support from the public, as well as from the private sector that is benefitting from these public goods.

This book will illustrate how National Parks benefit all parts of Thai society, and contribute to global welfare as well.

*Our National Parks provide opportunities to see magnificent wildlife, such as this herd of gaur in Thap Lan National Park, Nakhon Ratchasima.*



We will focus on **National Parks** because these are the major sites where people can visit the best examples of wild nature. And as the demand for land in Thailand continues to increase along with the country's growing prosperity, these sites soon may be the only remaining places where wild nature can be found. They are therefore increasingly valuable, and are managed by the Department of National Parks, Wildlife and Plant Conservation (DNP) with the general objective of preserving their natural features for the benefit of the public far into the future.

Each National Park is unique, and has specific objectives and management approaches that are suitable to the particular site, often determined in consultation with local communities and businesses. Thailand currently has 147 National Parks, in all parts of the country, including in the seas (they are listed in Annex 1). Their popularity can be judged by the over 12 million visitors they welcome each year.



*Thailand's 147 National Parks cover the best natural sites in the country, and they are managed to provide multiple benefits to society.*

DNP manages many other kinds of protected areas, at national, provincial and local levels, and these form part of the national system of sites that help to link people to the natural world. The most significant of these other kinds of protected areas are the large **Wildlife Sanctuaries** that are established to provide legal protection to all kinds of wild plants and animals and the natural habitats where they live. They normally require special permission to enter and some are devoted especially to scientific research in support of conservation. Many of these 58 sites (listed in Annex 1) are adjacent to National Parks and help to augment the wildlife populations that attract visitors to the Parks that share the distribution of these species. They can also serve as refuges for wildlife that has been lost from the National Parks, and can serve as a source of restoring the lost species. For example, the deer species being reintroduced in Huay Kha Khaeng and Phu Khieo Wildlife Sanctuaries could soon be returned to suitable National Parks, or even emigrate naturally to them.

**Non-hunting Areas** often have villages within their boundaries and are open to visitors, though they are managed to prevent activities that disrupt the wildlife. Several are based on Buddhist temples that contain important features, especially bat caves or bird roosting areas. Thailand currently has 67 such Non-hunting areas (listed in Annex 1), which often serve as important habitats for migrating birds and

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**WE WILL FOCUS  
ON NATIONAL  
PARKS BECAUSE  
THESE ARE THE  
MAJOR SITES  
WHERE PEOPLE  
CAN VISIT THE  
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OF WILD  
NATURE.**

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*The White-eyed River Martin was discovered in 1968 at Beung Boraphet Non-Hunting Area, Thailand's largest wetland. This site is used for many purposes by the people of Nakhon Sawan, making the Non-Hunting Area designation the most appropriate form of protection.*



other species. An outstanding example is Bueng Borapet in Nakhon Sawan, Thailand's largest wetland and the site of the 1968 discovery of the White-eyed River Martin, a species whose nearest relative lives in Africa. This unique bird was named in honor of Her Royal Highness Princess Maha Chakri Sirinthorn. Another outstanding Non-hunting Area is Thale Noi, Phattalung, whose Waterfowl Park hosts over 180 species.

DNP also manages Watershed Management Areas, some of which include various kinds of protected areas and may contain villages. While only parts of these sites are formally protected, much of their area contributes to the broad objectives of conservation.



*Forest Parks offer important opportunities for people to visit and enjoy nature in places that are close to cities.*

**Forest Parks**, of which over 120 have been established by the Royal Forest Department, are managed to welcome visitors into relatively small areas of forest that are of particular recreational or educational interest, often close to cities and towns and therefore convenient to visit. They help provide the Thai public with opportunities to interact with compact versions of nature.

Some other lands and waters also contribute to conservation objectives, though they are not formally recognized as protected areas. These include the roughly 1,000 Forest Reserves managed by the Royal Forest Department that may cover as much as 15% of the land and contribute to overall national conservation objectives such as watershed protection though they typically are not managed for tourism or wildlife<sup>1</sup>.

*Thung Yai Naresuan Wildlife Sanctuary is part of the Western Forest Complex with six National Parks as neighbors. It is part of a World Heritage Site, with Huay Kha Khaeng Wildlife Sanctuary. The Wildlife Sanctuaries are devoted to protecting species and ecosystems and require special permission to enter, but their wildlife is free to roam into the adjacent National Parks.*



Many areas controlled by the military also function effectively as wildlife protection areas and deliver other environmental benefits, especially when they are adjacent to established protected areas or located in remote areas of the country. For example, some of the Royal Thai Navy training areas have beaches that have long been managed as sea turtle sanctuaries, some of which have facilities open to the public (as at Sattahip in Chonburi Province).

Many of the Royal Thai Army bases or lands under military authority are fairly large and contain significant expanses of natural habitats that support important wildlife populations that are well protected.

*The mission of Thailand's National Parks and other protected areas is reinforced by conservation efforts by many other sectors, with the Royal Thai Navy making significant contributions to the marine species and habitats.*



While we recognize and applaud the many kinds of land and water use that contribute to conservation, our focus will be on the National Parks and other protected areas that are legally established and managed for conservation purposes. They are geographically defined sites, so their boundaries can be drawn on a map and marked on the ground or in the water. They are established and managed to achieve specific conservation objectives, such as delivering clean water, enhancing wildlife populations, and providing attractions for tourists. These protected areas make essential contributions to Thailand's national social and economic development, delivering many benefits to local communities and to other sectors beyond the established boundaries of the protected areas. We will describe these benefits in more detail in the following chapters.

The legal status of these protected areas gives them permanence that makes their contributions sustainable in the long term and prevents many harmful activities. Almost 20% of Thailand's land surface has been devoted to National Parks and other



kinds of legally protected areas, a substantial public investment that is one of the largest proportions of protected land in the world.

Some might wonder why so much of Thailand's territory needs to be devoted to conservation objectives. Careful consideration shows that these various kinds of protected areas fit together in a system of habitats and ecosystems that ensures the delivery of a wide range of valuable benefits to both people and the rest of nature. This network still faces some challenges in delivering these potential benefits and working productively with the wider landscapes and seascapes, but we will provide many examples to demonstrate that the national protected area system is already providing substantial welfare to our country and its people.



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**SOME MIGHT WONDER  
WHY SO MUCH OF  
THAILAND'S TERRITORY  
NEEDS TO BE DEVOTED  
TO CONSERVATION  
OBJECTIVES.**

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*The Red-headed trogon is a good indicator bird for forested regions, depending on trees for building its nest inside the tree. Seeing this bird is a goal for many bird enthusiasts.*



The map is for illustration purpose only and international boundaries are not definitive.

*Thailand's National Parks and other protected areas are spread throughout the country and cover all habitats, including both terrestrial and marine. Increasingly, they are being managed as a system where the various sites coordinate their management and contribute to making the entire landscape more productive.*

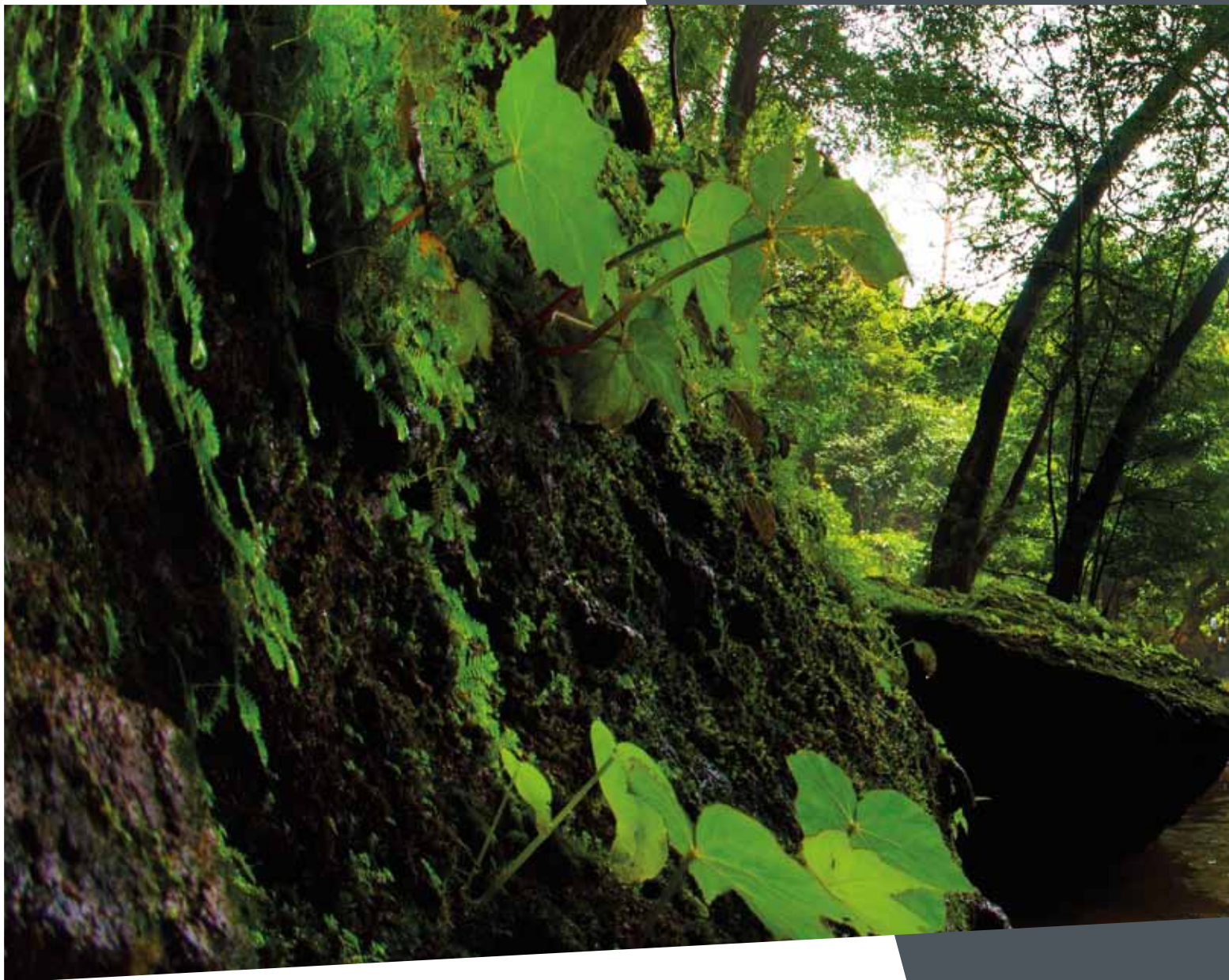


*Satellite images show dramatically that Thailand's National Parks and other kinds of protected areas are keeping the country green. The western border with Myanmar, the forests of the southeast, Khao Yai-Dongphrayayen in the center, and the parks in the north are outstanding examples that are visible from outer space. The human domination of the Northeast and Central regions is also clear.*

Thailand's National Parks provide a unique opportunity to enable people to maintain their contact with nature, and reflect Thailand's national identity. While many will link National Parks first with nature, these areas are more accurately seen as social institutions that are living illustrations of the value Thai people give to maintaining the beauty and productivity of the land where we live.

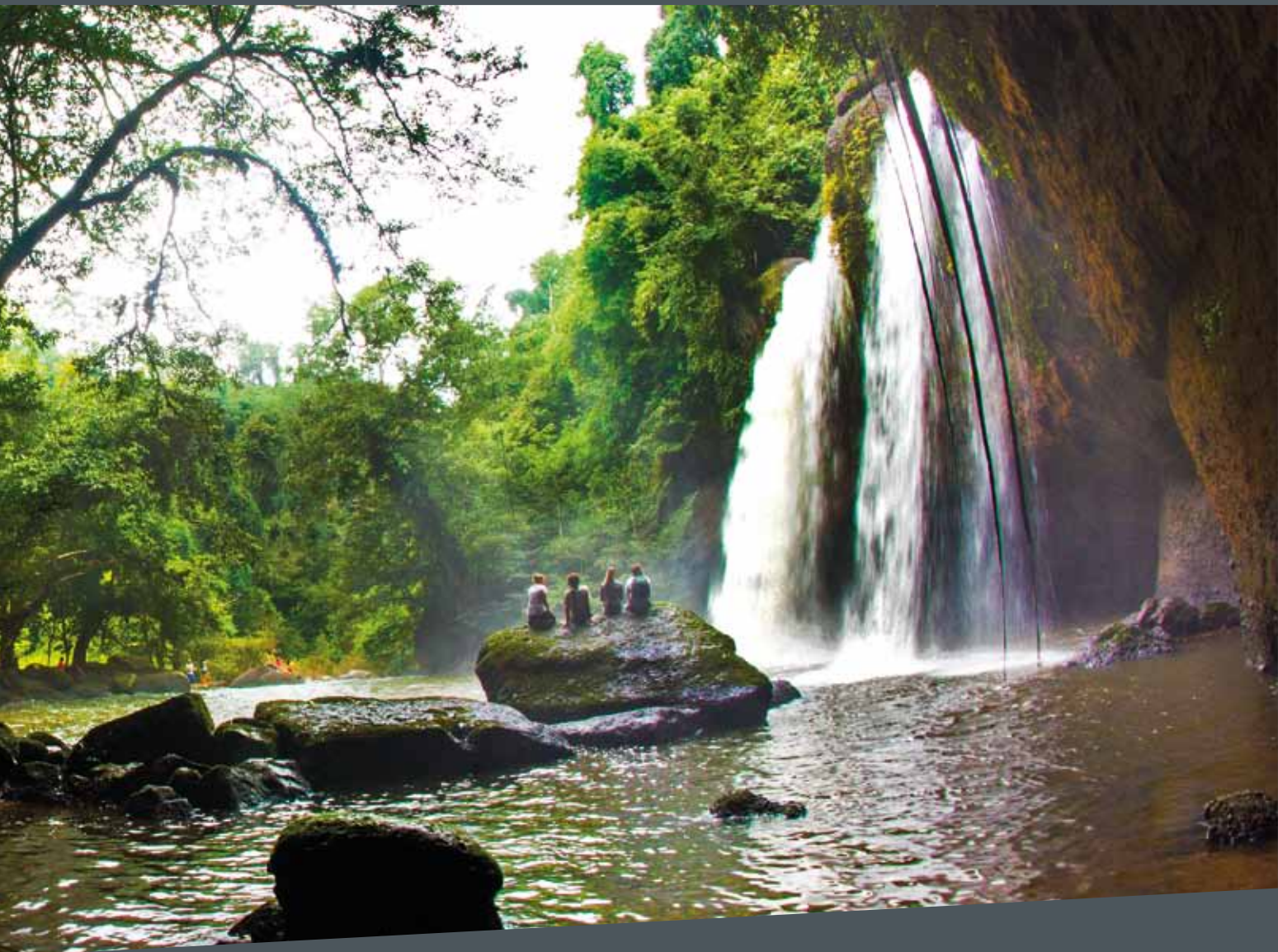
**In short, protected areas provide significant and sustainable social, economic, cultural, and environmental benefits to people of Thailand. We describe these in the following chapters, with the elements we present having variable relevance in the different National Parks because of their great diversity in history, size, location, wildlife, tourism, and other factors.**





# 2

## THE HISTORY OF PEOPLE AND NATURE IN THAILAND



THE PEOPLE OF THAILAND, LIKE ALL PEOPLES, ARE LINKED TO THE LANDSCAPE WHERE WE LIVE. THE OVER 100 ETHNIC GROUPS RESIDING HERE ENRICH OUR CULTURE BY CONTRIBUTING A GREAT DIVERSITY OF RELATIONS TO NATURE.

## CHAPTER 2

# THE HISTORY OF PEOPLE AND NATURE IN THAILAND

The people of Thailand, like all peoples, are linked to the landscape where we live. The over 100 ethnic groups residing here enrich our culture by contributing a great diversity of relations to nature. Rural people who have intimate links to nature, such as foragers, farmers or fishermen, may perceive their habitats and the species that share them in ways that are very different from people who live in cities. But all Thai citizens, and even visitors to Thailand, cannot help but be affected by the rivers, mountains, waterfalls, beaches, coral reefs, mangroves, canals, ricefields, hills, shorelines, reservoirs, forests, and wildlife that define the land where we live.



*The many landscapes, river systems, and seascapes of Thailand provide the setting for our culture, with the National Parks providing the most outstanding examples of relatively undisturbed nature.*

All people living in Thailand are dependent on the products of the land and waters, the rice, chickens, durians, pigs, mangoes, peppers, fish, coconuts, bananas, eggplants, papayas, garlic, crabs, and the hundreds of other species that help give the Thai cuisine the distinctiveness that contributes so much to the culture of Thailand, and is globally appreciated. National Parks form a critical part of the productive landscapes and seascapes that provide the setting for Thai culture and the history that has led to its current prosperous state.

And like all countries, Thailand's culture reflects its often-tumultuous history, formed as different cultural influences flowed across the rapidly changing landscapes and shorelines<sup>2,3,4,5,6</sup>. Its geographic location as the keystone of Southeast Asia has made it a crossroads for wildlife and human wanderers, and later voyagers and traders, circulating to and from India, China, Indonesia, and points further abroad.

When thinking about how National Parks contribute to Thailand's culture, we have found it helpful to seek a broad understanding of the historical setting of both the people who have occupied the land and the natural settings that supported their way of life. This chapter will paint a large picture of how nature has affected the people living here, how humans have affected the country's landscape, and how their knowledge of the environment has helped shape modern culture.

It starts in the distant past and continues until today, providing a historical context for National Parks rather than attempting a comprehensive review of a very rich past that is still being debated among historians, archeologists, and social scientists. Our intention is to build understanding of relationships with nature that have evolved over thousands of years, leading to a greater appreciation of these interactions and the role of National Parks in sustaining them today.

### **Thailand's earliest humans**

Recent discoveries have indicated that our ancient ancestors were living here millions of years ago. Judging from the 2004 description of a diminutive human ancestor found buried deep in a cave on Flores island in Indonesia<sup>7</sup>, and subsequently given the common name of "the Hobbit", our part of Asia was deeply involved in the evolution of modern humans. The Hobbits (formally called *Homo floresiensis*), though they were still thriving in eastern Indonesia as recently as 15,000 years ago, were physically much more like our ancient ancestors in Africa from over two million years ago, judging from anatomical comparisons of fossils of their feet, hands, shoulders, and teeth with similar remains of the earliest humans<sup>8,9</sup>. This suggests that ancient humans were passing through Thailand and may well have lived here for tens of thousands of years on their way to the islands of Indonesia and beyond, though no archeological proof has yet been found, perhaps because no suitable sites have yet been explored. But the remarkable discovery in Flores is a dramatic reminder of how much remains to be learned from further research in potential fossil deposits.

The earliest documented ancestors of our species in Asia, formally named *Homo erectus*, probably pushed the earlier Hobbit-like ancestors out of Thailand at least

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WHEN THINKING ABOUT HOW NATIONAL PARKS CONTRIBUTE TO THAILAND'S CULTURE, WE HAVE FOUND IT HELPFUL TO SEEK A BROAD UNDERSTANDING OF THE HISTORICAL SETTING OF BOTH THE PEOPLE WHO HAVE OCCUPIED THE LAND AND THE NATURAL SETTINGS THAT SUPPORTED THEIR WAY OF LIFE.

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Our earliest relatives to arrive in Thailand may have resembled the newly discovered "Hobbit" from Indonesia. They were living along Asia's rivers, streams, and coasts over a million years ago.



700,000 years ago. These early humans were spread across much of the region, with fossils found from China to Indonesia<sup>10</sup>. Judging from the confirmation of their presence by stone tools of *Homo erectus* discovered in Lampang by a team from Mahidol University in the 1970s<sup>11</sup>, it seems likely that they occupied Thailand's hills, floodplains, and coastlines, hunting wild animals, fishing in the streams, collecting shellfish along the coast, and gathering wild plants by using wooden and stone tools as well as fire.

Their stone implements, slowly improving over the millennia, have been found in many parts of the country, including Lopburi, Mae Hong Son, Ubon Ratchathani, Krabi, and Nakhon Si Thammarat, often in caves and rock shelters along rivers and streams where these early humans prospered<sup>12</sup>. The work of archeologists has indicated that these early humans preferred coastlines and more open forests, close to water, where many of their prey species also congregated, including animals such as hippopotamuses and several species of elephants that are now extinct<sup>13</sup>. And other predators, such as wolves, hyenas, tigers, and leopards also lurked nearby and were surely willing to convert a careless hominid into a meal.

The human hunters and coastal foragers were no doubt constantly on the lookout for sources of useful stones for their tools, especially flint, chert, and volcanic stones that could be chipped to form sharp knives and spear points, as well as more sturdy instruments for chopping, pounding, and digging up edible roots. It appears that the coastal peoples also used many kinds of shells as tools, and even drew abstract patterns on some of them. Recent discoveries of this ancient artwork demonstrate significant creativity among these ancestral humans<sup>14</sup>. And they were certainly testing every fruit, vegetable, leaf, animal, insect, fungus and anything else that might offer a tasty meal, or at least nutrition. They undoubtedly learned quickly which were edible and which were poisonous, just as do other species of animals, and passed this knowledge onto their relatives. Much of this knowledge survives until today, though our modern diet is very different.





*Later arrivals from Africa to Asia ranged from China to Indonesia and were using fire for cooking and to improve hunting conditions several hundred thousand years ago. They had significant influences on vegetation and the wildlife they hunted.*

Not surprisingly, many of the archeological sites where evidence of these early humans is being discovered are located in or around National Parks that are still rich in the kinds of resources that our ancestors were seeking. For example, ancient stone tools can still be found on promontories overlooking what would have been wildlife-rich wetlands in what is now Sai Yoke National Park in Kanchanaburi. A visitor today can sit quietly on such viewpoints and imagine how a Stone Age hunter could be surveying the opportunities for finding a meal for his family as the sun rises over a herd of plump deer drinking at the edge of a pond or stream. While many conditions have changed, our National Parks help give us an impression of the kinds of environments that may have been home to some of our earliest ancestors.

Our ancestors were living here in a time of dynamic climates, known by geologists as the “Pleistocene Epoch” and popularly known as the “Ice Ages.” Lasting from

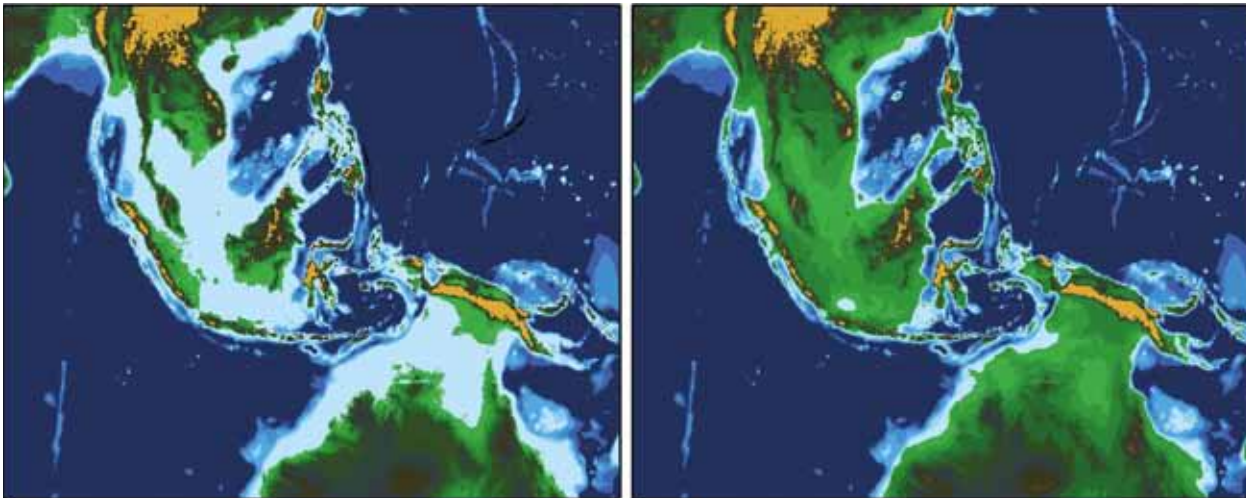


*The streams and swamps of Sai Yoke National Park in Kanchanaburi are a good example of ideal habitats for the early people living as hunters in what is now Thailand. Stone tools can still be found on the hilly areas overlooking the hunting grounds where game gathered to drink and bathe.*

roughly 2.7 million to 11,700 years ago, the Pleistocene was a dramatic time of variations in radiation from the sun and major volcanic eruptions that led to over 40 substantial periods of time when glaciers covered as much as 30% of the Earth, interspersed by shorter periods that had more amiable climates much like today's. It appears that climatic conditions like ours were enjoyed for only about 2% of the past million years, so our current climate should be considered a rare blessing<sup>15</sup>.

During the cold phases of the Ice Ages, a substantial amount of the world's water was tied up in massive ice sheets that covered much of Europe, North America, Russia and the high mountains of the tropics. As a result, sea levels were as much as 120 meters lower than at present and Thailand was linked directly to Sumatra, Java, and Borneo. This allowed mammals to move freely among these islands, expanding their populations along with numerous kinds of plants that took advantage of the new conditions<sup>16</sup>. All of Southeast Asia was generally colder and drier, and Thailand's additional territory in what is now the Gulf of Thailand was mostly grasslands and deciduous forests that resembled the savannas of today's East Africa. The river systems, too, were very different and offered productive habitats for our ancestors, though most of the best sites where hunters may have gathered are now deep under the sea. Our ancient ancestors adapted well to these changes, developing new hunting techniques to harvest some of the large mammals that grazed the savannas and finding plentiful plants to provide fruits, nuts, and other consumables such as firewood, dishes, and tools.

The wildlife of those prehistoric times was very different from that of today, judging from the rich fossil beds that have been found in several parts of Thailand, perhaps most notably in Tha Chang, Nakhon Ratchasima, where numerous fossils of large



*During the cold phases of the Pleistocene Ice Ages, the sea levels in Southeast Asia were 120 meters lower than today, allowing species to move freely between Indonesian islands and the mainland. Much of the newly-exposed land (shown in green on the right, with shallow water in light blue) was covered in grasslands and open forests, offering ideal habitats for our hunting and foraging ancestors. Sea levels returned to their current level only about 10,000 years ago, and at times were even a few meters higher than they are today.*

mammals are still being found (see [www.khoratfossil.org](http://www.khoratfossil.org)), including horses, giraffes, and a wide variety of elephant relatives. Similar species roamed across the savannas that grew in the lands exposed by the lower sea levels<sup>17</sup>. This region, now beneath the deep blue sea of the Gulf of Thailand, is called “Sundaland” by paleogeographers and was nourished by a system of long-gone rivers that today are represented by junior versions of their previous grandeur. For example the Pleistocene-age “Siam River” drained much of what is now Thailand, and included the Mekong River that in those days came from what is now Lao PDR and Northeast Thailand. The Chao Phraya River is a junior replacement internal to Thailand, and the Mekong captured its headwaters in Tibet from what is now Viet Nam’s Red River to take its current route only about 5,000 years ago. Our land has had an exciting geographical history.

Part of this saga included a major disaster that has never been experienced within recorded history. Consider living in the forests of Thailand as a *Homo erectus* hunter 75,000 years ago, quietly roasting a leg of venison over a campfire with your family, when the Earth started to rumble, and then the sky seemed to explode. The air was filled with 800 cubic kilometers of ash, roughly the amount that forms the entire Mt. Everest. A thick layer of volcanic ash covered southern Asia, including parts of Thailand, and some of the ash even reached Greenland. The estimated six billion tons of sulphur dioxide that were injected into the atmosphere led to decades of weather that was at least 3.5 degrees C cooler than the Ice Age would have been otherwise<sup>18</sup>. This influenced the distribution of the vegetation and many animals, possibly even affecting populations of our *Homo erectus* ancestors and leaving parts of Thailand unpopulated. Those living along the highly productive coastlines may have been washed away by a massive tsunami that accompanied the explosive eruption<sup>19</sup>.

This event was the spectacular eruption of the north Sumatran volcano known as Mt. Toba, 1,000 times more destructive than any historically known volcano<sup>20</sup>. The details of the impacts of this eruption on our ancestors are very poorly known because of scanty archeological evidence, but it coincided with a cold period when the sea level was over one hundred meters lower than at present, and with the time when *Homo erectus* was replaced by modern humans.

### **The arrival of modern humans**

Our own species, technically known as *Homo sapiens*, emerged out of Africa, reached Asia over 60,000 years ago as the impacts of the Mt. Toba eruption began to fade away, and washed up on the shores of Australia at least 55,000 years ago. It is reasonable to assume that these energetic pioneers who eventually reached Tasmania would have passed through Thailand, whose Pleistocene coastlines, savannas, and rivers would have been part of any route to points south. And of course some found amiable conditions in Thailand, and decided to stay.

The early *Homo sapiens* were hunting and foraging peoples who still lived in small bands and perhaps seasonal villages. They likely found the late Pleistocene a time of relative plenty, offering productive habitats for many species of wildlife, including grazers that could be hunted and their predators that offered some competition

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THIS REGION,  
NOW BENEATH  
THE DEEP  
BLUE SEA OF  
THE GULF OF  
THAILAND,  
IS CALLED  
“SUNDALAND”  
BY  
PALEOGEO-  
GRAPHERS  
AND WAS  
NOURISHED BY  
A SYSTEM OF  
LONG-GONE  
RIVERS THAT  
TODAY ARE  
REPRESENTED  
BY JUNIOR  
VERSIONS  
OF THEIR  
PREVIOUS  
GRANDEUR.

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and possible dangers. The mammals included several species of elephants, as well as hippos and a wide range of pigs, wild cattle, deer, and antelope, only a few of which survive until today<sup>21,22</sup>. These pioneers of our species may well have contributed to the extinction of at least some of these large species that may have been easy prey for a hunter with new technologies<sup>23</sup>. Unfortunately, any hunting sites that they may have left behind are now covered in sediments under the waters of the Gulf of Thailand and the Java Sea.

*Many species lived in what is now Thailand during the Ice Ages, including ancestors of elephants known as Stegodon shown here in an artist's conception from Khorat Fossil Museum. Their fossils have been found in many parts of the country. Hippos, horses, hyenas, antelope, and many others disappeared toward the end of the Ice Ages, along with our early ancestors. This set the stage for the arrival of modern humans.*



While all of this was happening, people were living productively in Thailand and developing their own knowledge about how best to survive in the variable conditions of coastlines, wetlands, hills, and forests. But the earliest actual evidence of modern humans here comes from 35,000-year-old human remains and tools in archeological sites from caves in Mae Hong Son province, near Tam Pla-Namtok Pha Sawa National Park, and from remarkably productive archeological investigations at Lang Rongrien Cave in Krabi<sup>24</sup>.

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**THESE PIONEERS OF OUR SPECIES MAY WELL HAVE CONTRIBUTED TO THE EXTINCTION OF AT LEAST SOME OF THESE LARGE PREY SPECIES THAT MAY HAVE BEEN EASY PREY FOR A HUNTER WITH NEW TECHNOLOGIES**

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*Archeological sites in National Parks are telling us a lot about how the earliest members of our species were living. They used a variety of stone tools and depended on caves for shelter and streams and forests for food.*



The fossils found in these sites indicate that these early residents of what is now Thailand looked something like the short-statured negrito people who still hunt and gather in the forests of Yala, Satun, Trang, and Phattalung (where they are called Sakai), on the Andaman Islands, in peninsular Malaysia (where they are called Semang), and in a few other isolated parts of the region<sup>25,26</sup>.

Judging from the way other foraging and nomadic peoples live in tropical forests and savannas<sup>27</sup>, it seems highly probable that those who occupied the forests, riversides, coastlines, and swamps of Thailand modified their habitats in various ways to make them more productive for people. They certainly used fire to cook, but also to clear old grass from the open forests that were found in the drier parts of the country. This attracted deer and other species to feed on the new grass shoots, making it easier to hunt them.



*The earliest arrivals of our species in Thailand looked much like the Sakai people who still live in parts of southern Thailand. They survive in small groups, foraging in the forests and trading with Thai villagers. Other such people also live on the Andaman Islands, Malaysia, Indonesia, and the Philippines, always in small groups or beginning to work as hired agricultural laborers.*

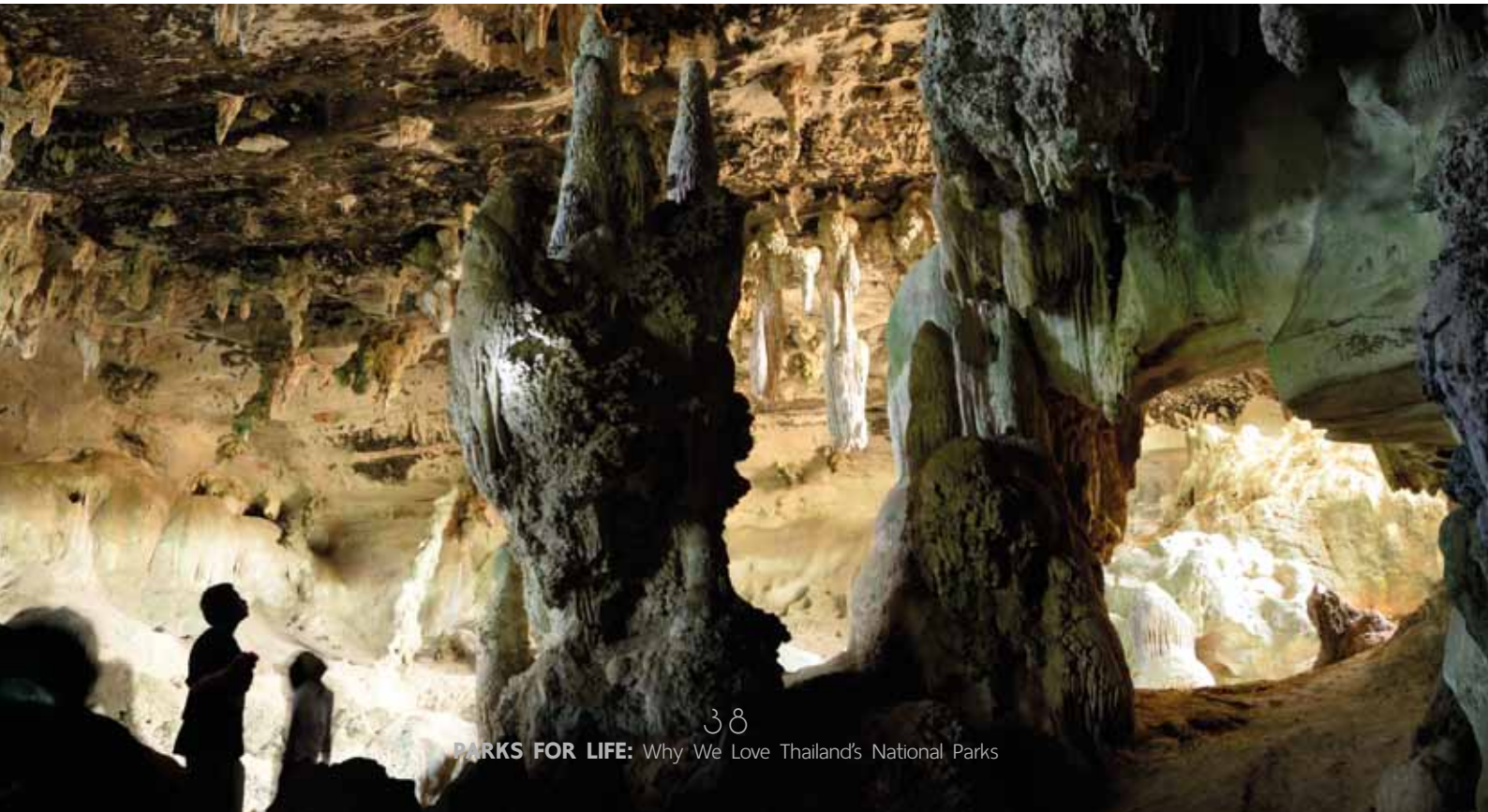
More generally, as people moved through the forests and savannas, they intentionally planted wild fruit trees, vegetables, and medicinal plants in certain suitable places, so they could return and harvest resources from them or hunt animals attracted to fallen fruit. While they were not exactly farmers, they were already managing their habitat to provide a more reliable source of food and setting the stage for agriculture<sup>28</sup>. Those living along the coastlines and estuaries also modified their environments to make it more convenient to collect the shellfish and other species that were a valued part of their diet<sup>29</sup>. Our forest- and coast-dwelling ancestors were not idle responders to the environments they found, but rather active agents in making their habitats more productive for their interests by influencing the distribution of plants and animals. In other words, they were very much part of Nature.

Their later agricultural practices attracted wildlife by creating optimal habitats for them too, with a rich diversity of nourishing plants within easy reach of large mammals that could then be hunted<sup>30,31</sup>. Rather like the way we are today creating National Parks to meet our modern needs.

## **More sophisticated cultures evolve in the forests, and along the coastlines**

The earliest fairly sophisticated culture in Southeast Asia started to appear about 15,000 years ago, when the conditions were still relatively cool and the forests were more open than they are today. These cultures are generally called “Hoabinhian” by archeologists, though the widely dispersed archeological sites show considerable variation in both the species they were harvesting and the tools they were using, demonstrating their capacity, even necessity, to adapt to the local conditions where they lived. It seems likely that they hunted with bows and arrows or blowpipes with poisoned arrows (much like the Sakai still use today), though such biodegradable instruments hardly ever survive in archeological sites. They left plentiful other evidence of their presence in the caves and rock shelters that are often found in our National Parks, close to streams that provide land snails and freshwater molluscs that the Hoabinhian people seemed to have enjoyed eating, judging from the remains of these species at their campsites. They seem to have well understood that it is a lot easier to catch a plump snail than to hunt an elephant. The evidence of these industrious people may be most likely to be found in National Parks that have been able to conserve reasonably natural conditions, since their ancient sites elsewhere have often been transformed by modern developments.

*Many of our National Parks have rock shelters like this one, helping to preserve important evidence about Thailand's early hunting and foraging cultures, known broadly as Hoabinhian.*



As the Pleistocene drew to a close, the climates slowly warmed, rainfall increased, major rivers changed their courses, and forests returned to their typical diversity of the more pleasant climates that have lasted until today. Caves and overhangs near streams that were suitable for human occupation during these times when the climate was more like today's are often found in National Parks, especially in the northern and western parts of the country, such as Ob Luang National Park in Chiang Mai, where ancient cave paintings can still be seen. Such sites were used regularly by ancestral humans, judging from the discovery of numerous stone tools, animal bones, plant remains (especially pollen), and shells that show signs of people eating their contents<sup>32</sup>.



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**CAVES AND OVERHANGS NEAR STREAMS THAT WERE SUITABLE FOR HUMAN OCCUPATION DURING THESE TIMES WHEN THE CLIMATE IS MORE LIKE TODAY'S ARE OFTEN FOUND IN NATIONAL PARKS**

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*Cave paintings in Ob Luang National Park help us understand how our ancestors were developing their culture, based on hunting and foraging along stream beds in habitats much like those conserved in today's National Parks.*

The Hoabinhian people were dominant until about 5,000 years ago<sup>33</sup> but were slowly being displaced over thousands of years by a trickling flow of other foragers with more sophisticated technology, judging from the evidence collected by archeologists in recent years<sup>34</sup>. The way of life of the opportunistic people who hunted, fished, and collected various kinds of plants, insects, and snails encouraged constant moving, following resources and shifting with the seasons as they followed the trails of other animals through the forests and grasslands, and moved along streams that teemed with life. As long as populations of the Hoabinhians were small and the forests were large, the hunters could stay in a productive location until they had reduced the population of wildlife, and then move on to a locality that would give them a better return on their investment of time and effort (their major economic assets in those times). Many of their ancient tracks are now nature trails in the National Parks, giving visitors a chance to experience at least part of the emotional links to the forests that today are tourist attractions, instead of home.

Many of the plants the Hoabinhian people collected and nurtured were later domesticated, including species such as peas, yams, cucumbers, peppers, betelnuts, bottle gourds, water chestnuts and many other species still found in the National Parks<sup>35</sup>. They also began to use new kinds of stone tools, with ground and polished axe blades that could have been used to clear forests. This has led some to speculate that as long as 10,000 years ago the Hoabinhian people of Thailand were well on their way to becoming some of the world's earliest farmers, domesticating both animals and plants that had already been closely associated with people.

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## PARK RANGERS SOMETIMES NEED TO SET CONTROLLING FIRES IN SOME NATIONAL PARKS TO MAINTAIN PRODUCTIVE HABITAT CONDITIONS

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*In Pha Taem National Park along the banks of the Mekong River, the rock paintings show people and the Giant Mekong Catfish that clearly was a popular target of their fishing efforts. National Parks play an important role in conserving such cultural sites.*

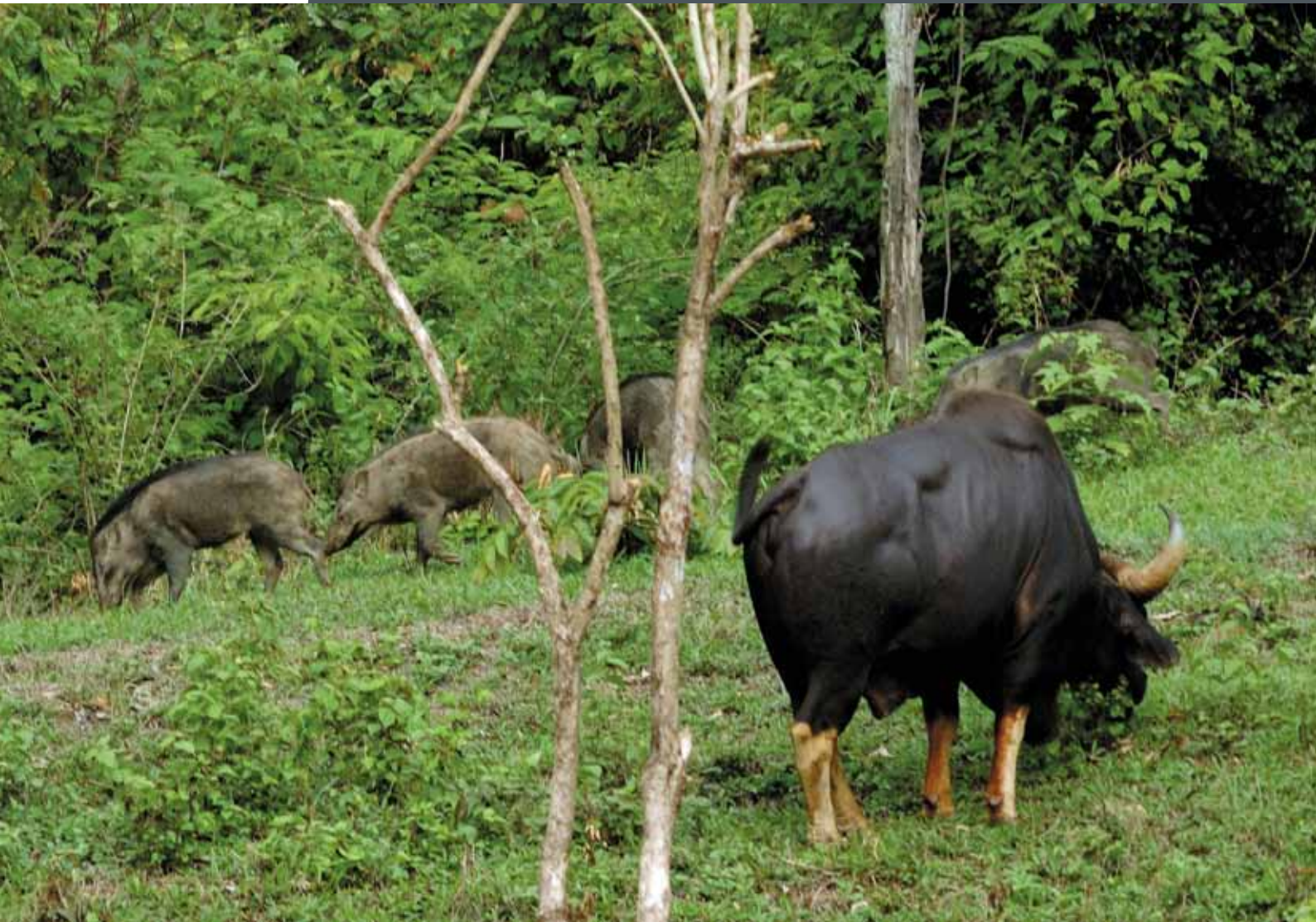


Wild pigs and pheasants from Thailand's forests would have been especially attractive early animal subjects for domestication, when groups of hunters may have captured piglets and chicks and turned them over to their children to raise. Of the 10 species of pheasants found in Thailand's forested habitats (many now confined to National Parks), the Red Jungle Fowl turned out to be the most suitable for domestication and is now a valuable resource that numbers about 25 billion throughout the world (almost four chickens per human). And about 800 million domesticated pigs have a wild relative of the same species flourishing in many of Thailand's National Parks. Chickens and pigs were ideal for early humans as they began to farm, being relatively small, easy to nurture, and with a readily available wild stock to replenish the farmed versions of these species. Both of them were significant early living elements of Thailand's culture, and can still be seen wild in the National Parks, domesticated on farms, and served in various recipes in food stalls and restaurants.

Several other culturally important wild species found in Thailand made their appearance as domesticated animals somewhat later in Thailand's development, including elephants, water buffalo, Banteng (still wild in Thailand, but a domesticated form of this species of cattle lives in Bali), and Gaur. These latter two species, as well as the Kouprey (which is now extinct) may have contributed some genes to early forms of domesticated cattle that lived in ancestral Thailand (probably having arrived from India).

By no later than 8,000 years ago, Hoabinhian people started clearing the forests using fire and planting food species in the ashes for a few years before the new growth of weeds encouraged them to clear new sites, a form of farming (technically known as shifting cultivation or swidden agriculture) that is still found in some parts of Thailand today<sup>36,37</sup>. The abandoned fields were, and remain, attractive for many species of wildlife, including elephants, deer, pigs, monkeys, and especially the wild cattle that prefer these edge habitats to deep forests, because they can feed more easily on the vegetation that reclaims the abandoned fields that are no longer productive for farming<sup>38,39,40</sup>. This has important implications for National Park managers who are expected to conserve these species that prefer low-growing vegetation and seasonal forests to the tall, mature evergreen forests favored by





*Wild pigs and cattle provided promising species to begin the process of domestication. The wild pigs still found in our National Parks are the same species as domestic pigs, and they sometimes interbreed in the most remote parts of the country. Our domestic cattle came from India, with the fierce gaur too difficult to tame.*



*The Banteng is an Endangered species of wild cattle in Thailand and Java, where it is restricted to National Parks and other protected areas. The Red Jungle Fowl is a wild species found in many of our National Parks, here shown in Khao Ang Rue Nai Wildlife Sanctuary. It is the same species as the common farmyard chicken, and they sometimes interbreed.*

gibbons, hornbills, and many other species. This is why you may sometimes see park rangers setting controlled fires in parts of some National Parks.

But rice was not yet a major part of the diet.

Around the same time as agriculture was spreading, the sea level may have been three meters higher than at present, meaning that the Chao Phraya delta was submerged as part of the Gulf of Thailand as far north as what today is Ayuthaya<sup>41</sup>. Thailand's flooding at that time may have presented no more than a productive new coastline for the Hoabinhians, but it also may have marked the beginning of the end for them as new people began arriving from the north and displaced them from the most productive habitats for farming. Alternatively, they may just have been absorbed into the cultures of the new arrivals with superior technology.

*Shifting cultivation, also called slash and burn because it involves cutting the forest and burning it, maintains a variety of habitats that support many species of large mammals when it is practiced at a sustainable level. But when the forests are not given time to regrow, the habitats can become degraded. A challenge for National Park managers is how to maintain the traditional diversity of habitats maintained by low populations of hill farmers.*



By about 5,000 years ago, the Hoabinhian people were being steadily displaced by new arrivals of more advanced cultures coming from several directions, following the coast along the Malay peninsula from the south and coastal Burma from the north, crossing the Mekong to the east and north and the Salween (now called Thanlwin) to the west, and trekking across the northern mountains from China. Some of their descendants survive today as the Urak Lawoi people who came from Indonesia over 100 years ago and now live on the islands and coasts of the Andaman Sea, including on some of the islands of Koh Tarutau National Park, such as Lipe and Adang. They are genetically similar to the Aboriginal Malays of the southern Malay peninsula<sup>42</sup>.

This steady flow of immigrants, including many ethnic groups speaking Mon-Khmer languages, brought innovations such as domestic animals from other countries (such as dogs, cats, and ducks), metals like copper and tin (and later alloys like bronze), and crops like upland rice. These thinly spread early farming villagers of Thailand learned much about the forest, coastal, and wetland resources from those who were already present and added their own innovations, helping to develop new cultural adaptations to the environmental challenges of Thailand at a time of significant changes in temperature and rainfall, and the resulting new ecosystems. Their survival depended on how well they managed their habitats and the resources they provided, with different approaches being effective in different kinds of habitats.

If we could go back to Thailand at that time, we might well consider the entire country a National Park because of the rich wildlife, diverse forests and sparse human populations that formed Wild Thailand.



*People like the Moken, Moklen, and Urak Lawoi, commonly called “sea gypsies”, have been living along the Andaman Sea coastlines for thousands of years, though the current groups arrived relatively recently and live in parts of our Marine National Parks.*

## The arrival of the Thais, and rice

The Tai peoples started arriving some 2,000 years ago, from southern China where their relatives still live. The Tai immigrants apparently settled first in the hills of the north, where some related groups still live, and brought upland rice cultivation to Thailand<sup>43</sup>. These hill farmers lived in a sort of balance with nature, harvesting many wild resources but generally keeping their harvesting within bounds of sustainability by treating the resources with respect that is still reflected by the virtually universal belief in spirits, among both urban and rural people<sup>44</sup>. More recent arrivals have included the Karen, Akha, and Lolo (originating from Tibet), Cham (originating from Vietnam), and various other ethnic groups from the neighboring regions, all bringing their own insights about how to adapt to the kinds of forests and other habitats found in Thailand. Today's Thailand is a rich tapestry of numerous ethnic groups, with customs and beliefs drawing from many sources that all contribute to the vibrant modern culture.



*Numerous ethnic groups live in the mountains of Thailand, often in and around the National Parks in northern and western parts of the country, adding diversity to the sites and knowledge about resource management.*

About 1,800 years ago, the idea of irrigated rice arrived in Thailand and led to significant changes in the way people treated the land. It appears that irrigated rice was brought into northeastern Thailand from people speaking Mon-Khmer languages, who were the dominant cultures in Thailand for roughly 1,000 years<sup>45</sup>. Their link to rice is well indicated by the imprints of rice husks in the bricks they used in construction as well as the shape of the fields they were cultivating, designed to facilitate irrigation and water sharing. Many wetland areas that were naturally irrigated by floods during the rainy season were converted into ricefields, yielding a surplus of food that was sufficient to nourish some of the world's most sophisticated civilizations at that time.

Part of the “rice revolution” that became so central to Thai culture was the domestication of the fierce and aggressive wild water buffalo that lived in the floodplains of the major rivers, precisely the environments that were ideal for rice. Today’s domesticated water buffalo is typically a gentle beast, easily handled by children, and an essential part of cultivating the flooded ricefields of the Northeast, where low walls (called “bunds”) form shallow ponds in which the rice prospered and gave high yields<sup>46</sup>. Wild herds of buffalo were still common in the floodplains and offered a ready source of new stock when needed. Today, water buffalo remain an important part of Thai culture, an image of bucolic rural life even though much of their traditional farm work has been transformed by modern equipment in the hands of better-educated and more productive farmers.



*The technological innovation of irrigation was revolutionary, enabling significant agricultural surpluses to be grown and changing Thailand from a diverse collection of village cultures to a center of high civilization.*

Cultural influences came steadily from India and China to these rice-growing areas, bringing State religions (both Buddhism and Hinduism) and the idea of irrigation through intentional water control that involved significant labor in constructing sophisticated irrigation systems. This innovation led to much higher productivity and the spread of rice into the forest lands that could be cleared and converted into ricefields (though villages also maintained sacred forests, some of which survive until the present as community forests)<sup>47</sup>. Villages were formed around ponds that captured water for domestic uses, and their surplus of rice helped nourish a remarkable flowering of high civilizations.

Much wildlife habitat was being converted to rice, but the forests and wetlands still supported vast populations of birds, crocodiles, turtles, fish, and other species. These habitats also were the home of wild elephants that could be captured and domesticated, becoming an important part of these monumental civilizations, working in forests, helping to build large stone temples, performing ceremonial duties for royalty, and eventually playing an important role in the military conflicts that raged across southeast Asia in early historic times. Notable among the many speakers of Mon-Khmer languages spread across Thailand are the Kui (or Suay, as they prefer to be called) people who live in Surin and are renowned for their expertise in capturing and managing wild elephants, a valuable source of traditional knowledge that has contributed to the use of elephants in Thai culture and is still being applied in various parts of Thailand<sup>48</sup>. Today, wild elephants are confined largely to National Parks and other protected areas, but the wide popularity of these pachyderms indicates their continuing importance in Thai culture. Seeing these magnificent, lumbering, agile, and intelligent tuskers in their natural habitat remains one of the thrills that National Parks can provide to visitors.

*The Wild Water Buffalo is Endangered in Thailand, with a small population remaining in Huay Kha Khaeng Wildlife Sanctuary. But its domesticated form has played a major role in the rice culture that supported Thai civilizations, and is still part of rural life.*





*Khao Phra Viharn National Park contains important cultural sites dating from Khmer times, when the center of civilization was at Angkor Wat in Cambodia but spread into Thailand at least as far as the Chao Phraya River.*

*Wild elephants depend on National Parks for their continued survival, and the domestic version has long been an important element of Thai culture. The Elephant has been declared a National Treasure, and 13 March is National Elephant Day. It is closely linked to the Buddha, in many roles. The elephant's religious expression as Ganesh, a Hindu influence, is widespread throughout the country, venerated as a remover of obstacles and patron of the arts.*



Perhaps the most dramatic manifestation of the grandeur of these complex civilizations is Angkor Wat in Cambodia, which started being constructed in the first half of the 12<sup>th</sup> century and was never really completed<sup>49</sup>. It is now part of Angkor Archeological Park, a World Heritage Site that includes a substantial forest area that conceals many other temples, much like some of the National Parks in northeastern Thailand. The best-known Khmer temple from this era in Thailand is Phimai, in Nakhon Ratchasima, part of a National Historical Park. It was at one end of the Ancient Khmer Highway from Angkor, with temples and resting spots found along the highway, many of them now protected in National Parks that were once part of the Khmer transportation system.

In the Chao Phraya basin, the monumental architecture took a rather different course with Sukhothai (established 1238) as the first capital of what could be considered a Thai State<sup>50</sup>. Designed originally as a Khmer-style city, its leaders then separated Sukhotahi from the Cambodia-centered Khmer empire about 900 years ago, steadily expanding its influence over the upper Chao Phrya basin as far north as Tak. Many of the farmers who were part of Thai civilization planted rice, with flood plain irrigation steadily being replaced by state-sponsored irrigation systems that still function today, though with modern improvements. This highly productive system generated food surpluses that were sufficient to support armies, a priesthood, and the monumental architecture that survives today as ruins that are part of the Sukhothai Historical Park World Heritage Site.

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**MANY OF THE FARMERS WHO WERE PART OF THAI CIVILIZATION PLANTED RICE, WITH FLOOD PLAIN IRRIGATION STEADILY BEING REPLACED BY STATE-SPONSORED IRRIGATION SYSTEMS THAT STILL FUNCTION TODAY**

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*The Sukhothai Historical Park World Heritage Site reflects the earliest Thai civilization, which depended on a significant flow of resources from the rural areas that are now National Parks.*



While the agriculture supporting Thailand's high civilization expanded, it was confined mostly to the flood plains and coordinated with the monsoon rainy season, leaving ample wildlife habitat. The art that remains from that time shows elephants, rhinoceroses, deer, and many other species that are today confined to National Parks. Thailand's two species of rhinos are now probably gone, though one still hangs on in Java's Ujung Kulon National Park on an island one quarter the size of Thailand and supporting more than twice as many people, and the other lives in very small populations in Sumatra, Borneo, and the Malay Peninsula<sup>51</sup>.



Many of Thailand's hills remained forested and were occupied by the wide variety of ethnic groups who practiced shifting cultivation. Generally known as "hill tribes", their descendants still occupy parts of these hills today. Domesticated elephants, water buffalo, cattle, pigs, chickens, ducks, geese, swans, dogs, and cats were put to work building the cities, feeding the people, and forming an essential part of the production system. Wildlife still prospered in the rural areas, and even lurked in the suburbs of Bangkok until very recent times.

The center of Thai civilization moved to Ayuthaya over 650 years ago (when it may have been one of the largest cities in the world), with various surrounding provinces now reporting to this stronger center, which later moved to Thonburi and eventually Bangkok. These Thai civilizations engaged in active trade with neighboring countries, with some products even reaching Europe. Items of trade included medicinal plants, animal skins, ivory, rhinoceros horn, and various other forest products that reflected the natural wealth of the country<sup>52</sup>. The trade in many of these forest products continues until today, though many of them are protected and survive only, or primarily, in the National Parks. Some have disappeared from over-exploitation (such as rhino horn) and others are illegal because trade is a threat to their survival (for example, elephant ivory, pangolin scales, and rosewood).

### **Thailand becomes a global trading partner, requiring new forms of conservation**

Once Thailand started entering into more formal treaty relationships with foreign governments in 1856, trade in rice became much more important than forest products. Ricefields expanded to occupy many of the lowland swampy areas that were optimal habitats for elephants, rhinos, water buffalo, deer, and other species

*Thailand once supported two species of rhinoceros, with their cultural importance memorialized in statues from early civilizations. The wild ones are now gone from Thailand (Asian two-horned rhino on the left, Javan rhino on the right), with National Parks established too late to save them. But their presence remains among the ancient statues, such as this one in the Phimai National Museum.*



adapted to these wetlands. By the early 1900s, virtually all areas that were suitable for rice cultivation were being used, greatly affecting the species that were especially dependent on the floodplains. The last Wild Water Buffalo moved westward to Kanchanaburi and Uthai Thani, where a small population of around 40 still survives in Huay Kha Khaeng Wildlife Sanctuary, its only hope for survival in Thailand (India still has about 3,000 left).

**BUT POSSIBLY THE MOST INTERESTING OF THESE SWAMP-LOVING SPECIES WAS SCHOMBURGK'S DEER (NEUA SAMAN IN THAI), WHICH HAD REMARKABLE ANTLERS THAT COULD CARRY AS MANY AS 33 POINTS.**

*The wild water buffalo today is found almost only in National Parks and other kinds of protected areas, such as Thailand's Huay Kha Khaeng Wildlife Sanctuary. The wild form is much more aggressive than the much calmer domestic version, but some interbreeding still results when domestic buffalo cows graze in the Wildlife Sanctuary.*



*The magnificent Schomburgk's deer was found only in Thailand, but its swampy habitat could be readily converted to rice fields. Floods during the rainy season moved them to the isolated higher areas where they were easy prey for human hunters. The last wild one was killed in the 1930s.*

But possibly the most interesting of these swamp-loving species was Schomburgk's deer (Neua Saman in Thai), which had remarkable antlers that could carry as many as 33 points. A few retreated to Kanchanaburi Province in what are now National Parks along the Khwae Yai and Khwae Noi rivers, where the last wild ones were shot in 1932, erasing the species forever. One captive individual was kept in a temple in Samut Sakhon but was killed one night in 1938 by a drunken man who reportedly thought the deer was a wild one<sup>53</sup>. Conserving

such species would have been a responsibility of National Parks, had they existed at that time. Instead, this magnificent deer remains as a silent symbol of lost nature that was unique to Thailand.

By the 1950s and 1960s, virtually all the best agricultural land was in production.

Part of the agricultural expansion meant that the forests were disappearing fast under the roar of the chainsaw, and timber concessions were granted throughout the country beginning in 1850 and lasting until all foreign timber licenses expired in 1960. Based on British and German models, forestry in Thailand became a major commercial activity that focused on logging. The Danes brought in eucalyptus, a species native to Australia that is now spread throughout Thailand where it grows quickly but consumes large amounts of water<sup>54</sup> and replaces native species. The most valuable timber species remains teak, found mostly in the north where it is still grown in plantations and harvested from them today, often using elephants. Wild teak today prospers only in Mae Yom National Park, in Phrae Province, where it is protected against illegal logging. And elephants that worked in forestry are being steadily replaced by more modern equipment and finding new employment in the tourism industry.

International demand for fish pushed advanced technology into the fishing culture, replacing the traditional marine harvesting households with far more sophisticated fishing trawlers that could stay at sea for many days, even weeks, using bottom trawling and other gear that damaged coral and productive ocean floor habitats, thereby converting what had been a reasonably sustainable form of fisheries management into lucrative but short-sighted over-exploitation and rapidly declining yields.

While the economic growth based on exploitation of natural resources brought many benefits to the country, most of these resources were being over-exploited. The quick profits from natural resource exploitation were used to help build the modern economy, but numerous species were being pushed to the edge of extinction, significant habitats were being lost, and many rural communities were suffering.



*The wetlands around Bangkok were converted to farmlands in the mid twentieth century, replacing the habitats previously used by elephants, wild water buffalo, hog deer, and many other species.*

*Domesticated or tamed elephants have long worked in Thailand's teak plantations, an important part of the economy in the early 20<sup>th</sup> century and still a significant industry in some parts of the North.*



The more sophisticated economy required stronger protection of the remaining natural resources. Learning from the experience of many other countries, a small group of conservationists led by Dr. Boonsong Lekagul starting pushing for laws to protect Thailand's wildlife. With technical advice from the US National Park Service (Dr. George Ruhle), the Thai Parliament passed laws to protect its wildlife, first with the Wild Animals Reservation and Protection Act of B.E. 2503 (1960) and then with the National Parks Act of B.E. 2504 (1961).

A time of remarkable social and economic development followed, with natural resources exploitation increasingly being replaced by more productive agriculture and industrialization. When the Wildlife Protection Act and National Parks Act were passed, Thailand had about 27 million people earning on average just over \$100 per year mostly from agriculture, forestry and fisheries. Today it supports over 66 million people each producing on average over \$5,500 annually, giving Thailand the world's 32<sup>nd</sup> largest economy, according to the International Monetary Fund. As of 2014, exports amounted for about 65% of the economy, with tourism (including to National Parks) accounting for about 17%, and natural resources exploitation providing less than 10%.

The demands on National Parks have developed along with the economy, evolving from a few 1960-era sites with a rather narrow species conservation role to nearly 150 sites with the much greater responsibility of providing a wide range of benefits to people, including tourism, watershed protection, climate adaptation, biodiversity conservation, disaster risk reduction, sustainable development, and much else besides. When the government opened forests up to settlers in 1976-1978, over 11,000 km<sup>2</sup> were lost each year, leading to downstream flooding, sedimentation of dams, and other environmental problems<sup>55</sup>. One result was a nationwide ban on logging in 1989,



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## NATIONAL PARKS AND OTHER PROTECTED AREAS ARE NOW PART OF THE SERVICE-BASED ECONOMIC AND SOCIAL DEVELOPMENT THAT IS FORMING AN IMPORTANT PART OF THE MODERN THAI CULTURE

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*Fish farming has replaced traditional fishing in much of the world, including in the buffer zone of Ao Phangnga National Park in southern Thailand. This serves local, national, and international markets.*

presenting a unique opportunity for converting timber concessions into National Parks and the substantial network of other forms of protected areas that now are found in nearly every province. These special areas have become an important part of today's Thai culture.

**National Parks and other protected areas are now part of the service-based economic and social development that is forming an important part of the modern Thai culture. National Park managers are facing many new challenges in delivering these services, often related to the people who live in and around protected areas or who are visiting them. But the boons of National Parks reach far beyond their geographic location and provide multiple benefits to cities as well, thereby justifying their title as “National” Parks, and making major contributions to the Thai culture.**



*The transformation of the Thai economy from primarily agrarian to a modern industrialized part of the global economy is supported by the ecosystems now found mostly in the Kingdom's National Parks. The forests have traded their role as an earner of foreign exchange from the sale of timber in the old resource-based economy for a prominent role as a provider of ecosystem services in the modern and more economically productive service economy.*



*Dr. Boonsong Lekagul (1907-1992) was a physician/naturalist who is widely considered the "father of Thai conservation". His vision helped to convince the government to pass the laws that created the Kingdom's system of National Parks and other protected areas, and his writings and teachings have built national support for wildlife conservation.*







3

NATIONAL PARKS ARE  
A FOUNDATION OF THAI CULTURE





IN THIS CHAPTER WE WILL FOCUS ON SEVERAL OF THE SPECIFICALLY CULTURAL DIMENSIONS OF OUR NATIONAL PARKS THAT DEMONSTRATE WHY PEOPLE VALUE NATIONAL PARKS AS PART OF MODERN THAILAND.

## NATIONAL PARKS ARE A FOUNDATION OF THAI CULTURE

It might seem more normal for us to focus a discussion of National Parks first on nature rather than culture. But in the previous chapter we showed that the people who were living alongside many other species were together developing the landscapes and coastal systems that provide the setting for Thailand's culture. And as we will show, the future of our National Parks is in the hands of today's residents of Thailand's cities, towns, and villages. In this chapter we will focus on several of the specifically cultural dimensions of our National Parks that demonstrate why people value National Parks as part of modern Thailand.

### **National Parks conserve cultural features**

Since people of our species have been living throughout Thailand for at least 35,000 years (and perhaps 60,000 years or more), it is not surprising that many of our National Parks contain significant cultural sites, ranging from ancient stone paintings to reminders of history and modern shrines to Royalty.

Some examples of the former include the rock paintings in Ob Luang National Park in Chiang Mai, thought to be over 7,500 years old and illustrating both hunting and farming. Pha Taem National Park in Ubon Ratchathani has outstanding examples of pre-historic art on the park's cliffs along the Mekong River, painted by artists some 3,000 years ago. More than 300 of these dramatic images have been discovered so far, and can be visited along walking trails that run parallel to the mighty Mekong.

**IT IS NOT SURPRISING THAT  
MANY OF OUR NATIONAL  
PARKS CONTAIN SIGNIFICANT  
CULTURAL SITES**

*Many of our National Parks have cave paintings from our Hoabinhian ancestors, such as these 3,000-year-old artworks from Than Bok Khorani National Park along the coastline in Krabi province.*

*Such early artworks show us how people were living in the days when all of Thailand was a giant National Park.*



And the Than Bok Khorani National Park in Krabi features 238 prehistoric paintings of people and animals on the walls of Phi Hua To Cave, possibly drawn by ancient ancestors of the Urak Lawoi 3,000 years ago. Krabi has numerous other sites that show how productive its coastal zone has been for thousands of years.

The historical development of the northeast and eastern parts of Thailand involved a thousand years or so of strong Khmer influence, leaving behind numerous shrines and other structures that today dot our National Parks, with Khao Phra Viharn National Park in Sisaket Province an outstanding example. The great majority of the protected areas in the east and northeast also contain Khmer relics of various ages<sup>56</sup>, testimony of this historical influence on the land.



*The Khmer influence on Thai history is shown dramatically in the many National Parks in the Northeast and East, where remains of the ancient civilizations remind us of their awesome skill as architects and artists. Their carvings show the early influence of Buddhism and the links with wildlife.*

Much more recently, Doi Inthanon National Park in Chiang Mai is the last resting place of King Inthawichayanon of Lannathai, who died in 1897 and was so concerned about preserving the mountain cloud forests in the northern highlands that he ordered his remains to be kept on the top of the mountain that was subsequently given his name. And Doi Inthanon today is capped by two monumental chedis erected by the Royal Air Force to honor the 60<sup>th</sup> birthdays of His Majesty the King in 1987 and Her Majesty the Queen in 1992, respectively. These monuments are prominent in many images of Doi Inthanon National Park. Among many other examples, these demonstrate that National Parks are helping to conserve important cultural sites.

### **National Parks deliver water, an essential celebration of Thai culture**

Water is essential to all life and its management has long been a defining feature of Thai culture. One of our most enduring water symbols is the naga, a giant snake that plays many roles as part of Thai culture, linked to Buddhism, Hinduism, and ancient religions. Some of our historians consider us to be “Water People”<sup>57</sup>, and we value water for providing transportation, sending nourishment to the ricefields

*A monument was built in 1890 to commemorate the visit of King Chulalongkorn (Rama V) to Phraya Nakorn Cave, in Khao Sam Roi Yod National Park in Prachuap Khiri Khan, and it is still an important attraction for visitors.*



that paint the lowlands bright green during the rainy season, generating the food surplus that has supported the rise of great civilizations along the Chao Phraya river, forming a vibrant part of Thai culture with festivals such as Songkran, Loi Krathong, Ok Phansa Day, and Chak Phra, playing a central part in rites such as weddings and funerals, and attracting people to protected areas to see waterfalls.

*Doi Inthanon National Park in Chiang Mai has a monument with the remains of King Inthawichayanon of Lanna Thai (passed away in 1897), who recognized the critical importance of protecting this cloud forest. More recently, the summit has been graced by two chedis, Naphamethindon, erected in 1987 to commemorate the 60<sup>th</sup> birthday of His Majesty King Bhumiphol, and Naphaphonphumsiri, erected in 1992 in honor of the 60<sup>th</sup> birthday of Her Majesty Queen Sirikit.*



With plentiful rain, bountiful forests to capture the rainfall and release it slowly, and effective irrigation systems to produce ample food, the hydraulic Thai civilizations have prospered. The many National Parks located in the Thai uplands today protect the watersheds that play an important role in ensuring that the benefits of water continue to flow to people to meet modern social, cultural, and economic needs (we give more details in later chapters).

*Songkran is a water festival celebrated in April to mark the end of the dry season and the coming of the rains. It is just one of many festivals that underline the crucial role that water plays in Thai culture. And much of the water used in such celebrations comes from National Parks, where waterfalls are a major attraction for visitors.*



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*The Naga is a many-headed snake resembling the King Cobra. It symbolizes water in our culture, and appears in many temples that celebrate the role of the Naga in protecting the Buddha while he was seeking enlightenment. King Cobras today survive mostly in National Parks and other protected areas, but Nagas are found as water symbols throughout the country, including as important architectural and spiritual parts of both modern and ancient temples.*



## National Parks support religious practices

The early people of Thailand were Animists, following an ancient religion that considers plants, animals, and even inanimate objects like rocks or phenomena such as rivers to have spirits. The belief in spirits still flourishes here and today in numerous forms<sup>58,59,60</sup>, with many people treating particular animals, trees, caves, springs, and other natural phenomena with special respect. National Parks often contain sacred sites that may have been the subject of such respect for hundreds, even thousands, of years. They may be sources of springs, important fish breeding areas, rocks that look like important species or deities, places where significant events took place, or trees that are considered to have outstanding value (perhaps reflecting the Bodhi tree, a fig tree under which the Buddha is said to have found enlightenment). Such trees (formally known as *Ficus religiosa*) are often venerated in temples and villages, where their fruit is also popular with birds, squirrels, and other animals.

Over 90% of the people of Thailand today are Buddhist, and Buddhism philosophically considers people to be part of nature, treating species of plants and animals with respect as part of the Buddha's teaching<sup>61</sup>. Some leading thinkers even say that Buddhism deserves to be called "a religion of nature"<sup>62</sup>. While this ideal may not always be followed in practice as well as it could be, the many National Parks directly linked to Buddhism are often particularly attractive to visitors.

**OVER 90% OF THE PEOPLE OF THAILAND TODAY ARE BUDDHIST, AND BUDDHISM PHILOSOPHICALLY CONSIDERS PEOPLE TO BE PART OF NATURE**

*Sites such as this one on Doi Chang Moob in Chiang Rai Province are typical of sacred sites found throughout the country, within many National Parks.*



For example, a visit to Khao Khitchakut National Park in Chantaburi often begins at Phuluang Temple, and then climbs to the top of the mountain, with numerous shrines along the way, where visitors pay homage to the Buddha's footprint found on the summit. Though this part of the Park is open only from late January until Magha Puja day, hundreds of thousands of people visit these shrines, a good indication of the site's cultural significance.

Along with other kinds of protected areas, National Parks provide the natural setting for numerous temples, including at least 15 with caves containing Buddhist



*The Magha Puja festival being celebrated in Khao Kitchakut National Park. This occurs on the full moon of the 3<sup>rd</sup> lunar month, with the spiritual aims to avoid sins, do only good, and purify one's mind. It is celebrated by a candlelight procession to the summit, where a Buddha's footprint is found.*

monuments, shrines or temples<sup>63</sup>. Thailand contains over 6,000 forest temples, many within National Parks<sup>64</sup>. Some of these forest temples have been established in places where Buddhism reinforces age-old respect for the sites where they have been built. Without their natural setting in a National Park, the serenity these temples provide could be lost, changing the very character of Thai Buddhism.

Another distinctive aspect of Thai Buddhism is the tradition of wandering forest monks<sup>65</sup>, who may roam from the far North to the far South, with National Parks and other protected areas providing them with the opportunity to meditate in quiet and peaceful surroundings. These monks take an approach to seeking enlightenment that is rather different from the more conventional focus on studying written scriptures in a temple setting. The forest monks instead find isolated forests to



*Thailand has about 6,000 forest temples, many of them found in and around National Parks. These sites help provide the serenity and isolation the forest monks are seeking, and their presence helps support the National Parks where they are located.*

*Many Buddhists, including monks, visit National Parks and support them in many ways, including protecting watersheds and even individual trees.*



**THAILAND ALSO HAS A SMALL BUT INFLUENTIAL GROUP OF “ECOLOGY MONKS” (PHRA NAK ANURAK THAMMACHAT) WHO ACTIVELY SUPPORT CONSERVATION, INCLUDING IN NATIONAL PARKS**

be the best setting for seeking inner peace, with the wildlife found in National Parks symbolically helping them to overcome the wild nature of the mind<sup>66</sup>. The presence of forest monks can help gain support for the National Park by the local communities.

Thailand also has a small but influential group of “ecology monks” (phra nak anurak thammachat) who actively support conservation, including in National Parks<sup>67</sup>. They base their advocacy on the teaching of the highly respected abbot, Buddhadasa Bhikku<sup>68</sup>, who promoted a prominent role of Buddhist monks in supporting environmental conservation based on both Buddhist teachings and the traditional knowledge of people living in the forest. Protecting the watersheds in National Parks is an important part of their teaching, which also extends to individual trees that can be given special protection through ceremonies in which the plants become wrapped in saffron robes rather like a Buddhist monk. Such trees can often be seen in National Parks and villages nearby, and their protection brings merit to those protecting the trees.

Islam is followed by over 5% of the population, widely scattered but concentrated in the South and along the Andaman Sea Coast. Many parts of the Koran support conservation, and the Islamic concept of Hima is often considered to refer to protected areas that can be extended to National Parks<sup>69</sup>. Almost all other religions also have belief systems that support protected areas<sup>70</sup>, though this does not always mean that people put their beliefs into practice.

### **National Parks help make us smarter about managing natural resources**

Part of conserving the cultural heritage of Thailand in National Parks involves drawing on traditional knowledge, while also taking full advantage of modern science. The research being carried out in the National Parks and other protected areas is



*World-class research is being carried out on tigers and other wildlife in Huay Kha Khaeng Wildlife Sanctuary in western Thailand. This research is guiding the conservation of tigers. Much of the research uses camera "traps" that take their photographs, and since each tiger has a distinctive pattern of stripes this enables researchers to identify each tiger in their study area, as shown below.*



providing significant information that is helping Thailand to adapt to the climatic, economic, and social changes that are challenging the Kingdom. Such research is a cultural means to guide the investments that are required to support long-term development and to identify where these investments are best justified.

Maintaining protected areas with a minimum of human impact provides significant opportunities for researchers. World-quality research from Thailand's protected areas has already been widely published on species such as tigers, elephants, hornbills, gibbons, and many species of plants, thereby providing a global benefit<sup>71,72</sup>. Their findings provide important information that can be used by visitors to enhance the enjoyment of their stay in the National Park and by protected area managers who need to monitor the effects of wildlife management, visitors, habitat management, impact of poachers, and so forth. The problem of human-elephant conflict is also receiving increasing attention from researchers seeking to find a solution that will suit both farmers and the elephants whose habitat is being fragmented from encroachment into forests where they have traditionally roamed<sup>73</sup>.

In Huay Kha Khaeng and Phu Khieo wildlife sanctuaries, research on the communities of smaller carnivores has provided much original information on species that have rarely been studied, such as Marbled Cats, Asiatic Golden Cats, Clouded Leopards, Binturongs, and Yellow-throated Martens<sup>74,75</sup>, drawing the attention of other scholars, including from within Thailand, to these species and the ways that information about them can be collected.

Research is widely seen as a critical activity in protected areas, both to inform more effective management and to help inform the public about the wonders of nature. Since protected areas generally offer the most biodiversity-rich sites, they are especially valued as research sites by scientists seeking to provide greater benefits to society<sup>76</sup>. This research also provides support to public outreach via mass media,

*Smaller mammals such as the Binturong (left), the world's largest civet, and the Leopard, a medium-sized cat, are being studied by both camera trapping and radio tracking. The latter uses a small radio transmitter that enables the animal to be followed so that features such as habitat use, food habits, and range can be determined and applied to improving their conservation.*





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## OTHER RESEARCH HELPS US UNDERSTAND WHY WE NEED TO CONSERVE SO MANY SPECIES

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*The research on plant species in National Parks is helping to show how the various plants interact with each other and with their pollinators and predators, giving us a better understanding of how ecosystems function and how they can be managed more effectively.*

supporting the preparation of popular nature-based television programmes and social media, and thereby helping make protected areas more attractive to the public<sup>77</sup>.

### **National Parks provide a setting for academic research that contributes to Thai culture**

Many National Parks provide unique sites where important research can be carried out on a wide range of topics. For example the Fine Arts Department and a group of French archeologists carried out major studies in Ob Luang National Park that helped provide better understanding of the development of Thailand's prehistoric cultures<sup>78</sup>. Many other National Parks have also provided the setting for such research, covering thousands of years of history<sup>79</sup>.

Numerous other National Parks, ranging from Doi Inthanon in Chiang Mai to Koh Tarutau in Satun, contain important historical sites that are of considerable interest to modern historians. National Parks in the Andaman Sea, for example, have been important for studies of pirates in that part of the Indian Ocean<sup>80</sup>, a topic that is still of considerable interest. Research on medicinal plants from Thailand's National Parks has provided significant benefits, including on traditional plants to treat cancer based on research in Thale Bun National Park, Satun<sup>81</sup>.

Other research helps us understand why we need to conserve so many species. For example, research carried out in National Parks has shown that the distribution of plants is related to the distribution of the animals that eat those plants, which in turn depends on the distribution of the animals that feed on the animals that are eating the plants. As one illustration, tigers help to control the impacts of wild pigs and deer on forest vegetation, with small cats helping to control the impacts of smaller mammals on the smaller plants and other organisms<sup>82</sup>. Other research is showing that plants can communicate with each other, through sending a sort of warning by releasing volatile chemicals when they are attacked by predatory insects or grazing animals. And the greater the diversity of plants, the more effective is their joint defense against the insects and other predators that feed on them<sup>83,84</sup>. All of

this helps demonstrate that the great diversity of species of plants and animals in our National Parks is maintained by the interactions among them. The great diversity of species in turn leads to a great diversity of interactions, and these ultimately help lead to more benefits for people.

### **National Parks inspire artists**

Throughout the world, artists including poets, singers, painters, photographers, and others, have long been inspired by the beauty of National Parks. Thailand is certainly no exception, and DNP regularly hosts contests for wildlife photographers that have produced some outstanding art, including some of the illustrations for this book. Wildlife photography is an art that requires skill, endurance, patience, and even a bit of good luck to be in the right place at the right time. Our National Parks certainly help provide the right place, as illustrated by the photographs that accompany this text and help bring it to life.

Landscape art in Thailand has a long history, going back at least 700 years to the Sukhothai period, though the first paintings that have been preserved in reasonably good condition date from the subsequent Ayutthaya period when many temple paintings depict scenery that reminds us of amazing National Parks. But the nature represented in the art from that era was idealized, often drawing from literary sources like the Ramayana rather than reflecting the reality of Thailand's forests, mountains, grasslands, and coastlines. More realistic landscape art began during the time of King Nangklao (Rama III) (1787-1851), but received a great boost with the establishment of Silpakorn University in 1943<sup>85</sup>. Its official emblem is Ganesh, a Hindu deity that is patron of the arts and sciences as well as having the head and body of an elephant. Landscape painting remains part of the Silpakorn University curriculum, beginning with realism and then becoming more innovative.

*Chaiya Wannalert's paintings from National Parks are good examples of the modern approach to artistic inspiration from nature, with this example from Thung Salaeng Luang National Park in Phitsanulok. His work is promoted in cooperation with National Geographic.*



As just a few examples, Tatiya Undosawat's paintings dramatically show the impacts of modern consumer society on nature, including National Parks. Seksan Sing-On draws from the geological features of Ob Luang National Park to dramatize the geological formations from the Thai rock formations formed by water. And Chaiya Wannalert has produced attractive representations of the vegetation of Thung Salaeng Luang National Park and Phu Kradeung National Park. Many others could certainly be mentioned as well.

Numerous Thai painters have prepared art works have been based on many national parks and are available in art galleries. Of particular interest is The Elephant Art Gallery, which sells paintings from elephant artists, who clearly have some talent as painters.

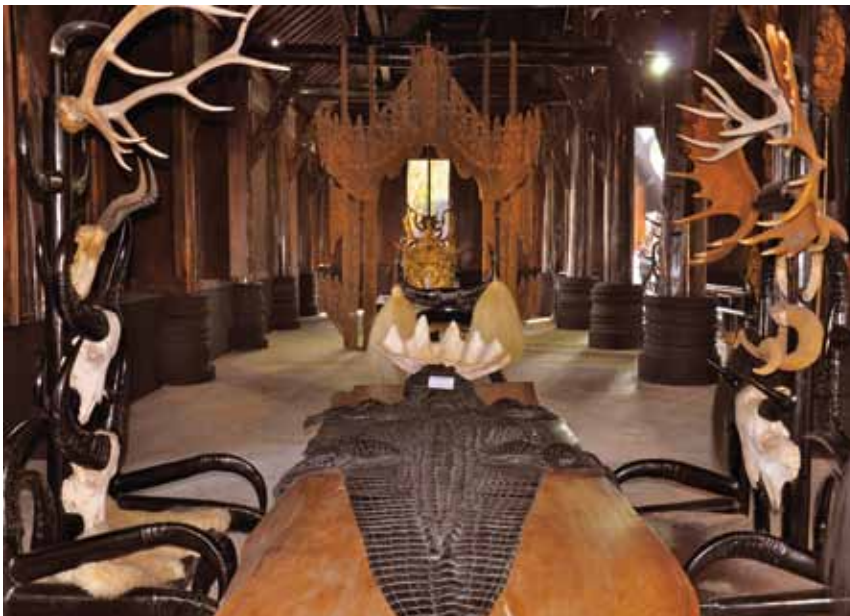


*Elephants are also artists, and seem to enjoy painting pictures of themselves. Profits from sales are devoted to elephant conservation.*

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**NUMEROUS THAI PAINTERS HAVE PREPARED ART WORKS HAVE BEEN BASED ON MANY NATIONAL PARKS AND ARE AVAILABLE IN ART GALLERIES**

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*In his artistic compound known as Black House, located in Chiang Rai, the distinguished Thai artist Thawan Duchanee has drawn extensively from nature for his work. Though this image indicates that he focused on the remains of animals, his deeper message is a call for a renewed effort to conserve them.*

One of Thailand's most distinguished artists, Thawan Duchanee (1939-2014), has drawn on nature for the wide range of his art, indirectly representing National Parks. And through the display of such art, many others benefit through enjoying the products of artists, and may be inspired to share the pleasure of nature.

### **National Parks provide opportunities for a sense of adventure**

Many people, especially among the young, welcome the opportunity for a sense of adventure. National Parks provide an ideal opportunity for seeking adventure, including camping, trekking, and watching wildlife that might sometimes be dangerous if the wild animals are not approached with care. This may suggest that travelling with a guide can be advisable when you are seeking adventure in a National Park. But many milder forms of adventure are also available in National Parks, including bicycle tours, river rafting, aerial walkways, and many others that are being developed by private tourism companies.

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### **NATIONAL PARKS PROVIDE AN IDEAL OPPORTUNITY FOR SEEKING ADVENTURE, INCLUDING CAMPING, TREKKING, AND WATCHING WILDLIFE**

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*Many of our National Parks have campgrounds for those seeking a closer link to nature. Numerous private tour companies can provide equipment and guides.*



*Flight of the Gibbon is a private enterprise that works with a local community in a forest in Chiang Mai, near many National Parks, to provide adventure tourism that takes visitors into the forest canopy.*





*White-water rafting is featured at many of our National Parks, including Salang Luang, Khao Yai, Kaeng Krachan, Ob Luang, and many other National Parks. Bamboo rafts are available on some of the calmer rivers and streams within many parks.*



*Protected areas such as Umphang Wildlife Sanctuary in Tak offer reasonably safe opportunities for excitement and adventure, giving young people useful experience that helps them develop their sense of independence and freedom, important parts of the Thai culture. This is Thee Lor Sue Waterfall, often considered Thailand's most scenic.*

## **National Parks conserve Traditional Ecological Knowledge**

The people living within and around National Parks and other protected areas often retain valuable traditional ecological knowledge (TEK), an expression of their culture. Much of this TEK is held by small ethnic groups that may have been living in the mountains, forests, and coastlines for many generations, and by Thai villagers who live among the nation's richest biodiversity and have done so for many decades or even centuries. Living with many other species, they have been keen observers of what animals are eating, what they are avoiding, where they are finding water, what trails they are making, and various other elements of survival that may have been useful to our ancestors. They have learned how to manage their resources in a sustainable way that ensures ample supplies of food, constantly modifying their TEK to adapt to new conditions. Much of this TEK can be useful to National Parks. Thailand's wild cattle, for example, may depend on the seasonal fires that are managed by rural people, who have valuable knowledge that is relevant to fire management in National Parks to the benefit of important wildlife species such as wild cattle<sup>86,87</sup>.

More broadly, considerable research has found that TEK in the highlands of Thailand has much to teach modern agriculture in these difficult habitats<sup>88</sup>, including using tree crops to rehabilitate degraded land, the many values of abandoned hill farms as parts of National Parks, and approaches to community-level governance of wildlife

resources. Traditionally, this knowledge was a public good, in that the knowledge was held within the community (though sometimes only among senior individuals trusted with such knowledge). But today, much TEK is being applied to various aspects of National Parks management, and becoming part of the management culture.

Modern forces, such as expanding plantations, building dams, promoting new varieties of crops, and becoming part of the global economy has tended to undermine TEK, losing a potentially valuable source of wisdom in resource management. National Parks provide an excellent setting for conserving TEK. For example, a recent study found that the TEK about dugongs in Trang was comparable to scientific knowledge, and that the use of TEK helps to encourage the villagers to participate in dugong conservation in National Parks<sup>90</sup>.

*The Gaur, called "kathing" in Thai, is an Endangered species of wild cattle that is found from India to Viet Nam, with Thailand in the middle of its range. Today it survives only in National Parks and other protected areas that provide it with a secure habitat. As a grazer, it depends on forest clearings for food in National Parks like Kui Buri and this gives visitors a chance to see this massive but shy species.*





Since many National Parks in Thailand (especially in the Andaman Sea and in the North and West) still support elements of traditional societies, greater efforts are now being made to incorporate the traditional knowledge of the forest-dwelling peoples into protected area management. National Parks thereby are also contributing to the conservation of such knowledge, and some are also showing that traditional ecological knowledge contributes to adaptive management that is especially valuable to times of rapid change<sup>91</sup>.

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### **How the Urak Lawoi can help inform National Park Management**

The Urak Lawoi live in several of the Marine National Parks in the Andaman Sea, notably on islands of Koh Tarutau National Park. Having lived around and on the sea for hundreds, perhaps thousands, of years, they have learned much about how to maintain its productivity. Major changes have come with the blossoming of tourism in recent years and the 2004 tsunami (though no Urak Lawoi died in a tragedy that killed over 280,000 people), but their knowledge still has much to contribute to National Park Management. In their traditional life they were particularly careful to manage oyster populations sustainably, nourishing them as a reserve food source that they could count on if other sources of food failed. They monitored the size and quantity of oysters by carefully observing how big were the shells in their refuse heaps. When the harvest showed signs of overexploitation, the Urak Lawoi would move to a new village site. They considered careful monitoring to be an essential part of living in balance with the marine resources that support their way of life. But external forces are now making their traditional life difficult, if not impossible, so they have joined the mainstream economy and are marketing their knowledge as diving guides<sup>99</sup>.

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*The people who live closest to the National Parks often have detailed knowledge about both the species that live there and how the resources can best be managed. This knowledge is often of great interest to visitors to the National Parks and to those responsible for managing these important sites. The peoples living in and around the National Parks are therefore a valuable part of Thailand's culture and an important part of conservation.*

## National Parks are an essential part of today's Thai culture

Today's Thailand is very different from the largely agricultural country of just a few decades ago. Thailand is now a major player in the global economy, with a thriving manufacturing component and significant international and domestic tourism. Highways and airports link the provinces, roads reach into even the most remote villages, and electronic communications keep everyone well informed about everything from politics to entertainment. Flying over the country reveals the profound impacts humans have had on the landscape, with agriculture, factories, and cities covering about two-thirds of the land and less than a third of the working population employed in farming, fishing, and forestry.

Almost all of the country now has access to electricity and clean water, we can enjoy food in remarkable quantity and diversity, we can turn on a light with the flick of a switch, we can purchase anything we may desire over the Internet (if we have the money to afford the object of desire), and access to healthcare is far better than ever before. The energy, water, food, and medicines that nature provided to our ancestors now come to us with hardly a hint of their ultimate source.

Visits to National Parks can help remind people of the benefits people receive from these outstanding sites. Some people go even farther in seeking an emotional link to National Parks, choosing them for the site of their weddings. For example, on Valentine's Day in 2015, over 30 couples got married in Khao Phra Viharn National Park (Sisaket Province) and commemorated the day by each couple planting a rosewood tree to symbolize a lifelong commitment to nature. In Hat Chao Mai Marine National Park, underwater weddings are held in a specially decorated seabed on Koh Kradan. In Thap Lan National Park (Prachinburi), couples get married while descending a cliff, giving a whole new meaning to "tying the knot." In Phu Kradeung National Park in Loei Province, couples climb up to the mountaintop for a sunrise wedding. Others say their marriage vows in the bed of lotus flowers in the Kumphawadpi Wetland Reserve (Udon Thani). These examples indicate that for at least some people, the link to nature has a deep emotional meaning in their lives.

*Tourism brings multiple benefits to National Parks, especially in terms of income and demonstrating that the public cares about conservation. And the National Parks make significant contributions to these visitors, as we have shown throughout this book. The tourism industry offers employment to people living around the National Parks and brings significant income into the regions that are blessed by nature.*



## National Parks provide a legacy to our children

It is wonderful for our children to watch nature programs on television, Facebook, and other media. Reading comic books about animals can help our youngsters gain appreciation for nature. But in a National Park, our children can touch the bark of trees, feel the texture of flowers, breathe clean air, see a night sky full of stars, smell wild elephants, taste fruits that monkeys may have let fall from the trees, see herds of deer and the diversity of bird species, hear the dawn chorus of birds and the singing of gibbons, witness the flight of flocks of bats as they escape their daytime cave roosts and hunt night-flying insects, enjoy a picnic by a magnificent waterfall, meditate quietly in a forest temple, and much else besides. This will give them an emotional tie to Thailand's unique nature that may stay with them forever. Detailed research has also shown that this tie to nature helps children develop a positive self-image and confidence to address challenges<sup>92</sup>.



*The group wedding at Khao Phra Vihan National Park in 2015 involved 30 couples, the Superintendent of the National Park, and two Provincial Governors, indicating another link between National Parks and modern Thai culture.*

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**IN A NATIONAL PARK, OUR CHILDREN CAN TOUCH THE BARK OF TREES, FEEL THE TEXTURE OF FLOWERS, AND BREATHE CLEAN AIR**

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*The more children who visit and enjoy our National Parks, the healthier and happier they will be and the more productive will be the future of conservation in Thailand.*



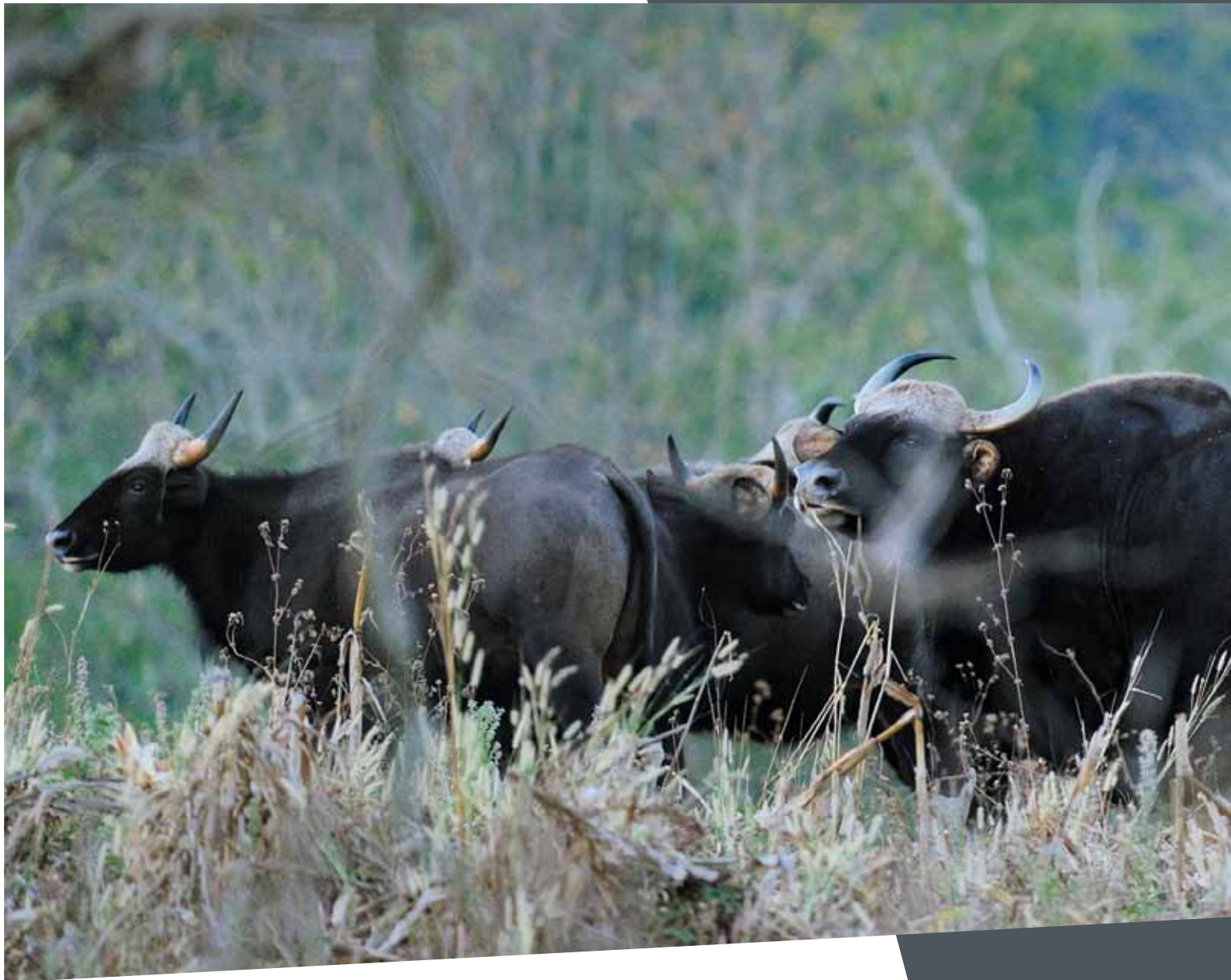
Here in Thailand, a United Nations Food and Agriculture Organization initiative called “Kids-to-Forests” is exposing children to forests, many for the first time. Activities carried out in the buffer zone of Sai Yok National Park in Kanchanaburi in April 2015 included surveying forest biodiversity, controlling invasive species, identifying species of trees, and building check dams to slow erosion<sup>93</sup>. The children participating in the event reported significant new interest in conserving forest ecosystems.

For many people, conserving Thailand’s natural legacy for their children is the most important function of National Parks and other protected areas. National Parks are places where our children can benefit from all that nature provides, connecting them to the natural world and giving them confidence that this magnificence is being conserved for them, and their children and grandchildren as well. Economists have even quantified the benefits of conservation for future generations, showing that restraint in consuming natural resources today provides much greater benefits in the future<sup>94</sup>.

**In summary, our National Parks cannot and should not be separated from our culture. Given the thousands of years of human impacts on natural habitats, National Parks offer the best reflection of our historical relations to our lands and waters. They demonstrate our desire to maintain a healthy environment, for today and long into the future. They help to stimulate the economy, provide employment, attract tourists, and inspire feelings of national pride. These special places help us to re-establish our personal links to nature, with multiple benefits to our health and well-being and to nature, as we will describe in the following chapters.**

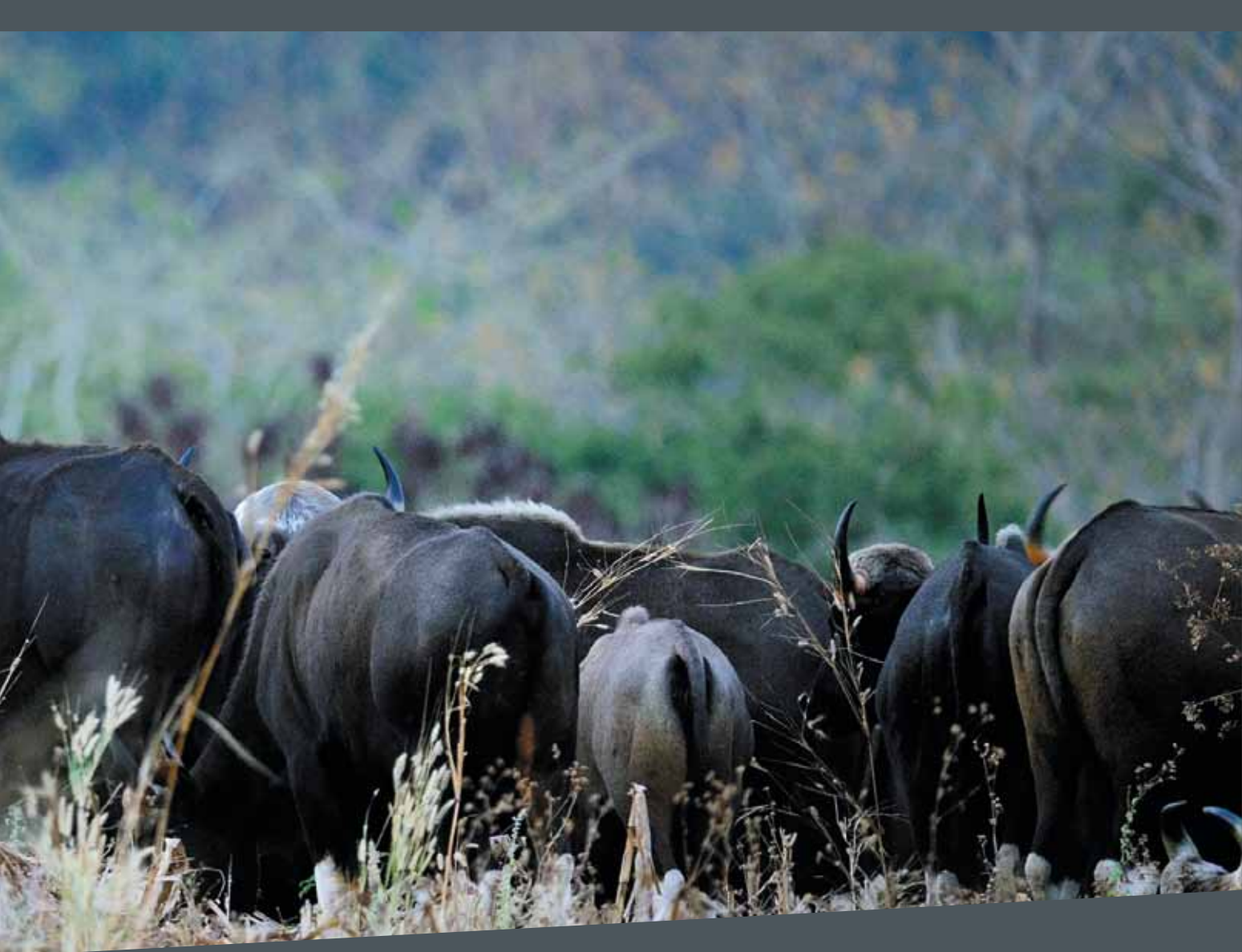






4

NATIONAL PARKS ARE CONSERVING  
THAILAND'S NATURAL HERITAGE



OUR NATURAL HERITAGE INCLUDES EVERYTHING FROM  
THE GENES IN THE CELLS OF PLANTS AND ANIMALS  
TO THE GEOLOGICAL FEATURES THAT SUPPORT  
THAILAND'S ECOSYSTEMS.

# NATIONAL PARKS ARE CONSERVING THAILAND'S NATURAL HERITAGE

Many people value National Parks especially for their role in conserving the country's natural heritage, such as its forests, coral reefs, birds, and mammals. But more broadly, our natural heritage includes everything from the genes in the cells of plants and animals to the geological features that support Thailand's ecosystems. The living parts of this heritage are generally known as "biological diversity" (or "biodiversity" for short), while the soils, rocks, and mountains are commonly known as "geodiversity"<sup>95</sup>. National Parks are essential to conserve both of these broad elements of the natural heritage that has been shaped by the long human history and geographical dynamism that we outlined in the previous chapters.

One result is that Thailand is in the middle of one of the world's 25 "biodiversity hotspots", regions that are particularly rich in both species and threats to them<sup>96</sup>. WWF has also included many of Thailand's forests, rivers, and marine habitats on its Global 200 Ecoregions of highest importance for conservation<sup>97</sup>. Such international recognition of the importance of our ecosystems has helped to draw attention to our natural heritage and has supported the establishment and effective management of our national system of National Parks and other protected areas.

### **The geographical setting of Thailand's National Parks**

The geographical setting of modern Thailand provides the stage where its great natural and cultural diversity interact. For our purposes here, it is useful to divide Thailand into eight rather distinct (though sometimes a bit arbitrary) biogeographical settings, each with its own unique characteristics, though merging with its neighboring regions around the edges. When possible, it is convenient to use the political boundaries of provinces, but these do not always correspond to watershed boundaries, habitat boundaries, and other characteristics important for National Park planning and management. And our first National Park, Khao Yai, services three Regions, the Central, Northeast, and East. Despite these challenges, these Regions help us to understand the contributions that their National Parks and other protected areas make to the Kingdom.

The Central Region comes first because it is the heart of the Kingdom, dominated by Bangkok, the center from which all else flows, at least at present. Stretching from Nakhon Sawan to the Gulf of Thailand, this is basically a swampy floodplain of several rivers flowing into the sea, with the Chao Phraya the largest. Much of it was



covered by the Gulf of Thailand's higher sea levels as recently as 8,000 years ago. As the seas retreated to their current level, the exposed lands were often flooded where rainwater collected during the wet season. Grasslands and seasonal forests teemed with wildlife, including Elephants, Wild Water Buffalo, One-horned Rhinos, and several species of deer and their predators. These have now moved elsewhere, but waterbirds such as the Indian Shag, Open-billed Stork, and the Black-crowned Night-Heron serve to remind us of the time when the Central Region was a great swamp.

Humans were long attracted to such a productive ecosystem. Once irrigation and water control technology became available, the great floodplains became productive agricultural land. Today, virtually all of the Central Region has now been developed for agriculture, settlement, and industry, so its National Parks are confined to the hilly and mountainous landscapes that separate this region from other regions (with Khao Yai National Park to the northeast being a notable example).

**The Central Region** also benefits in many ways from the National Parks that are upstream or shared with other regions, with their roles in water management and tourism especially important. Historically, the Central Region has been the seat of Thai culture, where rice was in the fields and fish were in the streams, a seemingly inexhaustible setting. Its landscapes have become dominated by people only in the past 100 years or so as the Thai economy and population have boomed. Many city



*The Central Region is characterized by the Chao Phraya and other rivers that have nourished the agriculture that support Thai civilizations and today serve as vital transport links that support Thailand's position as part of the global trading system. Its National Parks are all upstream, providing water, recreation, and other benefits to the low-lying plains.*

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**THE CENTRAL REGION ALSO  
BENEFITS IN MANY WAYS FROM  
THE NATIONAL PARKS THAT ARE  
UPSTREAM OR SHARED WITH OTHER  
REGIONS**

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*The coastal wetlands of the Central Region still teem with waterfowl, including many migratory species that depend on the mudflats or fallow ricefields. These areas are popular with birdwatchers from Bangkok.*

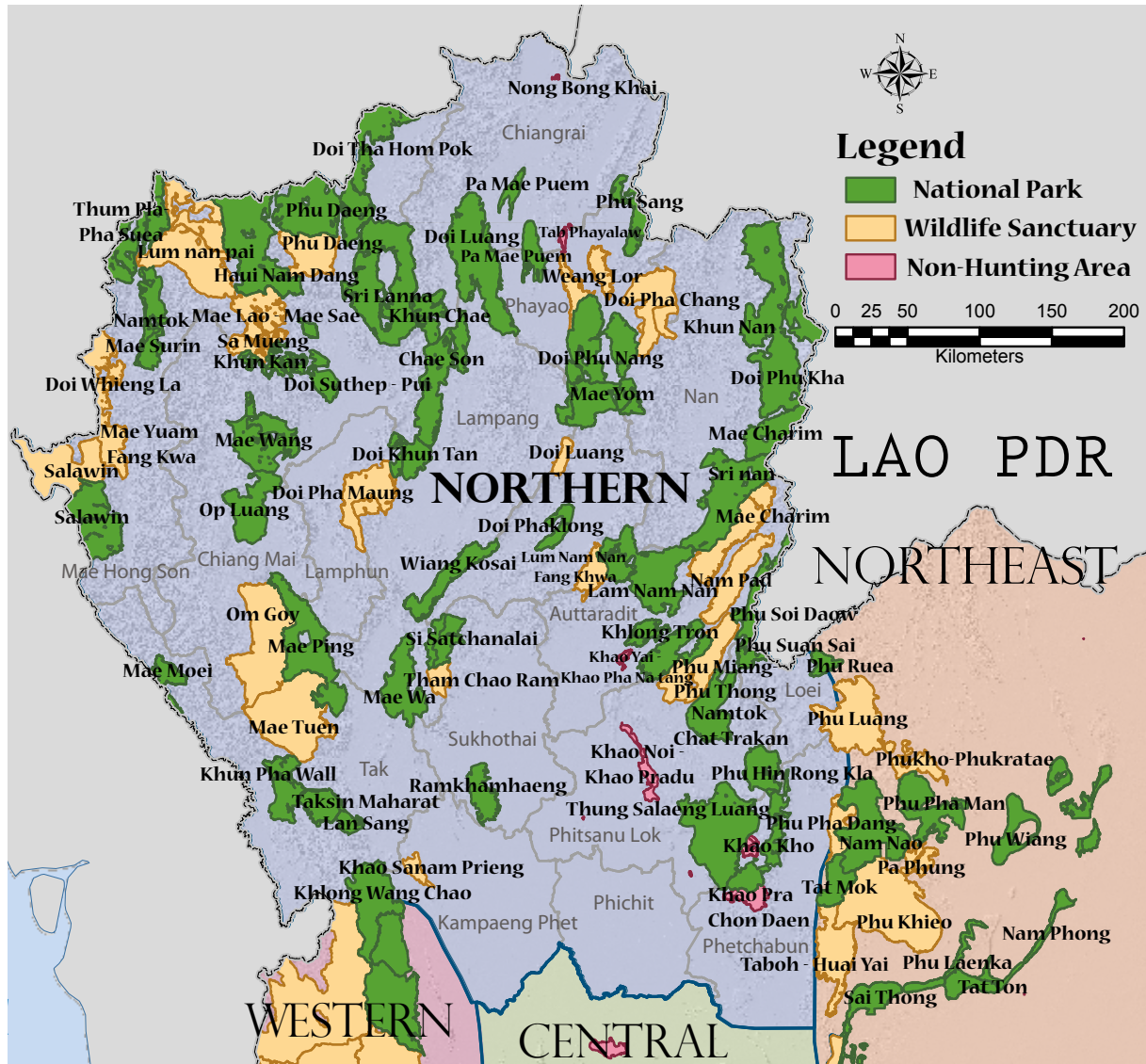


*A map of central region. It clearly shows Khao Yai National Park as the northeastern edge of Central Region.*

people maintain their links to nature through gardening, flowers indoors, fishponds outside, and frequent visits to family members living upcountry. The urban people often are strong supporters of National Parks, travelling to them frequently during holidays.

**The North Region** starts in Chiang Rai south to Pichit and west to Phitsanulok and the part of Petchabun that drains westwards (so it includes Petchabun's Thung Salaeng Luang National Park but the province's Nam Nao National Park is part of

The map is for illustration purpose only and international boundaries are not definitive.



*The North Region*

the Northeast because its rivers drain toward the Mekong). It also includes only the northern half of Tak province, with Umphang Wildlife Sanctuary considered here part of the West Region. The North Region is mountainous, formed as part of the geological process that is building the Himalayas, with numerous rivers (such as the Nan, Ping, Wang, and Yom) cutting through the mountains to form deep valleys whose soils washed down from the hills support prosperous farms. The forested uplands are important watersheds that contain the country's highest concentration of National Parks. This complex topography supports some species of plants and



*The Fire-tailed Sunbird (left) is just one of many primarily Himalayan species that are found only in the North within Thailand. The mountains here are part of the Himalayan system, and contribute many distinctive species to the country's biological diversity. Most of these species occur only within National Parks, such as the Beautiful Nuthatch (right) that is reported only from the summit of Chiang Mai's Doi Pha Hom Pok National Park.*

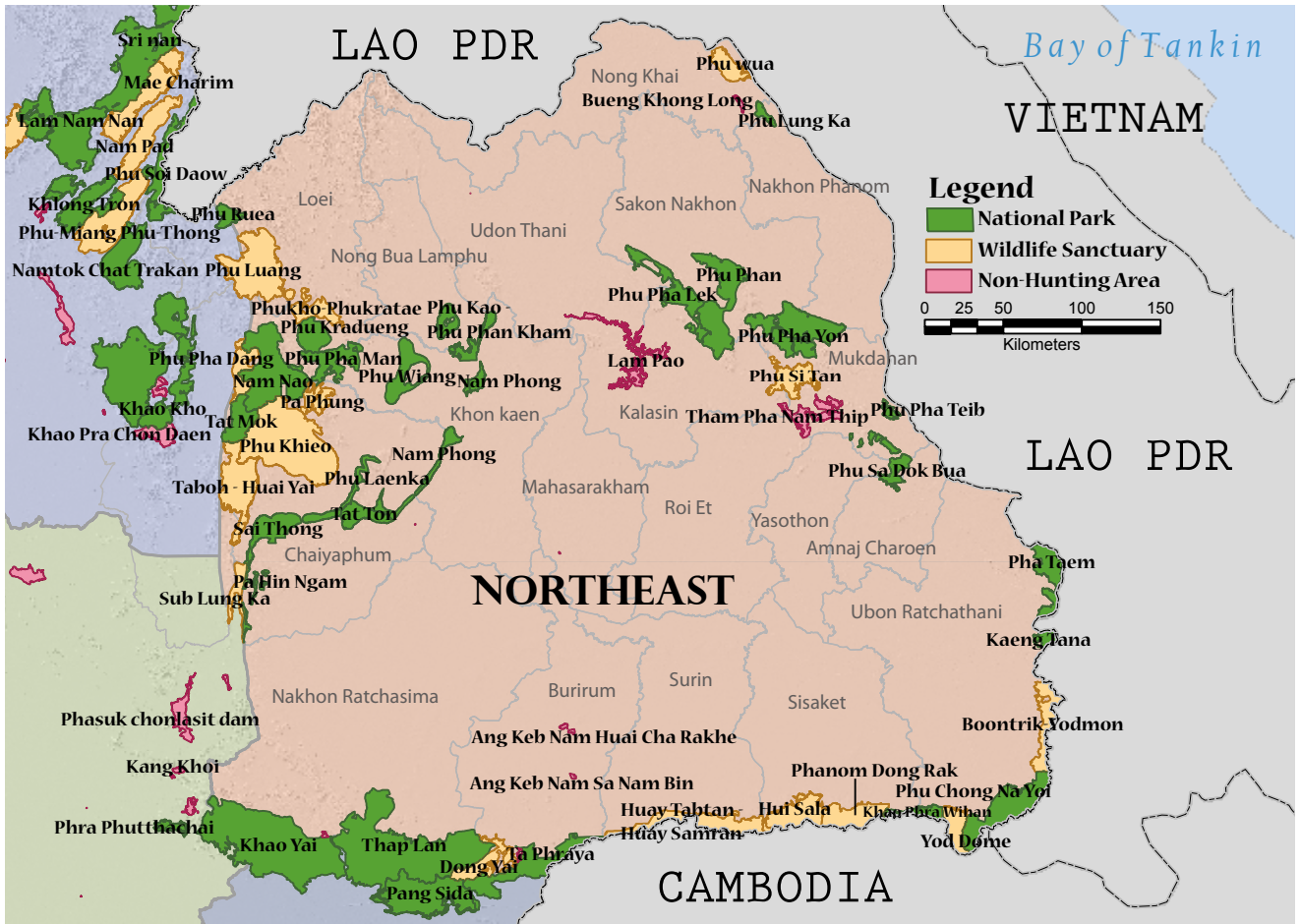
animals (such as five species of woodpeckers, several sunbirds, and some unique small mammals) that are found nowhere else in Thailand, though many of them extend westwards through Myanmar to the Himalayas.

The area is dotted with limestone mountains and cave systems, many with significant archeological sites that illustrate its occupation by humans for thousands of years. The caves where these sites are often found provide significant habitats to bats today, and many contain Buddhist shrines or temples that show a link to our early history. The lowland valleys have been irrigated for agriculture for over 800 years, leading to sophisticated societies and independent kingdoms such as Lan Na ("million rice fields" in Thai), in Chiang Mai. A complex system of water management included all water users, and encouraged villagers to participate in communal activities to a degree seldom seen elsewhere in the country<sup>98</sup>. The North has a rich culture based on the history of Lanna Thai, and historically has been the gateway to Thailand for immigrants (or invaders) from Burma and China. Numerous hill tribes live in the mountains of the region, which are covered with well-forested National Parks that often had been cleared for shifting cultivation in previous decades. Teak grows well here, and teak plantations historically have used elephants to help manage the logs.

**The Northeast Region** is very different, stretching from eastern Phetchabun and Loei north and east to the Mekong River, and south to Nakhon Rachasima and Buriram. This plateau has a long dry season as part of Thailand's monsoon climate, so it receives less rainfall than other parts of the country. The Phu Phan mountains split the plateau and support seven National Parks. The Northeast has long been covered with seasonal open forests, with some pines on the highest hills (such as the plateau at the top of Phu Kradeung National Park in Loei). This largely agricultural region is dotted with archeological sites stretching back thousands of years and demonstrating the long human occupation of this plateau. The many Khmer remains seem to have been abandoned at least partly because of unfavorable environmental factors<sup>99</sup>.

With a more difficult environment for humans, where firewood and water were at least seasonally scarce, the people of the northeast have developed their own distinctive diet based on dried raw meat from domestic and wild animals and fermented fish, augmented by various wild plants, insects, and other animals from

The map is for illustration purpose only and international boundaries are not definitive.



*The Northeast Region*



*The Petchabun Range separates the Northeast from the North, and is well covered by forested National Parks, here shown from Nam Nao National Park looking north toward Loei's Phu Kradeung National Park looming as a table-topped mountain in the distance.*

**A KEY BIOLOGICAL DIMENSION OF THE NORTHEAST IS ITS LONG RIVERINE BOUNDARY WITH LAO PDR, FORMED BY THE YOUNG MEKONG RIVER**

*The Pileated Gibbon is confined to the Eastern Region in Thailand, stretching into Khao Yai on the western part of its range and into Cambodia on the eastern part of its range. It is a good indicator species for the Eastern Region, and its haunting songs can be heard in the morning in the National Parks where they live.*



the deciduous forests that were seasonally burned. Long the poorest part of the country, it has maintained its unique identity even as many of its people have sought economic opportunities elsewhere. Its National Parks are mostly along its mountainous boundaries, where they perform important functions in providing water to the Mun and Chi rivers.

A key biological dimension of the Northeast is its long riverine boundary with Lao PDR, formed by the young Mekong River, which formed its present course only about 5,000 years ago<sup>100</sup>. This river supports about 1,100 species of fish<sup>101</sup>, though not all of them necessarily occur in Thai waters. This extraordinarily rich fish fauna is accompanied by a great diversity of molluscs, and both of these provide important sources of protein to the people of the Northeast, delivered by the world's largest riverine fishery<sup>102</sup>. This mighty river has no National Parks, and its fish and other species are vulnerable to numerous threats, including pollution, invasive species, and overfishing. But the biggest threat is the building of numerous upstream dams that will affect flow, fisheries, sedimentation, agriculture, flood management, water temperature, and many others<sup>103, 104</sup>.

**The East Region** is relatively small but complex, adjacent to Cambodia on the east and edging into the Central Region in western Chachoengsao. But beginning

The map is for illustration purpose only and international boundaries are not definitive.



*Khao Chamao-Khao Wong National Park, Rayong, is an important watershed in one of Thailand's rainiest provinces. It has many waterfalls and provides clean freshwater to downstream industries, farms, and towns. It is also the source of a productive downstream fishery. Many other National Parks in the Eastern Region provide benefits like these.*



with Chonburi and Nakhon Nayok and extending east to Sa Kaeo and south to Trat, it has many mountains that attract high rainfall that supports tropical rainforests and numerous National Parks. Its forests are home to the Pileated Gibbon, shared with Cambodia. This gibbon reaches the western limit to its distribution in Khao Yai National Park, where it sometimes socializes with the more common White-handed Gibbon. Several species of birds are found only here in Thailand, such as the Blue-rumped Pitta, Great-billed Heron, and Chestnut-headed Partridge, this being their western extension from the Cardamom Mountains of Cambodia. The key National Parks are linked with several Wildlife Sanctuaries to form the Eastern Forest Complex, a major initiative for effective management of wildlife and protected areas<sup>105</sup>.

Its lowlands have had a long historical tie to the Khmer civilizations of Cambodia, with numerous Khmer sites in the region and especially in the National Parks<sup>106</sup>. It is a major fruit producing part of the country, with rubber recently expanding significantly as well. Many of Thailand's new industries are located along the coastline for easy access to seaports, and they depend on water supplies from the plentiful rainfall that nourishes the National Parks and replenishes the reservoirs.

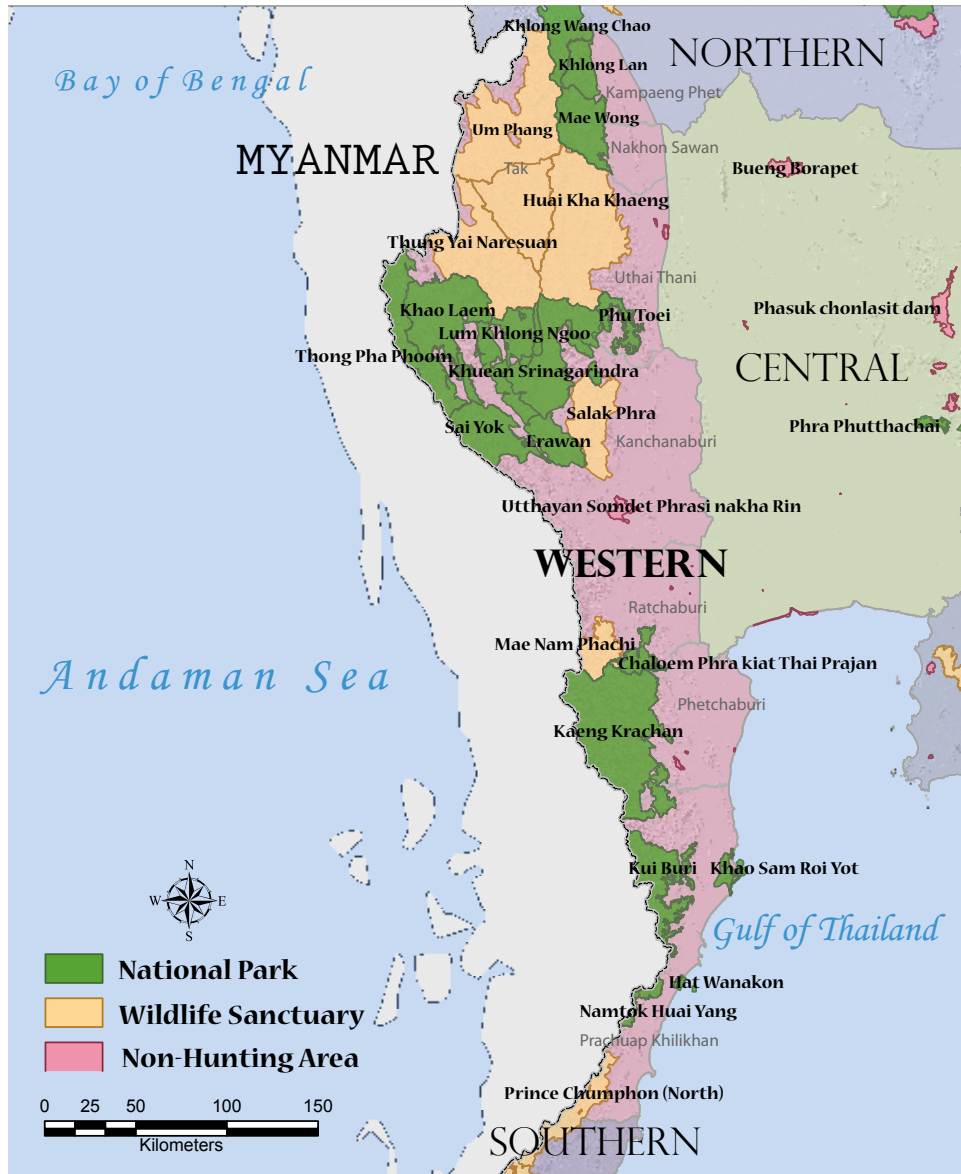
**THE KEY NATIONAL PARKS ARE LINKED WITH SEVERAL WILDLIFE SANCTUARIES TO FORM THE EASTERN FOREST COMPLEX**

**The West Region** stretches from the Umphang Wildlife Sanctuary of Tak and Uthai Thani through Kanchanaburi to Ratchaburi, Petchaburi, and Prachuap Khiri Khan. It includes the Tenasserim Range (Thiokhao Tanaosi in Thai) that separates Thailand from Myanmar (Burma) and contains Thailand's most important wildlife habitats, protected by numerous National Parks and Wildlife Sanctuaries that support significant populations of elephants, tigers, wild cattle, a great diversity of monkeys and small carnivores as well as the last remaining wild water buffalo. Many of these National Parks and other protected areas are connected, or nearly so, thereby providing a large and continuous wildlife habitat that is well adapted to climate change. Known as the Western Forest Complex, it includes some sites that are adjacent to similar forested areas in Myanmar, offering opportunities for transboundary conservation that involves close cooperation with colleagues who are managing Myanmar's protected areas, and perhaps ultimately enabling a habitat link





The map is for illustration purpose only and international boundaries are not definitive.




*The National Parks and other protected areas in the West. They form a complex that enables species to move freely between them.*

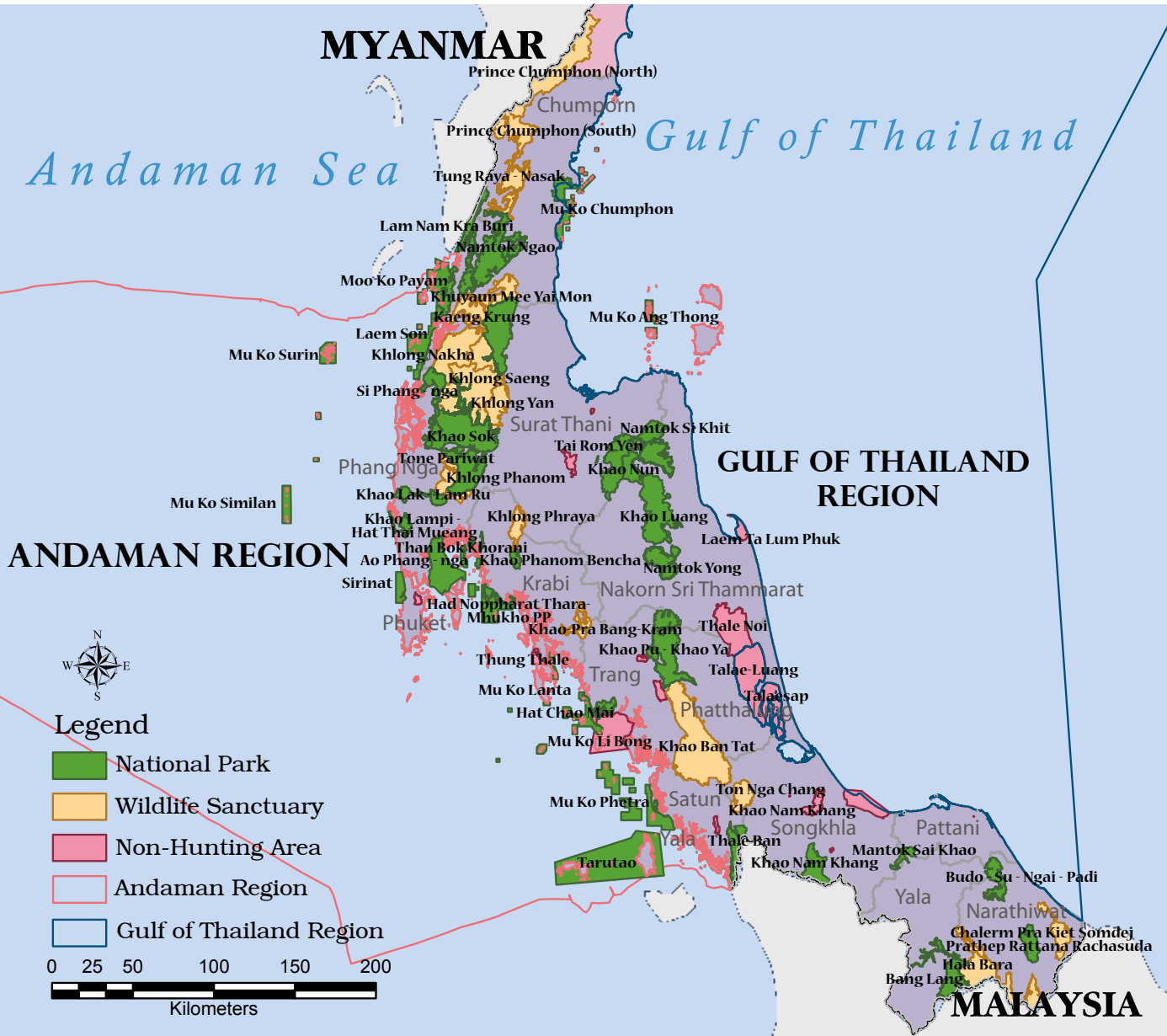
between the Western Forest Complex and the Kaeng Krachan Forest Complex to the south. And since species like elephants and tigers carry no passport, they move freely between countries and their conservation can be improved through cooperation between the agencies that are managing these species in the respective countries.

**The South Region** stretches from Chumphon south to the Malaysian border. It has several significant mountains that are contained within National Parks, such as Khao Luang in Nakhon Si Thammarat and Khao Sok in Surat Thani, along with numerous limestone mountains throughout the peninsula. This is a long, narrow



A tiger is shown from the side and back, standing in a forest. The tiger's body is covered in orange and black stripes, and its tail is long and also striped. The background is a dense forest with green foliage and brown tree trunks. The ground is covered with dry leaves and some green grass.

*The National Parks and Wildlife Sanctuaries of the West provide one of the world's most important habitats for the Endangered Tiger, and well as numerous other species that make the West the country's richest area for large mammals. This has led to the heart of the region being placed on the World Heritage List.*



### The South Region

part of the country but one that receives high rainfall and has important coastal resources. It also has significant tin deposits and is an important producer of rubber and palm oil (these having replaced species-rich tropical forests in many areas). It contains numerous species of wildlife that live mostly further south, in Malaysia and Indonesia, including 10 species of woodpeckers, 6 hornbills, and 4 barbets that go no farther north (though they may expand northwards if climate change creates the right conditions for them). The Agile Gibbon edges into Thailand from Malaysia, and the distinctive Malaysian tapir is confined mostly to the south.



*Khao Luang National Park in Nakorn Si Thammarat is a site of major importance to conservation in the South, providing habitat to numerous Threatened species and attracting significant numbers of visitors.(left)*

*The Red-Throated is one of four barbet species found in Thailand only in the south, where many species of birds, mammals, and plants more typical of Malaysia find their northern limit. They may come farther north with climate change. (right)*

*The rainforests of the South have rich forests with large fruit trees that attract six species of hornbills not found elsewhere in the country, including the Helmeted, Rhinoceros, White-crowned, Bushy-crested, Wrinkled, and Black.*



The Asian Tapir is confined mostly to the South, though some reach some parts of the Western Forest Complex. Its three relatives live only in Central and South America, but this one was seen in Khlong Saeng Wildlife Sanctuary and the species is also found in Khao Sok National Park, both in Surat Thani Province. The Tapir is a relict from the time the Malay Peninsula was connected with Sumatra.

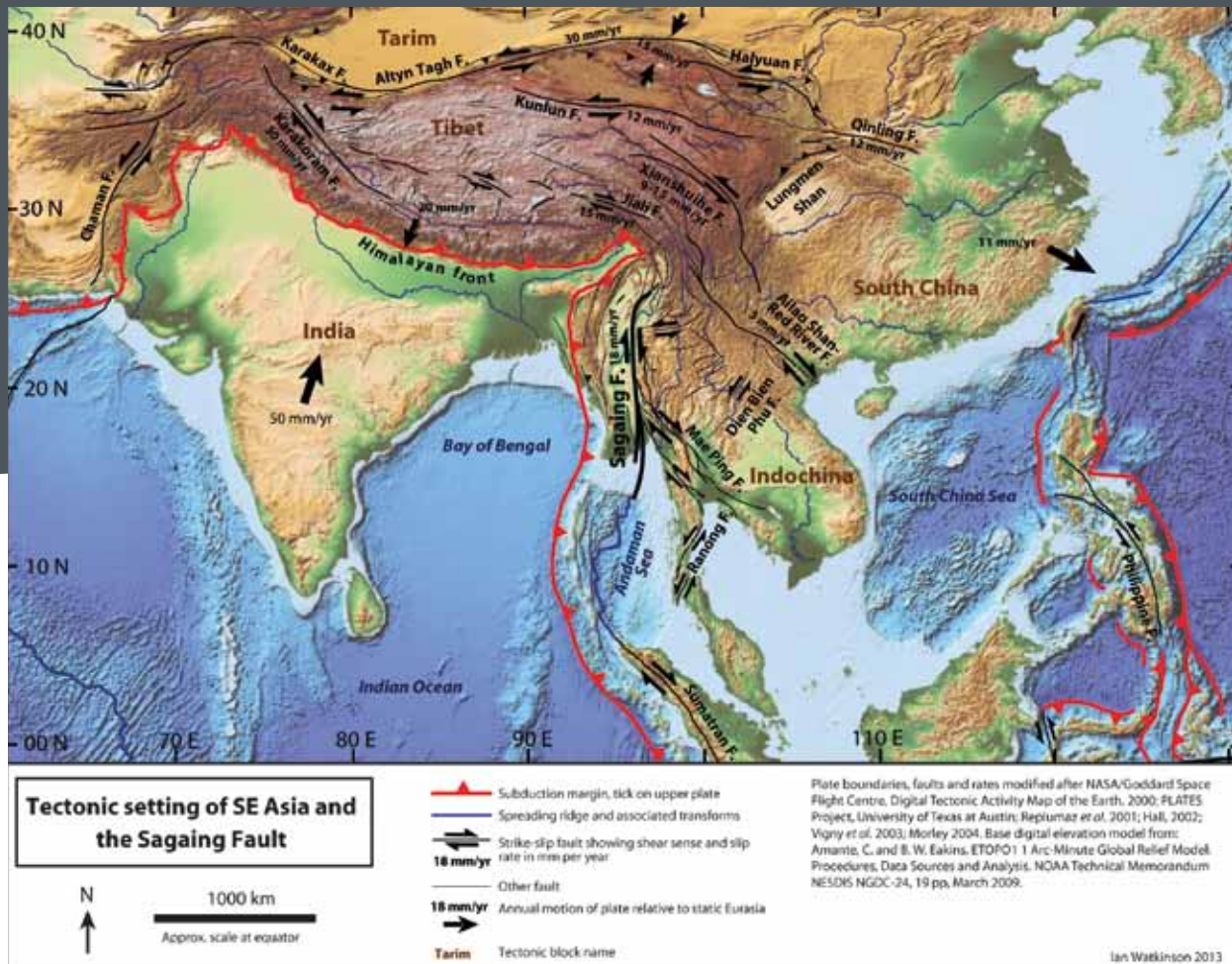


Many species of plants are also confined to the southern forests, which have affinities to Borneo, Sumatra, and Java from the time not long ago when Thailand was connected to them by low sea levels. Some botanists have proposed that a boundary exists roughly along a line between Pattani and Satun, based on climatic conditions, with some 375 genera (the taxonomic rank above species) of plants reaching their northern limit here and about 200 other genera reach their southern limit around here<sup>107</sup>. Of course things are not so simple, and others suggest a wider zone of transition for plants that may reach up to about 14° north<sup>108</sup>, about where Kaeng Krachan National Park is located.

## MANY SPECIES OF PLANTS ARE ALSO CONFINED TO THE SOUTHERN FORESTS, WHICH HAVE AFFINITIES TO BORNEO, SUMATRA, AND JAVA

*Moo Koh Surin National Park and the network of Andaman Sea National Parks are keys to the development of the coastal zone, including fisheries and tourism. They also help support the coastal ethnic groups that enrich the culture of the region, including the Moken and Moklen.*

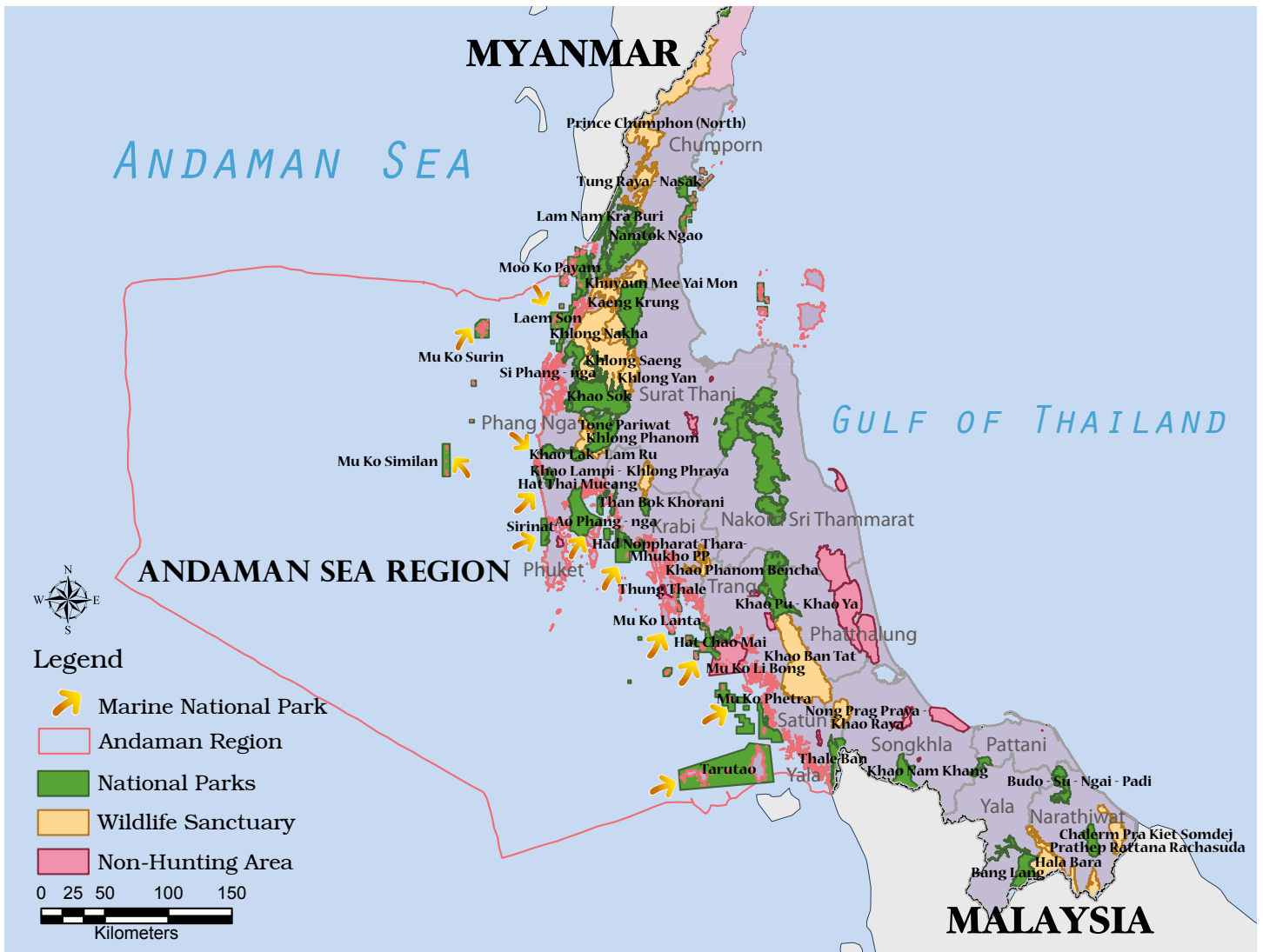




*This map shows the tectonic plates that affect the Andaman Sea, and even the rest of Thailand. The deep trench the tectonic plates form off the coast of Sumatra, called the "Sunda megathrust", helps to make the area's National Parks especially attractive to fishermen and visitors. But the movement of these plates also leads to earthquakes and tsunamis, such as the devastating one that hit Thailand's west coast and the neighboring countries in 2004.*

For birds, the transition is between 11° N and 13° N, about where Khao Luang and Khao Sok National Parks are located<sup>109</sup>. Mammals are complicated, with an area of the peninsula from 8° to 14° N relatively poor in species, with the range limits of the southern species typical of Malaysia clustering just south of this zone and the range limits of the northern species clustered just north of the zone and then widespread further north, east, and west<sup>110</sup>.

These findings indicate that the South is highly dynamic for many species of plants and animals, reflecting the climatic changes that have characterized the past few



*The Andaman sea coast of Thailand, from Ranong to Satun, has many National Parks that are attractive to visitors and provide multiple benefits to local people.*

The map is for illustration purpose only and international boundaries are not definitive.

million years. The National Parks in this region may be an essential part of adapting to future such changes, as we will discuss in chapter 8.

**The Andaman Sea Region** stretches over 900 kilometers from Ranong to Satun and here refers to the beaches, coastal zone, seas, and islands. This region could have been included in the South, since it is administered by the respective mainland provincial authorities, but the habitats are so distinctive that they deserve to be treated separately (though they are affected by the uses of the adjacent lands and waters).



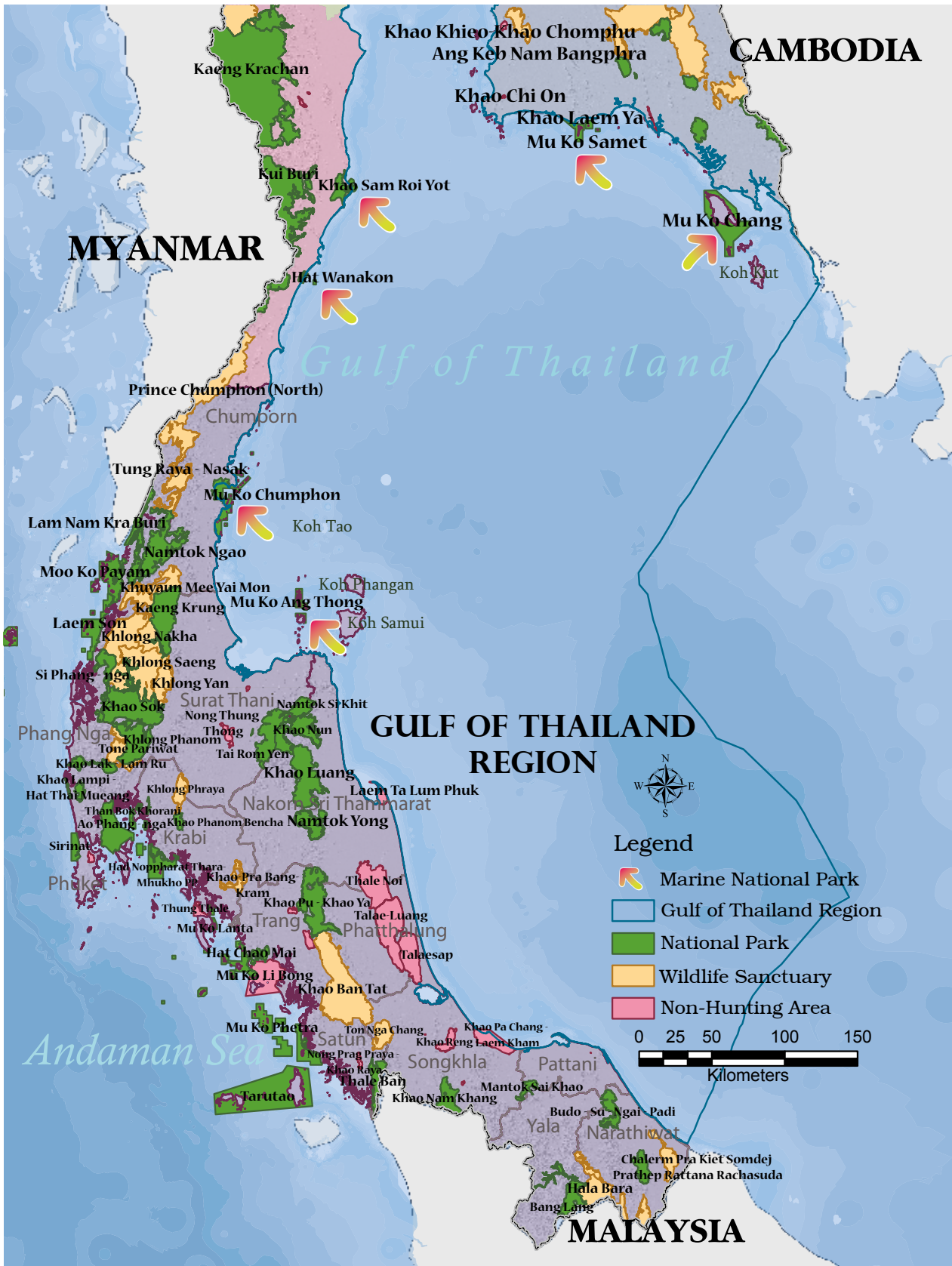
The Andaman Sea is shared with many neighbors and has a very complex ocean floor characterized by the meeting of what geologists call “tectonic plates,” pieces of the Earth’s crust that float on its molten core and have major geological effects when they collide. The two plates in the Andaman Sea are relatively small ones, the Burma Plate and the Sunda Plate, that once were part of the much larger Indian Plate whose collision with the Eurasian Plate about 55 million years ago led to the rise of the Himalayas, pushed the Salween (Thanlwin), Mekong, and Yangtze rivers closer together, formed the mountains of northern Thailand, and continue to cause major earthquakes in the Himalayas, volcanoes in Indonesia, and tsunamis in the Andaman Sea<sup>111</sup>.

The movements of tectonic plates are infamous for generating earthquakes and tsunamis, here most notably the devastating 2004 tsunami that affected the entire coast (as well as that of our neighbors, devastating northern Sumatra and even reaching East Africa)<sup>112</sup>. This geology also makes the Andaman a rather deep sea, averaging about 1000 meters though more shallow in the north due to sediment washed down the Irrawaddy (Ayeyardwady) and Salween (Thanlwin) rivers.

*The National Parks of the Andaman Sea contain Thailand’s richest coral reefs, making them popular with visitors as well as supporting fisheries and helping to address problems of climate change.*



The map is for illustration purpose only and international boundaries are not definitive.



The Andaman Sea is dotted with coral reefs, lined with mangrove forests, and graced with numerous small islands with scenic beaches and spectacular limestone peaks. It has historically been highly productive for fisheries and most of Thailand's migratory whale species are found in these waters, including the Blue Whale, the world's largest animal. Endangered dugongs also live here, along with six species of Endangered marine turtles. Many seabirds and wading birds are confined to the coastal zone, and some of the larger islands support a rich bird life, including Pied Imperial Pigeons. Thailand's part of the Andaman Sea has numerous National Parks, most created in the 1980s and 1990s and now popular tourist destinations. It also supports small communities of Moklen, Moken, and Urak Lawoi people, traditional fishing cultures whose ancestors have long exploited the rich coastal resources.

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THE GULF  
SHARES  
MANY OF THE  
SHOREBIRDS  
FOUND ALONG  
THE ANDAMAN  
COAST,  
INCLUDING  
THE  
WHITEBELLED  
SEA EAGLE

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**The Gulf of Thailand Region** extends some 1,800 kilometers from Narathiwat to Trat and is treated as its own region, unified by its watery setting. It is a shallow arm of the South China Sea, shared with Cambodia and Viet Nam. In marked contrast to the Andaman Sea, it is very shallow, averaging just 58 meters deep and nowhere deeper than 90 meters. It is regularly nourished, even polluted, from the many rivers that pour into it, especially the Chao Phaya, Bang Pakong, Thachin, and Mae Klong. These sediments mean that the beaches close to the rivers are often muddy, and few are very sandy except on the islands and the far south. Some areas have coral reefs, though typically of lower diversity than the ones in the Andaman Sea.

The Gulf has many bays and islands, and several popular Marine National Parks that are easily accessible from Bangkok. Some of the larger islands, such as Koh Samui and Koh Phangan, have been significantly developed for tourism and fishing remains an important enterprise despite the shallowness and modest productivity of the ocean. Several species of whales and dolphins still swim through on occasion, and a few dugongs still graze on the seagrass beds. The Gulf shares many of the shorebirds found along the Andaman coast, including the Whitebellied Sea Eagle, and the Marine National Parks are important wintering habitats for numerous species of migratory birds.

As the huge ice sheets began to melt away at the end of the Pleistocene, the sea levels rose quickly and marooned terrestrial mammals on the new islands that were created in the Gulf of Thailand, such as Koh Si Chang, Koh Samet, Koh Kut, and many other islands that are now included in Marine National Parks. Most of these islands could no longer support the larger mammals, but several of them have their own sub-species of squirrels<sup>113, 114</sup>. Their isolation over the past 8,000 to 12,000 years or so has been sufficient for evolution to work its wonders on small mammals who have relatively short generation times and relatively small populations, factors that favor rapid evolution.

*The Variable Squirrel has many subspecies on the islands in the Gulf, a remarkable illustration of evolution in action that mirrors the diversity of the Galapagos Islands that inspired Charles Darwin to formulate the theory of evolution. Our Marine National Parks in the Gulf enable such evolution to continue.*



**MANY PEOPLE APPRECIATE NATIONAL PARKS ESPECIALLY FOR THEIR SCENIC BEAUTY, WHICH IN TURN REFLECTS THEIR GEOLOGICAL HISTORY**

### **National Parks conserve Thailand's geological heritage**

Many people appreciate National Parks especially for their scenic beauty, which in turn reflects their geological history. For example, Erawan National Park in Kanchanaburi has rock formations that remind visitors of the mythical three-headed elephant, for which the site was named. The rock sculptures and limestone cliffs of many national parks serve as sources of inspiration to visitors and artists alike. For example, Mukdahan's Phu Pha Thoep National Park contains a remarkable collection of wind-carved sandstone formations, Koh Phi Phi Don National Park in Krabi attracts

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OUR NATIONAL PARKS  
CONTAIN A GOOD  
REPRESENTATION OF THE  
GEOLOGICAL HISTORY OF  
THE COUNTRY

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*Phu Pha Thoep National Park is characterized by its sandstone formations that are carved by the wind (above), while Ob Luang's gorge is carved by water (below, left) and the limestone formations of Than Bok Khorani in Krabi are characteristic of Thailand's karst formations that are found in many of its National Parks.*

visitors to its spectacular limestone mountains and caves, and Ao Phangnga's dramatic setting was made famous by a James Bond film, "The Man with the Golden Gun."

Ob Luang can be translated as "Grand Canyon", and this National Park contains a dramatic deep gorge, with a raging torrent during the rainy season that is easily reached by visitors and is a major tourist attraction. Many other National Parks also have geodiversity that attracts numerous visitors, including to the thousands of caves that riddle our limestone mountains<sup>115</sup>.

Our National Parks contain a good representation of the geological history of the country, since most are found in the more mountainous parts of the country.



*Among the many National Parks that have hot springs and geysers, Chiang Mai's Pha Hom Pok National Park has the most interesting geysers.*



*Lam Nam Kok National Park in Chiang Rai is one of several National Parks that support hot springs, in a geologically very active part of Thailand.*

Ancient volcanoes dot the landscape, with the continuing geological activity indicated by hot springs such as those found in Doi Pha Hom Pok National Park and Huay Nam Dang National Park in Chiang Mai, Lam Nam Kok National Park in Chiang Rai, Chao Son National Park in Lampang, Nam-Tok Ngaw National Park in Ranong, Sri Nakarin National Park in Kanchanaburi, in Kanchanaburi, and many others. For many of the hot springs, National Park protection is essential to their continued effective management.

Some of our National Parks support geodiversity that is globally important. For example, the world's tallest limestone pillar (62.5 meters tall) is in Sao Hin Cave in

*Sao Hin Cave in Lam Khlong Ngu National Park in Kanchanaburi contains the world's tallest limestone pillar, demonstrating that Thailand's protected areas are of global importance.*

*The fossil deposits of freshwater shells from Hat Noppharat Thara Moo Koh Phiphi National Park in Krabi is another globally important site, with the world's oldest such formations.*





Thailand's Northeast may have looked like this 70 million years ago, judging from fossils discovered at Phu Wiang National Park, Khon Kaen. Our national parks are even conserving the remains of ancient biodiversity, and helping increase public awareness about this important part of Thailand's prehistory.

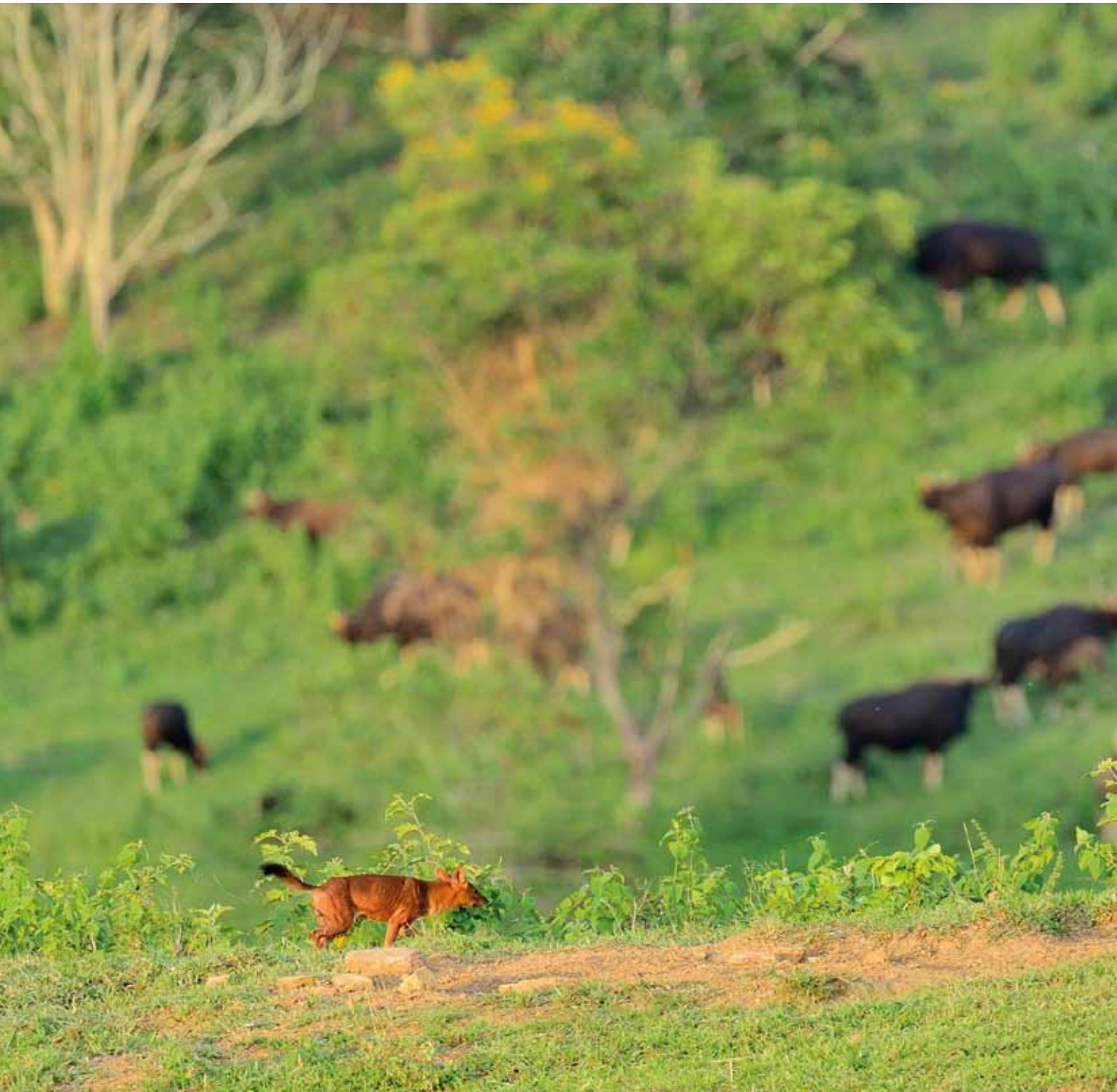
Lam Khlong Ngu National Park, in Kanchanaburi Province. The Park's Namtok Cave is nearly 3 km long, and has been carved by a stream that has 17 tiers as it works its way out of the mountain and into the sunshine of the Khwae Yai River that feeds into a major reservoir in Sri Nakharin National Park.

As another example, Hat Noppharat Thara-Mu Koh Phiphi National Park in Krabi Province has the world's most ancient fossil deposits of freshwater shells from snails that lived in a swamp some 40 million years ago. Their remains have formed a layer of shells 40 cm thick, one of only three known such deposits in the world<sup>116</sup>. And Phu Wiang National Park, in Khon Kaen, is one of the world's largest dinosaur graveyards and contains a Dinosaur Museum that contains some of its finds, including a new species of giant hunting dinosaurs, known as *Siamotyrannus isanensis*<sup>117</sup>. This is part of the mission of National Parks to conserve even ancient biodiversity.

### **National Parks conserve Thailand's biological heritage**

All National Parks and other protected areas are expected to conserve biological diversity, the multitude of genes, species, and ecosystems that help enable Thailand to prosper. Thailand's ecosystems support about 1,100 species of birds, 300 mammals, 360 reptiles, 140 amphibians, 2,800 fish, and 12,000 plants. These numbers can be expected to grow as biologists continue their studies, but these current numbers make Thailand extraordinarily rich in species. The challenge now is to ensure that the legacy from our biological history is well managed to ensure that future generations can enjoy this biological wealth.

On the basis of current knowledge, at least 133 of the vertebrate species (those with backbones, including mammals, birds, reptiles, and amphibians) are considered endemic to Thailand, found only here. Many of the 757 endemic species of plants are found only in National Parks, giving these sites globally important responsibility for conservation of biodiversity. For many of our unique species, National Parks are their last chance at life.







*Our National Parks support complex ecosystems, including many Threatened species such as the Endangered Wild Dog, here watching a herd of Endangered Gaur in Kaeng Krachan National Park.*

It should come as no surprise that National Parks and other protected areas remain the repositories of much of the Kingdom's biodiversity. For example, Doi Suthep National Park supports over 2,300 species of plants and Kaeng Krachan National Park and Huay Kha Kaeng Wildlife Sanctuary each contain seven species of cats, a remarkable number that reflects the diversity of prey species

**The species richness of Thailand. These numbers are rounded off because new research regularly finds new species.**

Birds	1,000 species
Mammals	300 species
Reptiles	360 species
Amphibians	140 species
Fish	2,800 species
Plants	12,000 species

The international standard for the status of species is the Red List of Threatened Species prepared by the Species Survival Commission (SSC) of the International Union for Conservation of Nature (of which Thailand is a State Member)<sup>118</sup>. Categories of status range from Least Concern to Critically Endangered (with Extinct coming next). Red List status is determined by the SSC, which includes 66 of Thailand's leading species experts. Many of Thailand's species are considered Critically Endangered, Endangered, or Vulnerable (the categories that make a species Threatened), with 824 species of plants (6.8% of the described species), 57 mammals (19.3%), 47 birds (4.9%), 27 reptiles (8.3%), 4 amphibians (2.8%) and 96 fish (16.8%) qualifying for this global designation. Many more are receiving additional protection under our national laws.

It seems likely that naturalists will add more birds, reptiles, amphibians, and plants to the Threatened list as our field biologists conduct more intensive field surveys and regular monitoring. The vast majority of these Threatened species are confined to National Parks or other protected areas, indicating the importance of these sites for species conservation.



*The serow is a goat-antelope that haunts the steep hills of Khao Sam Roi Yot National Park and other protected areas that have the forested steep hillsides they call home.*

**Thai species considered as Threatened on the IUCN Red List. This includes the species that are Critically Endangered, Endangered, or Vulnerable. It is likely that more research will identify more species as Threatened. Further details are available at [www.iucnredlist.com](http://www.iucnredlist.com).**

Species group	Number Threatened	Percent threatened
Birds	47	4.9%
Mammals	57	19.3%
Reptiles	27	8.3%
Amphibians	4	2.8%
Fish	96	16.8%
Plants	824	6.8%

Recent improvements in National Park management have made it possible, even certain, to see some of these Threatened Species, such as Asian Elephants, Banteng and Gaur. Kui Buri National Park in Prachuap Khiri Khan, for example, is an excellent place to see all of these species, with experienced guides from local communities able to bring you close to these rare species. In the case of Threatened birds,

*Thailand's two species of bears are now largely confined to National Parks and other protected areas. These are in Dong Phrayayen Khaoyai World Heritage site.*



National Parks are especially important for the rarest and the most Endangered that may find their only remaining habitat in National Parks. These extremely rare and Endangered species of birds can help pay for their protection by earning tourist revenue from birdwatchers<sup>119</sup>.

Thailand has already lost some significant species that once occurred here, including the Javan Rhinoceros, the Asian Two-horned Rhinoceros, Schomburgk's Deer (found only in Thailand, so now globally extinct), Kouprey (a species of wild cattle that is now globally extinct), and the White-eyed River Martin (discovered only in 1968 at Beung Boraphet, Nakhon Sawan, but not seen again since 1977). Several species of plants are extinct in the wild but are maintained in captivity, including an orchid that has a remarkable long crimson flower stalk. A cycad (an ancient form of plant that seems to have changed little in the past 145 million years) that is found only in Khao Chamao National Park is considered Critically Endangered, so its survival depends on effective protection. And a rare species of grass named after the pioneering Thai botanist Tem Smitinand is found only on the top of Phu Kradeung National Park.



*Thailand supports four of the world's 13 species of otters, a reflection of its diversity of aquatic habitats where these relatives of weasels like to hunt fish and other aquatic species. As predators, they help to ensure the health of the ecosystem by recycling nutrients. Most of Thailand's remaining otters are confined to National Parks and Wildlife Sanctuaries.*

*A Critically Endangered species of cycad, a relative of palms, is found only in on a small area of granite outcrops in Khao Chamao National Park. This one is in a botanical garden, as it is hard to find in the wild. First described in 1999, its scientific name is **Cycas chamaoensis**. Many other plants remain to be discovered in our National Parks.*



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**NATURE IS CONSTANTLY EVOLVING, ADAPTING TO CHANGING CONDITIONS. NATIONAL PARKS AND OTHER PROTECTED AREAS PROVIDE THE SETTING WHERE EVOLUTION CAN CONTINUE WITH ONLY A MINIMAL DISTURBANCE FROM HUMANS**

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Our National Parks are essential for preventing many more species from falling into oblivion, with their unique characteristics gone forever after evolving for hundreds of millions of years.

### **National Parks conserve ecological processes**

Nature is constantly evolving, adapting to changing conditions. National Parks and other protected areas provide the setting where evolution can continue with only a minimal disturbance from humans. For example, many animals, including elephants, primates, fruit bats, and fruit-eating birds such as hornbills, have a significant influence on their habitats through dispersing seeds from the fruits of plants they favor or pollinating their preferred species, thereby affecting the composition of forests and enabling them to adapt to changing conditions.

Large predators help control the populations of smaller predators and grazing animals, and their hunting helps keep the grazers moving, thereby helping prevent overharvesting of any particular part of an ecosystem. Tigers, for example, can control the number of wild pigs that may raid crops, cobras help control rats, and bats and birds help control insects. Removing any species is therefore likely to have effects on others, and thus on the functioning of the ecosystem of which they are part. The changes to ecosystems in Khao Yai National Park after tigers disappeared are easily seen by changes in the increasingly bold behavior of its former prey species, such as deer, wild pigs, and monkeys, and the resulting damaging effects on the vegetation. This underlines the importance of conserving the full range of species and ecosystems.

A critical ecosystem service that is coming under increasing pressure is pollination, the process of transferring pollen from the male to the female part of plants.

*Thailand's many species of hornbills are largely confined to National Parks and other protected areas. They are "keystone" species that help to spread the seeds of the species of fruit trees that produce their main food supply.*

About 94% (11,280) of Thailand's 12,000 plant species depend on animals to be pollinated and reproduce, and many of these animals are found in National Parks or confined to them. These include nectar-feeding birds and bats, squirrels, monkeys, moths, butterflies, bees, and many others. The loss of wild pollinators is affecting the health of forests, including in Thailand<sup>120</sup>. The mammal and bird pollinators are under particular threat<sup>121</sup>, and are given particular protection within National Parks (in Chapter 6 we will explain how National Parks help pollination in agriculture).

### **National Parks help restore ecosystems to their former productivity**

When modern Thailand was developing rapidly beginning in the 1950s, its forests, fisheries, and wildlife



*Tigers are top predators that keep many other species alert and moving from place to place and thereby avoiding over-exploitation of the vegetation. By preying on wild pigs, deer, and monkeys, they limit the damage of these species on crops growing near National Parks and villagers normally adopt a live-and-let-live approach to their relationship. This tiger lives in Kui Buri National Park, Prachuap Khiri Khan.*

*By feeding on nectar, squirrels help to carry pollen among flowers, thereby pollinating the trees where they feed. Along with numerous other nectar-feeding species, such as some bats, birds, butterflies, moths, squirrels, and many others, squirrels help plants to continue breeding. This maintains the productivity and diversity of the forests and grasslands. You can see many of these pollinators at work in the National Parks.*



were suffering from over-exploitation and some species even disappeared. Many of the newer National Parks are helping to restore ecosystems, enabling the forests, grasslands, mangroves, and other kinds of ecosystems to regenerate naturally, and sometimes with technical support as well. Restoring wetlands is especially important, creating new habitats, helping to store water during the rainy season, recharging ground water, and reducing risks of drought. Now that these sites are being well managed, it may be possible to reintroduce some species into their former habitats or to enrich depleted populations.

The reintroduction of the Endangered Eld's Deer and Hog Deer to Huay Kha Khaeng Wildlife Sanctuary is an outstanding example. The successful long-term reintroduction

**THESE FORESTS HAVE EXPERIENCED BOTH NATURAL AND MAN-MADE DISRUPTION HISTORICALLY, AND STILL HAVE SEEDS AND SEEDLINGS**

*The Eld's Deer being reintroduced into Huay Kha Khaeng Wildlife Sanctuary are now thriving, though they take great care to avoid tiger habitats. Some have radio collars so that their movements can be tracked.*





*Endangered Siamese Crocodiles are a freshwater species now reproducing well in captivity, providing an opportunity to reintroduce them to their former habitat when sufficient protection is provided. At least a few still survive in remote parts of Kaeng Krachan National Park and efforts are being made to reintroduce the species in Pang Sida National Park in Sa Keao.*

of Hog Deer into Phu Khieo Wildlife Sanctuary in Chaiyaphum shows that our National Parks can be restored to their former wildlife glory<sup>122</sup>. Numerous efforts are being made in both the Andaman Sea and the Gulf of Thailand to enhance the populations of sea turtles that nest in Marine National Parks, through captive hatching and subsequent release<sup>123</sup>. Siamese crocodiles are being reintroduced in Pang Sida National Park and gibbons are also being considered for reintroduction in several National Parks.

Most of Thailand's terrestrial forests are regenerating naturally, following the 1989 ban on logging. These forests have experienced both natural and man-made disruption historically, and still have seeds and seedlings, as well as neighboring forests with animals that help disburse seeds, to help ensure that the forests regenerate. But



*Mangrove restoration is becoming more popular in Thailand's coastal zone, especially where shrimp ponds have been abandoned and may become part of a coastal National Park once they have been restored. The private sector is helping to replant mangroves in Khao Sam Roi Yot National Park.*

mangroves regenerate rather slowly, and in recent decades many of these coastal forests were replaced by shrimp ponds that have now been abandoned, leaving polluted soils behind. Mangrove restoration therefore needs help from specialists who have developed appropriate means of bringing back the forests. Often using volunteers, many mangroves in the coastal and marine National Parks in the Andaman Sea and Gulf of Thailand regions are now regenerating well, though care is required to ensure that the mangroves have their normal full complement of species diversity<sup>124</sup>.

*Mae Yom National Park in Phrae Province has Thailand's last remaining teak forests, a genetic resource of great value to foresters growing teak plantations.*



Thailand's seagrass beds, critical habitats for the Endangered Dugong (or sea cow) are also being degraded by fishermen dragging heavy nets along the sea beds where these grasses grow. Most of the best remaining seagrass beds are found in the National Parks, and they can be restored to their previous productivity through replanting of the native species<sup>125</sup>.

### **National Parks contribute to forestry resources**

Conservation goes far beyond wild animals. Given the depletion of mature and biologically rich forests in Thailand, protected areas are also valuable to forestry though the conservation of the genetic diversity of valuable timber trees. For example, Mae Yom National Park (Phrae) contains the greatest genetic diversity of teak, a valuable timber species that has been significantly depleted outside of protected areas<sup>126</sup>. National Parks are therefore an essential foundation for conserving, and eventually restoring, economically productive teak forests outside the parks.



## **National Parks support valuable plant resources in forests**

Many wild flowers and nuts of economic importance are growing in Thailand's National Parks. Some of these could be harvested as breeding stock without damaging the protected area, given proper management oversight. The flowers, fruits, and nuts of many trees are especially important to the health of forests and depend on pollinators that increase in numbers when the trees are in flower and thereby support forest biodiversity. Many of the trees that produce goods for people have been planted by forest-dwelling peoples for at least hundreds, and perhaps thousands, of years and have contributed to their current distribution and abundance. National Park managers can draw on Traditional Ecological Knowledge to help conserve these plants that have played such an important cultural role in Thailand.

These valuable plant species are also spread by the wildlife species that share our appetite for them. A dramatic example is the role of hornbills in spreading the seeds of fruit trees throughout the forest. Their role is so important that they have been called "farmers of the forest"<sup>127</sup>. But for them to play this role, the hornbills and their habitats must be conserved. Since hornbills nest in tree cavities, they need old-growth forests that have both nesting sites and a great diversity and richness of fruit trees. This increasingly means well-protected National Parks. Saving the habitat of hornbills will enable the hornbills to enrich the forest (and attract bird watchers who find these species especially fascinating).

## **National Parks protect our natural resources for the benefit of all**

National Parks and other kinds of protected areas, such as Wildlife Sanctuaries and Non-hunting Areas, have legal protection in the name of the people of Thailand. The laws that have been passed beginning in 1960 help ensure that the benefits flow to the public, and seek to prevent individuals from gaining private benefits from these public goods. These laws ban hunting, littering, collecting of forest products, logging, and other commercial activities unless such activities are given specific permission. By joining international agreements such as the World Heritage Convention, the Convention on Wetlands of International Importance (also called the Ramsar Convention), and the Convention on Biological Diversity, Thailand is demonstrating its solidarity with the global community by establishing and managing its protected areas for public benefit, and cooperating with other countries in doing so.

**In summary, our National Parks well represent the diversity of geological and biological diversity that has supported Thailand's prosperity. The great variety of our landscapes and seascapes has helped our people adapt to changing conditions, and the natural resources represented by our National Parks have made fundamental contributions to this adaptation. Part of our responsibility to ourselves, and to future generations, is to ensure that this natural heritage remains available to support the development efforts of future generations.**





*Hornbills sometimes flock in National Parks with fruit trees that attract these large and loud birds. They are popular to visitors to these Parks but the hornbills will stay only if they can find mature old trees that have natural holes where they can nest and plentiful fruit trees that provide food for them throughout the year.*





5

NATIONAL PARKS ARE SUPPORTING  
NATIONAL, PROVINCIAL,  
AND LOCAL ECONOMIC DEVELOPMENT



**NATIONAL PARKS PROVIDE “PUBLIC GOODS”  
THAT BENEFIT EVERYBODY IN THAILAND,  
EVEN THOUGH THEIR VALUES MAY NOT BE  
ECONOMICALLY RECOGNIZED**

# NATIONAL PARKS ARE SUPPORTING NATIONAL, PROVINCIAL, AND LOCAL ECONOMIC DEVELOPMENT

Like all countries, Thailand's development depends on its natural, cultural, and human resources. In Chapters 2 and 3, we showed how Thailand's cultural development has been linked to nature and, more recently, to National Parks and other kinds of protected areas. In Chapter 4 we briefly introduced the natural resources of Thailand and showed how National Parks are conserving these for the long-term benefit of the country. In this chapter we will illustrate some of the ways that National Parks are supporting economic development, focusing especially on land-use planning, water, and tourism. Agriculture, human health and climate change are so important for National Parks and development that they will each receive their own chapter.

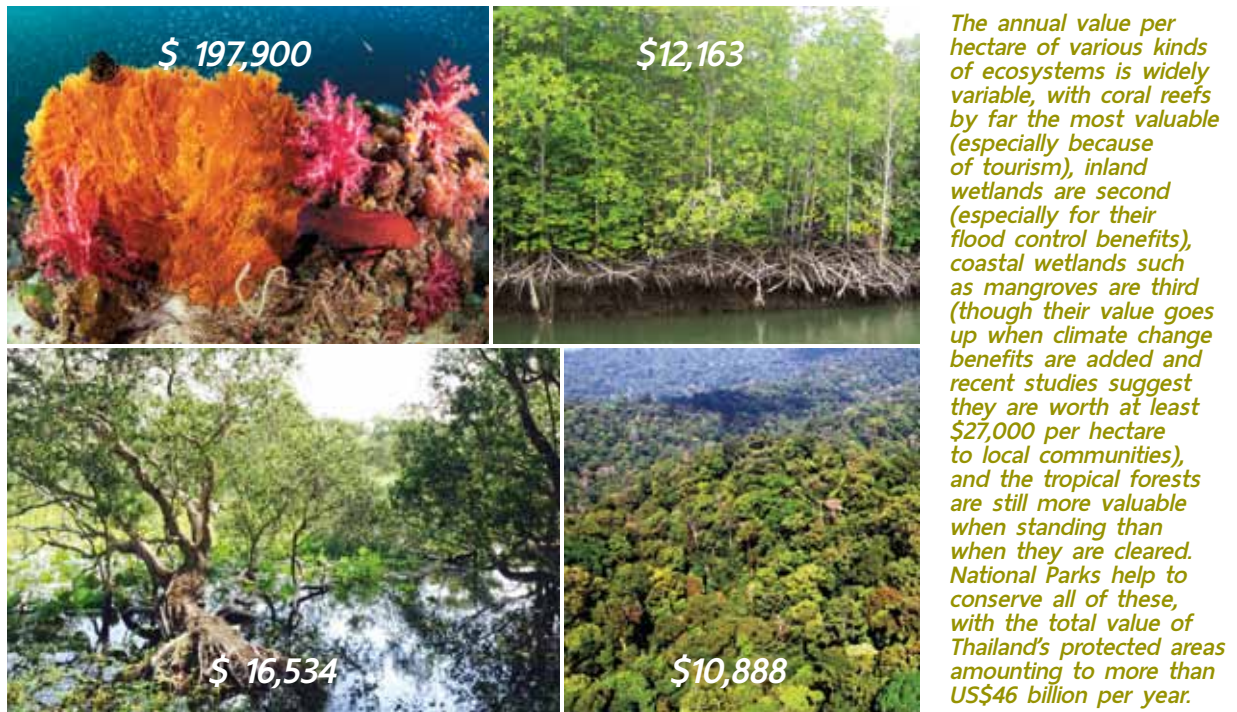
### **National Parks make important contributions to the national economy**

National Parks provide “public goods” that benefit everybody in Thailand, even though their values may not be economically recognized because only some of them are traded and therefore given a market value. For example, nobody pays for pollination from wild species, even though this value is estimated at \$217 billion per year worldwide<sup>128</sup>. And the price paid for water normally reflects the cost of delivering the water, not the costs involved in conserving the watersheds that provide the clean water. Such public goods have two characteristics: nobody can be easily excluded from the benefits provided by the public good; and the use of the public good by one individual does not reduce its availability to others. Well-known examples of public goods include national security (provided by the military), domestic security (provided by the police), urban green space provided by city parks (included in the municipal budget), clean air and water (implemented through various laws and regulatory agencies), and knowledge that is freely available (and provided by many sources).

The public goods delivered directly by National Parks include many of the benefits we have discussed earlier and some that we will explore below. Among them are the conservation of biological diversity (a national and global public good), the conservation of cultural values (a national public good), air quality regulation (the scales of benefits range from local to regional), regulation of erosion, pests, and natural hazards (mostly local), social and religious values (many levels, including global), and educational values and inspiration (also at many scales). Such public

goods typically are covered by the national budget for the National Parks and sometimes receive international support (in the case of biodiversity, for example).

Many of our economists are now recognizing that these “free” public good values of nature need greater attention because many of them are being threatened by people who take advantage of this public property by seeking private gain. This is leading to the degradation or even loss of the ecosystems that provide the services. Thoughtful economists are now recognizing that these natural assets are a form of capital that needs to be managed as carefully as our investments in roads, schools, buildings, dams, harbors, and national security. This “natural capital” has been shown by international studies to be remarkably valuable, as shown in the picture below<sup>129,130</sup>.



These global figures will vary from site to site, and will depend on how well they are managed and for what objectives. But nature's ecosystems are usually best represented in National Parks and other kinds of protected areas.

Taking their full values into consideration often demonstrates that conserving these sites is the most economically sensible use of the land or sea where they are located. Further, investment in National Park management is very cost effective. Research by leading economists has indicated that each dollar (or baht) invested in wetland conservation leads to a return of 10 dollars (or baht), a return on investment of 1,000%. Conserving coral reefs is an even better investment, yielding a 7,200% return, in other words returning 72 baht for every baht invested in conservation<sup>131</sup>.

## National Parks benefit Thailand's larger landscapes and seascapes

Many of the development challenges facing Thailand today are linked to the conditions of the forests, wetlands, mangroves, coral reefs, and other kinds of ecosystems, both within National Parks and other protected areas as well as on the other 80% of the land. Maintaining a healthy environment is an essential part of a healthy economy, as recognized by numerous international studies and agreements that the government of Thailand has helped negotiate. Our natural environment, with National Parks providing the best illustration of nature's benefits, provides clean water, protection against floods and coastal storms, productive soils, crop pollination, carbon storage, adaptation to climate change, natural raw materials, tourist destinations, and many other development necessities. As our population and economy continue to grow, our dependence on these services of nature will become even greater and their value will increase.

The ecological links between well managed National Parks and people living in surrounding lands provides an opportunity for the parks to serve as natural laboratories that can demonstrate improved land management that can deliver important ecosystem services to people. Royal Projects in Doi Inthanon and Kui Buri national parks provide good examples of this demonstration service, though many other examples are found throughout the country (see [www.royalprojectthailand.com](http://www.royalprojectthailand.com) for details), including some that establish well-managed sites that serve many conservation

*Doi Inthanon National Park benefits from Royal Projects that provide multiple benefits to agriculture, implemented largely by the Hmong people. These projects are popular with visitors to this National Park, though agriculture is permitted only in a few selected National Parks. The lessons learned can be applied in many other parts of the country, outside the national parks.*



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**THE ECOLOGICAL LINKS BETWEEN WELL MANAGED NATIONAL PARKS AND PEOPLE LIVING IN SURROUNDING LANDS PROVIDES AN OPPORTUNITY FOR THE PARKS TO SERVE AS NATURAL LABORATORIES THAT CAN DEMONSTRATE IMPROVED LAND MANAGEMENT THAT CAN DELIVER IMPORTANT ECOSYSTEM SERVICES TO PEOPLE**

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*Doi Chaing Dao highland ecosystem in Chiang Mai provides public goods and services that benefit for local people and everybody in Thailand*





functions and thereby contribute to the national system of National Parks and other protected areas. The national network of botanical gardens has been supported by many Royal initiatives, including some within National Parks such as Doi Inthanon.

National Parks and other kinds of protected areas are surrounded by other land or water uses that are linked by the flow of water, species, and other ecosystem elements. These surroundings may include features that can contribute to conservation objectives, such as limestone outcroppings that support populations of bats that are important predators on insect pests of agriculture, wetlands that recharge ground water and control floods even when they are of only modest size or form only seasonally, bird rookeries that provide significant nutrients (especially phosphorus) to water that may be used for irrigation, isolated forests that may contain rare or threatened species of plants or provide important pollinators to nearby croplands, and coral reefs that may be essential for fish migrations even if they are far from other reefs.

Linking National Parks to larger landscapes and seascapes can also help avoid the problem of extirpation (local extinction) of even small mammals from forest fragments that are reduced to less than 10 hectares in size<sup>132</sup>. The pattern of protected areas can also help support the migratory pathways of birds and fish (the latter especially in marine habitats, but also including freshwaters).



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## LINKING NATIONAL PARKS TO LARGER LANDSCAPES AND SEASCAPES CAN ALSO HELP AVOID THE PROBLEM OF EXTIRPATION (LOCAL EXTINCTION)

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*Even small isolated natural areas can contribute to national conservation objectives, providing resting places for migratory birds, hosting some species of useful insects and other pollinators. While they may not be protected areas, they are part of the productive landscape.*

### **National Parks contribute to many other development sectors**

National Parks and other protected areas reach their full potential when they build productive relationships with the many other sectors that affect them, at both the national and local levels. The links of National Parks to tourism, forestry, fisheries, religion, and agriculture are well recognized, but National Parks have more subtle, but nonetheless significant, relations to many other fields, including transportation, communication, defense, education, health, and energy. All of these contribute to the social and economic development of Thailand, and the conservation management of about 20% of the country's land is supporting this effort in ways that we will discuss further in the following sections.

*Small parts of mountain National Parks may be required to serve other national interests, such as this radar installation that is essential to air transport in Thailand, even though it is on the top of Doi Inthanon National Park. Such sacrifices of small pieces of land can help enhance the social value of the National Park, especially when rent is paid.*



**THIS ECONOMIC BENEFIT LEADS TO MIXED IMPACTS. FOR THE RURAL POOR, THEIR LAND MAY BECOME A VALUABLE ASSET THAT THEY ARE TEMPTED TO SELL TO OUTSIDERS WHO MAY HAVE A VERY DIFFERENT PERSPECTIVE ABOUT THE NATIONAL PARK**

*Many of our National Parks are an important part of the national network of roads and highways. For example, Highway 304 splits the Dongphayayen-Khao Yai Forest Complex, separating Khao Yai from Tap Lan National Park*



Throughout Thailand, the establishment of a National Park leads to increasing the value of the adjacent lands. While living close to National Parks can involve some costs, such as crop raiding by elephants, deer, and wild pigs, the benefits typically far outweigh such problems. Many of these benefits are related to tourism, but others reflect the more general amenity values of living close to nature and providing access to it. This economic benefit leads to mixed impacts. For the rural poor, their land may become a valuable asset that they are tempted to sell to outsiders who may have a very different perspective about the National Park.

A dramatic example is providing the development of a booming condominium market around Khao Yai National Park, as well as numerous hotels that appeal to all economic groups. These benefits are so substantial that they tempt encroachment into the National Park, requiring regular vigilance and dialogue between the National Park managers and the surrounding communities. Protected Area Committees have been established as a means of ensuring that the benefits of National Parks are distributed equitably and that the boundaries are respected so that the amenity value of the National Park is maintained. This is a continuing challenge.



*One conservation management response is to build corridors, either as tunnels or overpasses, to enable wildlife to move freely and safely between the forests in protected areas that elephants are using to avoid the traffic dangers to both elephants and automobiles when animals cross highways.*



### **National Parks provide high-quality water for farms, industries, and households**

Conserving the watersheds that provide the water that supports the prosperity of Thailand's farmers, industries, and cities is a critically important role of National Parks and other protected areas. Much of the fresh water for the fields, villages, and cities of Thailand comes from National Parks, which typically have much higher rainfall than the lowlands because many are located in the hilly or mountainous areas that capture clouds and therefore receive more precipitation (typically with over 60% of the country's rain falling there). The protected areas containing cloud forests, such as Doi Inthanon and Doi Pha Hom Pok national parks in Chiang Mai and Phu Kradeung National Park in Loei, are able to capture moisture even during the dry season and then release it into the streams that send the water downstream to thirsty crops. This "water tower" phenomenon of National Parks enables them to provide water even during the driest times of the year.

Further, the mature forests that are more likely to be found in National Parks than elsewhere have much higher water yield than disturbed (logged) forests because



*Mountain national parks such as Doi Inthanon National Park in Chiang Mai support cloud forests that help provide a consistent flow of water, even in the dry season.*

the older trees in mature forests are better able to store water, up to 50% more than the younger forests<sup>133</sup>. More generally, watershed protection and the provision of freshwater may well be one of the most valuable ecosystem services provided by National Parks, with many of the benefits provided to distant users. For example, people living in cities may have little idea of where their fresh water comes from, or that the low-cost energy that drives their fans comes from hydroelectric dams that are made more efficient by forested National Parks that are extending the life of the reservoir through slowing sedimentation rates.

The value of National Parks in providing drinking water to cities is especially dramatic, with 33 of the world's largest cities depending on water from them, including Bangkok<sup>134</sup>. The Chao Phraya River provides the lifeblood for the Bangkok-Thonburi Metropolitan area, which supports nearly 15 million people. The Chao Phraya River is fed by the Nan, Ping, Wang, and Yom rivers, all of which are protected in their upper reaches by National Parks. Once they join the Chao Phraya, the protection offered by National Parks is reduced because the provinces closer to Bangkok are largely deforested and the natural wetlands have been converted to agricultural uses. The condition of the Chao Phraya basin and its recurrent floods provide a dramatic illustration of how important protected areas are in providing water for domestic uses.

More broadly, most of Thailand's cities, farms, and industries depend on water that ultimately comes from protected areas. Virtually all of Thailand's terrestrial National Parks feed our rivers. As just a few examples, Ang Rue Nai Wildlife Sanctuary



*The Wang River feeds into the Ping River, both coming from National Parks in the North, while the Yom flows through domesticated lands before feeding into the Nan River. The Nan and Ping join to form the Chao Phraya River at Nakhon Sawan, then flowing through Singburi, Ayutthaya, and Bangkok to the Gulf of Thailand. The clearer waters of the Ping show the effectiveness of the upstream National Parks in reducing sedimentation, while the muddy waters of the Nan indicate the erosion more typical of the agricultural lands through which they flow.*

(Chachoengsao) is the watershed of Bang Pakong River and Prasae River. Many of the National Parks in the west feed into the Khwae Yai and Khwae Noi rivers that become the Mae Klong River, Doi Suthep Pui National Park is the watershed of Mae Sa River, Ob Luang National Park provides the watershed of Mae Jaem River that is the main tributary of the Mae Ping River, and Khao Yai National Park serves as the source of no less than five rivers: Nakhon Nayok, Bang Kapong, Prachin Buri, Takham, and Lam Ta Khong. All of these provide essential water supplies to farmers, urban centers, and factories.



*Virtually all of Thailand's rivers are nourished by National Parks, whose forests help to provide clean water to users downstream. The cleaner the water, the more effectively the National Parks are being managed to deliver this benefit to the many water users. This is the Khwae Noi River in Sai Yoke National Park that joins the Khwae Yai River (from Sri Nakarin, Erawan, and Salak Phra national parks) in Kanchanaburi to become the Mae Klong River. Khao Laem and Sri Nakarin reservoirs in this basin are major parts of Thailand's water system, with their water quality assured by the upstream National Parks.*

## National Parks help purify main water supplies

Like virtually all countries, Thailand is suffering from water pollution, including toxic bacteria, runoff from agricultural fields, sewage waste, and industrial effluents. The water purification service provided by wetlands that are often found in protected areas (especially those that are recognized as Wetlands of International Importance under the Ramsar Convention) can be especially important. For example, wetlands can filter up to 80% of nitrate pollution from agricultural fields, and many of the plant species they contain are especially effective in absorbing various kinds of pollutants, including heavy metals that are hazardous to human health.

*Reservoirs such as this one in Kaeng Krachan National Park are important wetlands, with their seasonally flooded areas providing dry or boggy habitats for the many grazing species in the park during the dry season when the water level is low and nutrients to the aquatic species when the rains flood the grasslands shown here.*



National Parks can contribute to water purification and waste treatment, with the aquatic species of plants serving to capture many of the organic and pathogenic pollutants that would otherwise lower water quality. Recent research has shown that natural freshwater wetlands are effective in limiting the damage from pollutants coming from abandoned mines that continue to leak toxic metals that are filtered by the wetlands<sup>135</sup>. Wetland protected areas have proven so successful in treating water that using the natural filtering services of aquatic ecosystems to provide clean water is being applied in many parts of the world to improve water quality for the wider community, saving billions of dollars from not building expensive water treatment plants<sup>136</sup>.

Marine pollution is especially troublesome when it receives excessive nutrients from the runoff of fertilizers from farmers' fields. This flow of nutrients might seem like a good thing, but the dense growth of plant life in the water uses up the oxygen that animals depend upon and leads to the death of fish and other marine creatures. This problem, technically known as "eutrophication", typically results from the discharge of organic wastewaters and heavy metals. But coastal wetlands have been shown to be effective filters of such pollutants, converting them into plant growth on

land so that the runoff to the sea is significantly less damaging. National Parks that contain coastal wetlands can help prevent “dead zones” in the sea. Fishermen benefit from this service, even if they are not aware of it.



*Erawan National Park in Kanchanaburi is a good representative of the many sites that provide clean water to downstream users, all the way to the Gulf of Thailand via the Mae Khlong River.*



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**AND SINCE THESE RESERVOIRS ARE A CRITICALLY IMPORTANT PART OF MODERN WATER MANAGEMENT IN THAILAND, EVERYBODY BENEFITS**

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*The wetlands within National Parks, especially in the coastal zone, can help filter pollutants from runoff from agricultural fields, and thereby reduce the dangers of eutrophication that can lead to “dead zones” in the sea.*

### **National Parks extend the life of dams by reducing sedimentation of reservoirs**

At a much larger scale of watershed protection, the dams that provide hydroelectric power gain a substantial benefit from the protection that National Parks provide to reservoirs by reducing sedimentation and thereby extending the life of the dam. For example, the Bhumipol Dam (which currently generates about 20% of Thailand’s electricity) depends on watershed protection from the many national parks upstream that feed the Ping River into the dam’s reservoir. Numerous other reservoirs throughout our country are within National Parks or very close to them, as at Kaeng Krachan National Park and Si Nakarin National Park. Khao Sok National Park

(Surat Thani) is the source of Tapi River, which feeds into the Chiao Lan reservoir. The industrial developments along the Eastern Seaboard depend on water from the Dok Krai, Nong Pla Lai and Khlong Yai reservoirs, all of which depend on the well managed National Parks and Wildlife Sanctuaries in the Eastern Forest Complex and the coordination of flow from the reservoirs. This plan depends especially on the management of Khao Chamao/Khao Wong National Parks as watersheds, as well as community water management further downstream. And since these reservoirs are a critically important part of modern water management in Thailand, everybody benefits.

*The Bhumipol Dam provides a significant proportion of Thailand's electricity, with the life of its reservoir greatly extended by the watershed protection benefits provided by the network of National Parks upstream from the reservoir.*

**DETAILED RESEARCH HAS SHOWN THAT CONVERTING NATURAL FORESTS TO RUBBER, OIL PALMS, OR FIELD CROPS LEADS TO MORE FLOODS DURING THE RAINY SEASON AND LESS WATER FLOW DURING THE DRY SEASON**



Some neighboring countries are ensuring that some of the economic benefits from watershed protection are returned to the protected area. A notable example comes from Lao PDR, where the Nakai Nam Theun National Protected Area is allocated US\$1 million per year by the Watershed Management Protection Authority which sells 7,000 megawatts of electricity from the Nam Theun 2 Dam per year to Thailand<sup>137</sup>.

### **National Parks reduce damage from floods**

Thailand is blessed by plentiful rainfall, but cursed when too much falls too quickly and leads to harmful floods. Historically, seasonal floods have been used to irrigate ricefields, and floods provided welcome nutrients to agricultural lands. But floods can become a serious problem when natural vegetation has been replaced by roads, factories, and other developments that do not absorb water into the soil and are not tuned to the seasonal symphony of floods. For example, the World Bank estimated that damages from the 2011 floods in central, northern, and northeastern Thailand cost the Thai economy US\$48 billion. Not all vegetation is equal in its ability to soak up the rain. Detailed research has shown that converting natural forests to rubber, oil palms, or field crops leads to more floods during the rainy season and





*Kaeng Krachan National Park is a good example of a close link to a reservoir that is included within the park, and forms part of its boundary. This link between National Parks and the many economic benefits of water management demonstrates their contribution to development.*

less water flow during the dry season, yet another reason to maintain the forested National Parks<sup>138</sup>.

On the other hand, National Parks and other protected areas, including watershed protection areas, can significantly reduce the effects of floods. The mountain forests absorb rainfall in their soils and root systems, releasing it more slowly and thereby reducing water flow. The forests and other vegetation along the streams and rivers within protected areas also slow the flow from heavy rainfall, stabilize the banks against erosion, and can absorb excess water. When protected areas contain marshes, lakes, and other wetlands, these serve as sponges that store water and replenish groundwater rather than running downstream to cause floods in fields and cities. Wetlands alone are estimated to provide an economic benefit of US\$464 per hectare per year in flood control services, on average, though with considerable variation from site to site<sup>139</sup>.



*National Parks can contribute to limiting the devastation from extreme climate events, such as those that caused the 2011 floods that affected many parts of Thailand. As the National Parks and other protected areas become better managed, their forests will be even more effective in reducing the runoff from heavy rainfalls.*

National Parks alone are not sufficient to control the floods that may become even more serious with the changes to the climate that are expected in the coming years<sup>140</sup> and will be discussed further in Chapter 8. Rather, National Park managers will be working with farmers and foresters to ensure that the parks are contributing to broader landscape management that will control the potential damage from floods, and ensure that water continues to be a blessing rather than a curse for the productivity of the country's landscapes<sup>141</sup>.

*Many communities in Thailand have developed their own ways of managing their water supplies, ensuring that each household gains a fair share of the water and contributes appropriately to the management of the water system. Such community management can be linked to the National Park that is providing the water. Some communities have even arranged to exchange water from the National Park for services such as forest protection, anti-poaching, and fire fighting.*



## **National Parks can help reduce the damage from droughts**

While floods often receive the most attention, droughts are also causing problems in Thailand, especially in the Northeast but also in other parts of the country where industries have become dependent on predictable amounts of rainfall. An important part of modern water management is the establishment of reservoirs, many of which are fed by runoff from National Parks and other protected areas, as indicated above. National Parks are especially important for areas where both flood and drought are likely to become larger problems as climates change in the future, such as the Northeast<sup>142</sup>.

National Parks can also provide best-practice examples of managing grasslands, and protect water supplies that can be available during the dry times of the year. In parts of the Northeast, National Parks have drought resistant plants that may be of interest to herders living outside the park but looking for suitable species to grow as dry-season fodder.



## National Parks support tourism

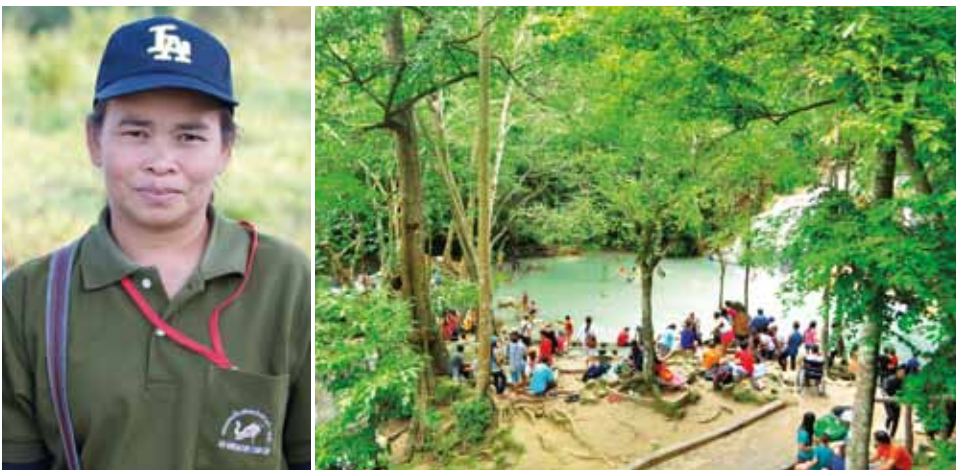
We have already mentioned tourism several times because it is such an important part of National Parks, and because tourism makes so many contributions to them<sup>143</sup>. The most important flow of cash to National Parks today comes from tourism, which globally attracts 8 billion visits to the parks per year (in other words, more than one visit to a National Park per person per year), generating about US\$600 billion in benefits to the locations that support the protected areas<sup>144</sup>.

In Thailand, protected areas are an expression of the cultural value of natural areas that attracts over 12 million visitors each year. A key point is that many protected areas, even some of the smallest and most obscure ones, provide business opportunities to local people and are thereby providing a cultural value to them that is worth money. The local people can provide food and drink, lodging, and guide services. Studies have shown that people who live close to National Parks tend to be better off financially than people living in similar conditions farther from protected areas, benefitting primarily from the business opportunities provided by tourism<sup>145</sup>. Some of the larger protected areas, such as Khao Yai, have attracted major investments in tourism in the surrounding lands. These large developments, too, can offer employment opportunities to local communities as well as providing markets for crops and handicrafts.

But eternal vigilance is required to enforce National Park regulations that will protect the very resources that make them so valuable to so many.

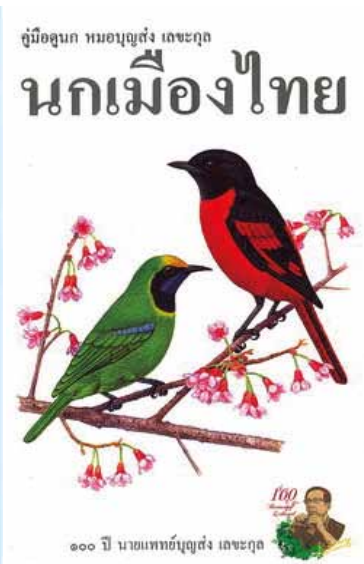
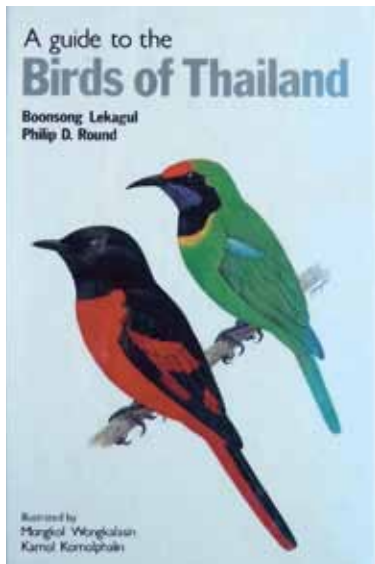
The legal protection provided to National Parks helps ensure that private profit is

*People from the communities around Kui Buri National Park have formed a well-trained organization of guides for the visitors to the Park. This benefits both the visitors and the local communities, providing an economic benefit to the latter and a knowledge benefit to the former.*



*Attracting young people to the National Parks provides great benefits to both the visitors and the parks, with many of the youth indicating that such visits have made them happy. This is a non-commercial value of great importance.*

kept within appropriate bounds, and that the private investments are consistent with the conservation objectives of the National Parks. But many National Parks also suffer from their success, attracting more visitors than the site can accommodate, thereby damaging the natural values of the site. This trade-off between effective management of the National Park and the hazards of making it too attractive requires sensitive handling by the National Park managers and tourism companies.



*Tourism to see some of Thailand 1,100 birds has received a boost from the high quality bird guides pioneered by Dr. Boonsong Lekagul. With the Thai-language guide now widely available, bird-watching groups are proliferating throughout the country and numerous commercial firms have been established to support bird-watching tourism.*

## **Marine National Parks are especially popular for tourists**

Economic studies of tourism to Marine National Parks have shown that iconic species such as whale sharks in Koh Lanta Marine National Park can provide benefits worth US\$225,000 per shark<sup>146</sup>. And the coral reefs at Hod Nopparattara-Koh Phi Phi National Park are worth US\$205 million per year for tourists (and US\$497 million for all values, amounting to \$15,118 per hectare per year)<sup>147</sup>. Judging from the many private sector nature tourism enterprises that are already springing up around Thailand's Marine National Parks, this sector has had considerable economic impact already, with a promise of more to come if the sites are managed well and deliver a high-quality experience. This proviso still needs more attention<sup>148</sup>.

The coastal and marine National Parks are especially attractive to international tourists, and generate substantial funding for the private sector tourism operators that can provide diving services to the Marine National Parks that have coral reefs. Visits to the Marine National Parks are estimated to earn about 70% of the income of tourism to Thailand's protected areas, leading to overexploitation of some coral reef diving sites<sup>149</sup>.

Thailand's marine mammals include the Dugong and at least 22 species of whales



*The Whale Shark is the largest shark in the world, but thankfully is a plankton eater rather than a predator, so it has become an important tourist attraction in Marine National Parks such as Koh Lanta in the Andaman Sea. The economic benefit of each shark amounts to US\$225,000 per year, a clear demonstration of the value of conservation.*

and porpoises (some only seasonal migrants). It is worth noting that whale watching has replaced fishing as a source of income for coastal communities in many countries that have appropriate conditions for this activity. In 2008, over 13 million people went on whale-watching trips in 119 countries, earning over US\$2 billion for 3300 operators who employed over 13,000 people<sup>50</sup>. In Thailand, this has been primarily dolphin viewing, with some seasonal whale watching, but the potential for expansion is substantial if whale populations continue to recover.

### **National Parks provide opportunities for ecotourism**

Tourism to National Parks becomes “ecotourism” when it is designed and implemented to enable visitors to help improve the management of the National Park and conserve the species and natural settings that are found there. The ecotourism market has grown three times faster than the global tourism industry as a whole, and it is a market that is very well suited to Thailand, with its biodiversity-



*Dugongs graze on sea grass beds that are largely confined to Marine National Parks. Enhancing these habitats and effectively protecting dugongs can provide support to tourism in sea. Whale watching is a growing business opportunity in Thailand, depending on a good understanding of whale migrations. Such understanding may best come from fishermen who trade their nets for whale-watching binoculars.*

rich forests and coral reefs. Marine National Parks are especially well suited to ecotourism. In Thailand, ecotourists are working to protect the coral reefs, collect trash from beaches, and support research on marine species and ecosystems. The private tourism sector and relevant research organizations are working together to develop performance standards that support the improved management of protected areas, a good example of ecotourism. This approach was been developed by “Green Fins”, a coalition of diving centers that began in Thailand in 2004 and has now spread to other countries in the region<sup>51</sup>.

### **National Parks provide water as a tourist attraction**

In the previous chapters we have highlighted many of the benefits of National Parks related to flood control, watershed protection, water supply and so forth. Water also provides a resource for tourism. Most of Thailand’s National Parks have waterfalls that are very popular with visitors. In fact, almost all of the country’s best waterfalls are

*A good example of ecotourism, where the visitors contribute actively to improving the protection of the National Park, is Reef Guardians, a group that works in the Andaman Sea National Parks, with broad support from many organizations*

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**AS A COUNTRY WHOSE ECONOMY IS STRONGLY BUILT ON THE FOUNDATION OF ITS INTERNATIONAL REPUTATION AND IMAGE, THE KINGDOM'S NATIONAL PARKS ARE A SIGNIFICANT ASSET**

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in our National Parks and other protected areas. Many of the waterfalls feed ponds where visitors can wade or swim, as in Umphang Wildlife Sanctuary in Nan. Many also contain rivers or streams, such as Mae Charim National Park in Nan Province, which protects the upper reaches of the Nan River and is very popular with people who enjoy exciting rafting through rocky rapids. Others have reservoirs, where visitors can take boats and quietly watch wildlife coming down to the shores for water. Tourism is covered in more detail elsewhere in this chapter, but water is such an important attraction that we give it additional attention here (and elsewhere, for example in Chapter 7).

### **National Parks give international recognition to Thailand**

As a country whose economy is strongly built on the foundation of its international reputation and image, the Kingdom's National Parks are a significant asset. Many of them are reflected in promotional images used by the Tourism Authority of Thailand, illustrating the natural beauty of the country. Some of the National Parks are formally recognized by international conventions. The prestigious World Heritage Convention, for example, lists Dong Phrayayen-Khao Yai Forest Complex (which includes five National Parks) and Thungyai-Huai Kha Khaeng Wildlife Sanctuaries (which are surrounded by six National Parks) (see [whc.unesco.org](http://whc.unesco.org) for details). More National Parks are being proposed for listing under the World Heritage Convention. The link between nature and culture is illustrated by the World Heritage Convention, which also includes cultural sites on the World Heritage List. Thailand's cultural sites that are World Heritage include Ayutthaya, Sukhothai, and Baan Chiang (an ancient archeological site showing early agricultural societies in Thailand).

Thailand is also a Party to the Convention on Wetlands of International Importance, otherwise known as the Ramsar Convention ([www.ramsar.com](http://www.ramsar.com)). The Convention maintains a list of Wetlands of International Importance, with Thailand having 13 sites on the list as of 2015, with many more in the process of nomination. Four of





*Since so many of Thailand's National Parks are in mountainous areas, most of them have waterfalls. These are highly attractive to visitors, who benefit from the clean, cool air and the attractive and dramatic scenery waterfalls provide.*

the sites are National Parks, including Hat Chao Mai Marine National Park (Trang), Laem Son National Park (Ranong), Mu Koh Ang Thong Marine National Park (Surat Thani), and Phangnga Bay Marine National Park (Phangnga). The Ramsar Convention provides technical advice on wetlands management, policy guidance on sustainable use of wetlands, and opportunities to collaborate with the other 167 Parties to the Convention.



## THE RAMSAR CONVENTION PROVIDES TECHNICAL ADVICE ON WETLANDS MANAGEMENT, POLICY GUIDANCE ON SUSTAINABLE USE OF WETLANDS

*As of 2015, Thailand has two natural sites recognized and listed as World Heritage by Unesco: Dong Phrayayen-Khao Yai Forest Complex (which contains four National Parks and one Wildlife Sanctuary) and Thungyai-Huai Kha Khaeng Wildlife Sanctuaries. Many other sites are recognized under the Convention on Wetlands of International Importance, otherwise known as the Ramsar Convention.*



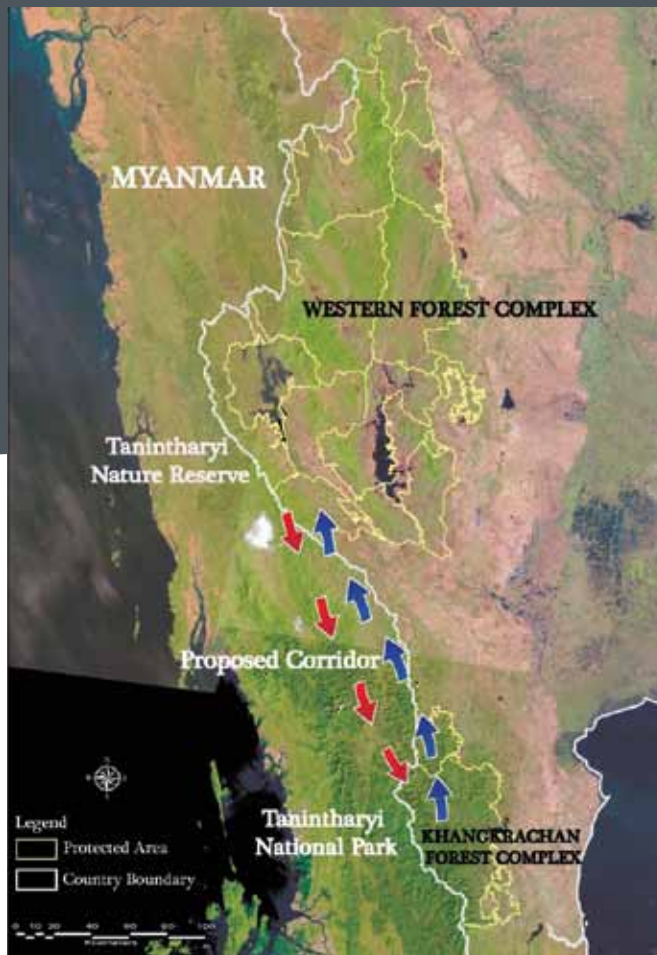
*As a member of ASEAN, Thailand also has several outstanding National Parks recognized as ASEAN Heritage Parks, including Kaeng Krachan National Park. The ASEAN Heritage Parks are designed to encourage mutual tourism among the ASEAN countries, which is likely to grow as the ASEAN Economic Community comes into force.*

## **National Parks support national security**

Many of Thailand's protected areas are located along international borders, thereby helping to avoid conflicts over land disputes, or even help solve them by promoting peace and cooperation<sup>152</sup>. Some progress is even being made to link some of Thailand's protected areas to adjacent protected areas in neighboring countries, and Thailand already is working with its neighboring countries as part of the Greater Mekong Subregion, with specific attention to environmental management<sup>153</sup>.

One important example is the expanding cooperation with Myanmar, to form a link between our Western Forest Complex and Kaeng Krachan Forest Complex. Within Thailand, these areas are separated by a substantial expanse of agriculture. But the Myanmar side of the border is well forested and contains several protected areas that could provide a welcome habitat link, important opportunities for tourism with a fellow member of ASEAN, and a significant contribution to national security for both countries along a border that has always required attention.

The map is for illustration purpose only and international boundaries are not definitive.



*This example of transboundary cooperation on conservation between Thailand and Myanmar makes an important contribution to the national security of both countries.*



*Thailand's Khao Phra Viharn National Park is adjacent to Cambodia's Preah Vihear Temple, a World Heritage site. Negotiations are underway as part of the Greater Mekong Subregion cooperation to make this a transboundary protected area that would enhance the national security of both countries.*

Another important example is Khao Phra Viharn National Park, which is adjacent to Cambodia's Temple of Preah Vihear, which is on the World Heritage List as a cultural site. This site is made "of outstanding universal value" by its setting on the edge of Thailand's Khorat Plateau, and the National Park on the Thai side contains both protected forest and convenient approaches to the Cambodian Temple. Such a combination of attractions makes this potentially an ideal transboundary protected area, once political issues are fully addressed to satisfy the national security issues of both countries. The benefits that tourism would bring can help lubricate the necessary cooperation.

**This chapter has introduced some of the many contributions National Parks and other protected areas can make to the social and economic development of Thailand when they are well managed. National Parks support larger landscapes and seascapes with the flow of benefits they provide, especially in terms of water and tourism. But these are only some of the most obvious benefits. Others that are essential but less widely recognized are coming in the following chapters.**





6

NATIONAL PARKS ARE HELPING  
TO FEED THAILAND

140

**PARKS FOR LIFE:** Why We Love Thailand's National Parks



IT MIGHT BE SURPRISING TO SOME PEOPLE THAT THAILAND'S NATIONAL PARKS PLAY A CRITICALLY IMPORTANT ROLE IN FEEDING THE COUNTRY, WHOSE CUISINE IS WORLD-RENOUNDED FOR ITS VARIETY, FLAVORS, AND NUTRITION.

## CHAPTER 6

# NATIONAL PARKS ARE HELPING TO FEED THAILAND

It might be surprising to some people that Thailand's National Parks play a critically important role in feeding the country, whose cuisine is world-renowned for its variety, flavors, and nutrition. Gathering wild food has been part of the way of life for people since our earliest ancestors first arrived in Thailand. And while growing food in fields or buying it in the market is a lot easier than gathering it in the forests, many people still enjoy going into the forest to collect fruits, nuts, mushrooms, and other products from the forested buffer zones that surround National Parks (such collection is legally forbidden within the Parks to ensure that their resources are conserved).

People often consider foraging in the forest to be a way of expressing their cultural heritage, especially for those who are worried that they may be losing their ties with nature as they become city dwellers. Actual farming within the Parks is technically illegal though some exceptions have been made (for example, in Doi Inthanon and Ob Luang National Parks in Chiang Mai). But protected areas provide a wide range of benefits provided to support productive agriculture in the more suitable agricultural lands outside the National Parks. The benefits agriculture gains from National Parks include:

- the production of a great diversity of crops, spices, fish, medicinal plants, and wild game;
- the processes of soil formation, photosynthesis, and nutrient cycling;



*Protected Areas like Doi Inthanon National Park provide water to support agricultural land in Mae Klang Loung village outside the National Parks.*

- controlling predators on crops or food supplies (such as insects and rats);
- enabling wild fisheries production;
- protecting watersheds to provide water to farmers;
- providing pollination;
- regulating climates;
- filtering pollutants by wetlands; and
- conserving traditional knowledge about food production.

We introduced some of these earlier, but will address several of them in more detail here.

### **National Parks help farmers**

The relationship between farmers and National Parks is a complex one, especially when the farmers have long depended on resources from forests that have become part of the now-extensive system of protected areas. For example, over 701 edible plants were found in a survey of 25 of Thailand's Wildlife Sanctuaries and National Parks<sup>154</sup>, and a quarter of the 157 wild plants that produce food from field boundaries, irrigation canals, and fallow areas in the Northeast have been intentionally transplanted by farmers from wild stock that may come from protected areas or their buffer zones<sup>155</sup>. In the Northeast, 88% of the home gardens contain wild species<sup>156</sup>. With deforestation, the availability of wild foods in the Northeast has declined significantly<sup>157</sup>.

As land use is stabilized, new relationships can be formed based on the benefits that protected areas provide in terms of pollinators for some crops (especially coffee, fruits, and vegetables), watershed protection (thereby delivering irrigation water), protection against extreme climatic events (such as preventing devastating landslides that have damaged farms below deforested hills), protection provided by mangrove forests against storm surges for coastal rice croplands, and maintaining a healthy balance among the species that occupy the forests.

*When bats, like these from Erawan National Park, are naturally controlling insects that feed on rice, farmers do not need to use so much pesticide to maintain crop yields. This enhances food security and leads to additional benefits such as reduced water pollution from pesticide runoff.*



In Ob Luang National Park (Chiang Mai) the local people are involved in managing the park, an effort that has proven both economically and environmentally beneficial<sup>158, 159</sup>. Providing limited access to medicinal plants, grass that can be harvested for livestock (maintaining the prohibition against domestic livestock in at least National Parks and Wildlife Sanctuaries), bamboo shoots, and other designated resources could be considered in a few special cases. But these normally are prohibited activities in a National Park, so areas permitting such activities may warrant a different designation, such as a Cultural Landscape.

Rural communities have typically established their own approaches to conservation, and those using agroforestry techniques are already well aware of the importance of biodiversity (even if they do not use the term). While some people remain skeptical about the ability of rural people to live in harmony with National Parks, the many examples of such collaboration (especially in the North) are strong indicators of the benefits of working with local communities rather than being seen to work against them.

*In a time when maintaining productive soils is increasingly critical, the soil-forming species such as termites living in National Parks provide a soil-formation service that may be essential to food production. Many of the most important soil organisms remain underground, where their contributions are quietly essential to soil productivity.*



### **National Parks protect species that control agricultural pests**

The value of wild species in controlling agricultural pests was introduced in the discussion of the role of National Parks in conserving ecological processes. This included species like tigers controlling crop raiders like pigs, deer, and monkeys. But most farmers are more concerned about insect pests, and these are controlled by many species of birds and especially by bats. The insect-eating bats that roost in the caves that riddle the limestone mountains of some of our National Parks range widely to feed on insects that plague most crops. The well-studied Wrinkled-lipped Bat was found to feed on major insect pests of rice, this species alone saving 2,900 tons of rice per year, worth US\$1.2 million annually<sup>160</sup>.

### **National Parks help to form productive soils**

With their diverse complement of plant species and high net primary productivity, terrestrial National Parks help form soils that are rich in nutrients. These both support



the species in the protected areas and contribute to farmlands downstream when the nutrients are carried by rainfall to alluvial areas where the rainwater collects. These soil-forming processes are supported by a complex ecological community of bacteria, fungi, nematodes, arthropods, earthworms, and many others that are able to develop naturally in protected areas (without chemical fertilizers and the constant withdrawal of nutrients by crops). Shifting cultivation can also help maintain soils when this ancient form of farming is carefully managed, and National Parks can provide a baseline against which to compare agricultural soils and their biodiversity. Species as humble as dung beetles<sup>161</sup> and termites<sup>162</sup> also contribute to soil formation, and bird rookeries in protected areas provide significant nutrients (especially phosphorus) to water that may be used for irrigation downstream. Even some pollinators help contribute to nutrient cycling<sup>163</sup>.

### **National Parks conserve valuable genetic diversity of crop plants**

Wild ancestors of domestic plants continue to survive, and evolve, in National Parks, and enable plant scientists to draw on the genetic diversity of these species to help crops adapt to changing conditions. The species that are wild relatives of domesticated species could also be given further protection under our Plant Varieties Protection Act (B.E. 2542). These could include, for example, the 18 wild species of mangoes, 25 wild species of mangosteens, and 7 species of wild rambutans that



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**WILD ANCESTORS OF DOMESTIC PLANTS CONTINUE TO SURVIVE, AND EVOLVE, IN NATIONAL PARKS, AND ENABLE PLANT SCIENTISTS TO DRAW ON THE GENETIC DIVERSITY OF THESE SPECIES TO HELP CROPS ADAPT TO CHANGING CONDITIONS. THE SPECIES THAT ARE WILD RELATIVES OF DOMESTICATED SPECIES COULD ALSO BE GIVEN FURTHER PROTECTION UNDER OUR PLANT VARIETIES PROTECTION ACT (B.E. 2542)**

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*Thailand's National Parks support many wild species of fruits that are related to the domestic forms. These wild fruits are popular with gibbons, hornbills, and many other species that spread the seeds of these plants throughout the forest. Wild relatives of domestic species also provide farmers and researchers with genetic material than can be used to improve the domestic species. As just one example, rambutans have 25 relatives in the forest, and these are very popular for the fruit eating species.*

are found within protected areas, along with the wild relatives of durians, jackfruit, bananas, and many fruits and vegetables. Genes from these wild species could be of considerable importance to plant breeders to provide new traits that can adapt to new conditions.

With modern biotechnology, numerous other plant species will be found to have genes that are helpful to domesticated plants, thereby increasing their potential value to ensure that Thailand's agriculture is able to adapt to changing conditions. The National Parks may be the only places where much of this genetic diversity can be found, providing that measures can be put in place to ensure that any such collection of genetic material for research does not pose a threat to the National Parks. National Parks and other protected areas also have the significant advantage for researchers of conserving genetic resources in the long term, enabling the scientists to return to promising areas when fresh infusions of genetic diversity are required.

*Many of the species that pollinate Thailand's crops live in National Parks. Both birds and butterflies provide significant benefits to farmers and are the subject of tourism as well.*



### **Protected areas support pollinators**

Pollination is the process of fertilization of plants by the transfer of pollen between flowers. The pollen of many plant species (such as rice) is carried by wind but about 75% of crop species rely on animals for pollination, including most fruits and vegetables that are especially important for the nutrients they provide<sup>164, 165</sup>. Animal pollinators include bees, bats, birds, butterflies, moths, monkeys, and many others<sup>166</sup> that are of significant economic importance<sup>167</sup> and National Parks provide important shelter to them. While pollinators from within National Parks benefit primarily the crops grown in or around the protected areas<sup>168</sup>, at a time when the loss of pollinators is a major global problem, those arising from within National Parks are receiving greater attention<sup>169, 170</sup>.

### **National Parks conserve valuable genetic diversity for domestic animals**

The forests and wetlands also support wild relatives of domestic species of animals, including the wild ancestor of domestic chickens (Red Jungle Fowl), six species of wild

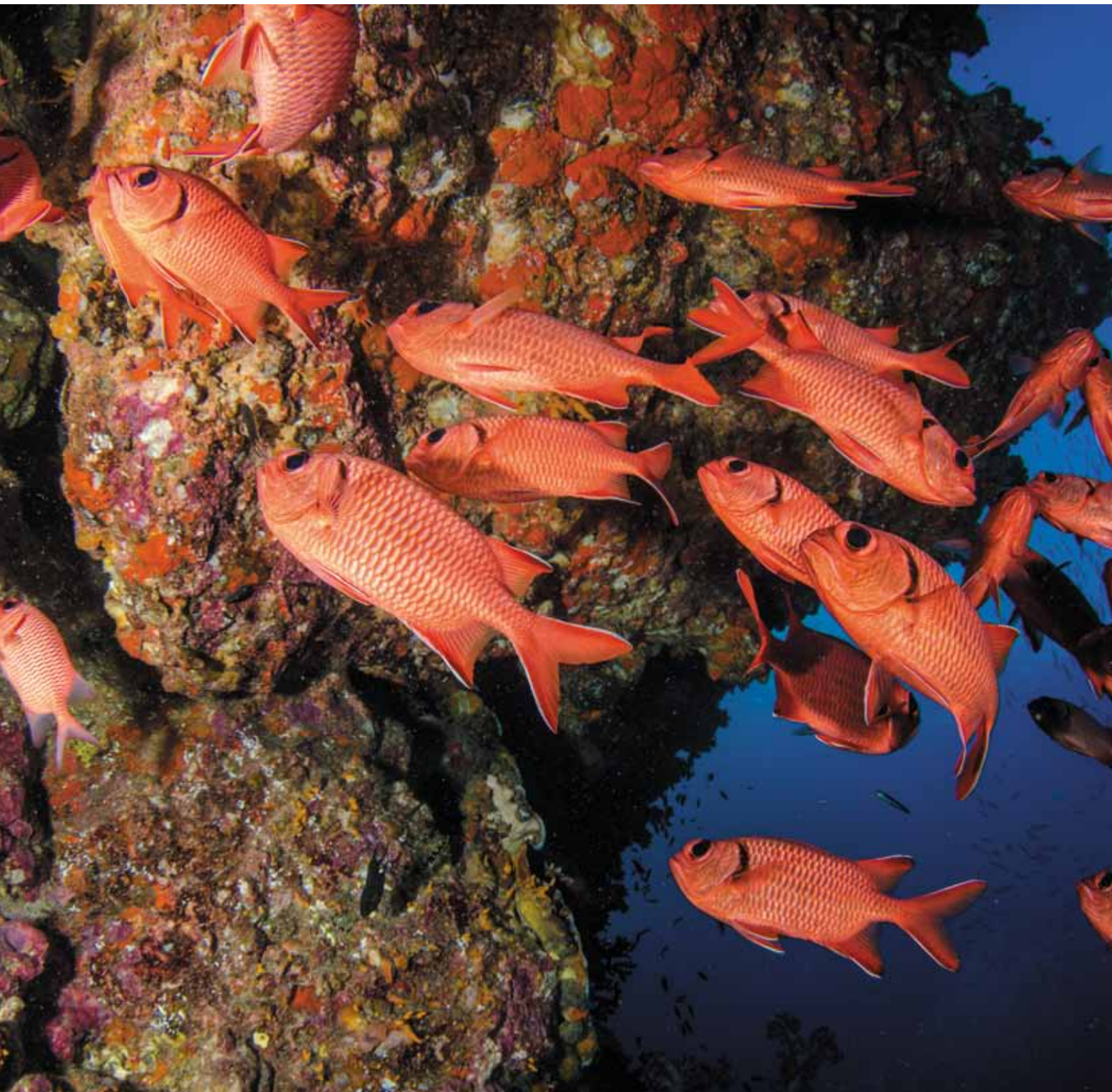


*The wild Red Jungle Fowls make themselves useful to other species that share the same habitat. They are thriving in many of the National Parks and the farmers around the Parks sometimes allow the wild roosters to breed with their domestic hens, giving them valuable genetic diversity that provides a welcome boost to the heartiness of the hens.*

ducks, two species of wild cattle (Gaur and Banteng), and the wild form of domestic water buffalo and pigs. These wild species contain characteristics that can help the domestic forms adapt to changing conditions, for example through resistance to disease, adaptation to climate change, and greater productivity.

*The wild pigs that live in many of our National Parks are the same species that has been domesticated, and lives on many of our farms. Sometimes wild baby pigs are captured when they raid crops, and are raised with the domestic pigs and crossbreed with them.*







## Marine National Parks support fisheries

The coastal zone has been a productive habitat for people in Thailand for tens of thousands of years, drawing on the multiple biological resources that can support coastal communities. These resources include shellfish, crabs, sea cucumbers, sea urchins, and over 2,000 species of fish. Reef fisheries in Thailand have long been productive, but destructive fishing practices have destroyed many of Thailand's coral reefs and climate change is adding more pressure to them by making the salt water more acidic<sup>171</sup>. Coastal and marine National Parks typically permit some controlled harvest of these resources by coastal communities, though both fishermen and park managers need to understand that effective non-fishing zones lead to greater harvests of fish outside the National Parks.

National Parks in the Andaman Sea and the Gulf of Thailand are a fairly recent innovation and some are still seeking their most appropriate roles. But supporting fisheries is an important element of their mission. Evidence from many parts of the world has shown that density of fish populations, size of the fish and other aquatic species, and diversity of species are all significantly higher inside the no-fishing zones of protected areas than outside. This includes for carnivorous fishes (such as sharks, tuna, and sea bass), herbivorous fishes (such as catfish and carp), and invertebrates (such as mussels, clams, shrimp, and rock lobsters)<sup>172</sup>. Even small marine protected areas are effective, but larger ones deliver substantially greater benefits. Ironically, no-fishing zones are especially valuable to fishermen, because they produce the highest net benefits to fisheries outside the no-fishing zone<sup>173</sup>. In the Andaman Sea, the Moklen, Moken, and Urak Lawoi people have often managed their fisheries effectively, when permitted to do so<sup>174</sup>.

Benefits of National Parks in supporting marine fisheries include:

- Enabling fish to reach adult size within the marine protected area before they migrate into adjacent fishing grounds, where they increase fishing yields;
- Increasing reproductive potential within the protected area, thereby seeding surrounding fished areas with eggs and larvae that enhance the growth of populations, a service that is especially useful to help recover areas that have been over-fished;
- Eliminating the accidental catches that harm species that are not being sought; and
- Acting as scientific reference areas that can enable comparison of the population of species that are being heavily fished against those that are not subject to harvesting.

All of these benefits depend on the Marine National Parks being effectively managed, especially to enforce no-take zones<sup>175, 176, 177</sup>. This positive experience demonstrating the economic benefits of National Parks for fisheries has encouraged the growing efforts of Thailand to establish Marine National Parks.

*The great diversity of coral reefs in Thailand's Marine National Parks produces a great diversity of fish and other marine species that make a significant contribution to the productivity of the sea. Numerous studies have shown that non-fishing areas in coral reefs can greatly enhance fisheries in the areas outside the National Parks that are open for fishing.*



*Thailand's Marine National Parks contain about 160,000 hectares of mangroves, making them the most effective and important way to conserve these valuable ecosystems that provide multiple benefits, including to sustainable food supplies. They are popular with visitors.*

## **Marine National Parks conserve mangroves**

Mangroves make many important contributions to providing food. About half of Thailand's mangroves have been converted to shrimp farms, which have helped make Thailand the world leader in shrimp exports. But mangroves are far more valuable for the other ways they support food production. Judging from detailed studies by economists, the economic value of mangroves to local communities in southern Thailand is \$27,264-\$35,921 per hectare, with values for fisheries production, habitat for shellfish, storm protection, pollution control, carbon storage, and others amounting to much more than their value when they are converted into shrimp farms<sup>178</sup>. The challenge for development comes in the distribution of benefits among communities, protected areas, and international commerce.

**To summarize, National Parks make multiple contributions to the farming lands and fishing waters around them, and even to the farming and fishing economy of Thailand. They contain wild relatives of domestic plants and animals, providing genetic diversity that is useful in maintaining the productivity of the crops and animals that are native to Thailand. They provide clean water and contribute to soils downstream. Their benefits to fisheries have been widely demonstrated, though this depends on the sites being effectively managed.**





*The Marine National Parks in the Andaman Sea and the Gulf of Thailand protect many of the most important marine ecosystems as well as the islands that provide a flow of nutrients to them. They are also the most attractive National Parks for visitors. This one is Koh Tarutau, established in 1974 as our first Marine National Park.*









7

NATIONAL PARKS  
ARE MAKING US HEALTHIER



WE ARE NOT THE FIRST TO DISCOVER THIS VALUE. JUST AS WILD ANIMALS HUNT OR FORAGE TO SEEK NUTRIENTS, THEY ALSO USE MEDICINAL PLANTS APPARENTLY TO TREAT PAIN, INFECTIONS, OR PARASITES. ELEPHANTS, FOR EXAMPLE, OFTEN FREQUENT SALT LICKS THAT MAY HELP FLUSH PARASITES FROM THEIR INTESTINES



## NATIONAL PARKS ARE MAKING US HEALTHIER

The World Health Organization considers good health to be “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” National Parks contribute to all of these dimensions of good human health. They conserve medicinal plants, provide material for medical research, and help visitors feel happier, calmer, and more refreshed. And perhaps most intriguing, National Parks are helping to reverse the leading driver of the emergence of new diseases among humans: land use change through deforestation<sup>179</sup>.

### **National Parks show how people learned to use medicinal plants and animals**

All of Thailand’s 12,000 plants and many hundreds of its animals are virtual pharmacies, containing numerous secondary compounds, including alkaloids, phenolics and numerous other kinds of chemicals that they use to defend themselves against predators (in the case of plants and some animals such as butterflies and frogs), attract pollinators (in the case of plants) or mates (in the case of animals), or to attack other species in order to eat them (in the case of poisonous snakes, wasps, and cone snails). This evolutionary battle between and among plants and animals has generated this amazing diversity of genetic materials that are useful to us as medicines.

We are not the first to discover this value. Just as wild animals hunt or forage to seek nutrients, they also use medicinal plants apparently to treat pain, infections, or parasites. Elephants, for example, often frequent salt licks that may help flush parasites from their intestines.

Other species use moss as a sort of bandage for wounds, an approach often used by humans in the North. Both birds and mammals suffer from forms of malaria, and eat parts of plants to help deal with the symptoms. Our closest living relatives, the great apes, have been shown to eat plants that reduce their parasite loads, and subsequent laboratory analysis has shown that these plants are effective in controlling intestinal parasites<sup>180</sup>. Considerable research has been devoted to self-medication by animals, observing that individual animals that seem to feel ill selectively feed on a plant that they would not normally eat<sup>181</sup>.

*Elephants and many other species are attracted to mineral licks, sometimes called “salt licks”, apparently because of health benefits such as controlling intestinal parasites. Elephants have also been seen peeling bark from a tree whose bark is also harvested by villagers to make an antiparasitic potion.*



As just one particularly interesting example, a scientist studying chimpanzees was watching one that seemed to be suffering from malaria, with alternating shivers and signs of fever. It then ate some leaves that were obviously bitter to the taste, judging from the grimace of the chimp. The scientist collected specimens from the tree and it was found to contain a useful anti-malaria drug that is now being used to treat humans for malaria<sup>182</sup>. An entire new field of research about self-medication by wild animals has emerged, called “zoopharmacognosy”, and National Parks may be the best place to observe such behavior because these sites typically have the richest medicine box of wild medicines that animals can use to self-medicate.

Judging from the presence of fossils of medicinal plants found in excavations at archeological sites, humans too have been using medicinal plants and animals for at least thousands of years, and likely very much longer. Rather than testing each plant or animal, our ancestors were keen observers of other animals and sought clues about plants that might have medicinal values, just as anthropologists have observed among traditional forest-dwelling people today.

*Now illegal in Thailand, opium poppies have a long history of providing useful pharmaceuticals, including being converted into morphine (one of the world's most important medications for pain). Numerous other medicinal plants are growing wild in the National Parks.*



### **National Parks support medicinal plants and animals**

While Thailand has no chimpanzees, it does have numerous species of mammals that self-medicate, including elephants, gibbons, gaur, pigs, bears, and no doubt others that helped our ancestors learn which species of plants might be helpful in treating the various maladies that affected humans long before modern medicine arrived<sup>183</sup>. Observation is far more efficient than trial and error, and part of Thailand's culture is based on the use of nature's pharmacy, often drawing on the traditional knowledge of forest-dwelling people who use numerous medicinal plants and coastal people who have learned about the medicinal value of marine species. And since the greatest diversity of plants and animals is found today in National Parks, they are valuable as living pharmacies for the medicinal species that our ancestors and fellow residents have learned to be useful for treating various ailments<sup>184</sup>.

This field is so important to the rural people who have legitimate ownership rights to such resources that the Parties to the Convention on Biological Diversity have negotiated a special Protocol (an agreement among governments) on access to such resources and how any benefits generated will be shared among the various interested parties (see <https://www.cbd.int/abs/> for details).



## SOME 1800 SPECIES OF MEDICINAL PLANTS ARE NOW CONSIDERED THREATENED AT A NATIONAL LEVEL IN THAILAND

*The cone snails of Thailand are beautiful and popular with collectors, but their value as pharmaceuticals is far more important. These predators hunt by using a harpoon that injects their prey with deadly poisons containing highly complex substances that are being used to develop a wide range of drugs to fight everything from pain to heart disease. Many of these are found in Marine National Parks, where the carefully managed harvesting of toxins could provide a significant source of income with little impact on the populations of these species.*

In Thailand, medicinal plants have long been an important part of health care, especially in rural areas. Systematic records of medicinal plants from India<sup>184</sup> and China<sup>185</sup> are over 2,000 years old, and surely have been informing Thailand for many centuries. In Europe, about 2,000 species of plants are used medicinally, a trade worth billions of dollars per year.

Often used in combinations, medicinal plants and animals help treat pain (such as morphine, from the opium poppy, and various toxins from coral reef-dwelling cone snails that may have as many as 50,000 toxins of pharmaceutical interest), malaria

*Many of the spices used in Thai food are collected in National Parks as well as grown on farms, and have significant medicinal value. This makes the Thai cuisine healthy as well as tasty. Chilli peppers (especially the spiciest variety known as phrik khii nuu) stimulate blood circulation and may help prevent heart disease; cloves relieve toothache; and ginger improves digestion and counteracts nausea and vomiting. Many other species collected in National Parks for food also have medicinal values, and hundreds of plants have significant medicinal value that has been known for centuries, as documented by Mahidol University.*



(quinine), infection (various antibiotic substances), coughs (codeine), kidney problems, skin afflictions, liver disease, intestinal parasites, tumors (for example, from a steroid called squalamine, from shark tissues), constipation, depression, diarrhea, fatigue, and sexual disfunction, among many others<sup>186, 187</sup>.

A complete compilation and database on Thailand's medicinal plants (but not animals) is maintained by Mahidol University, available at <http://medplant.mahidol.ac.th>. A major problem facing these plants is that some 1,800 species of medicinal plants are now considered Threatened at a national level in Thailand. National Parks and other protected areas may offer the best chance for these species to continue surviving and being able to be used by people. Some of these species may find their best habitats within National Parks or even be confined to them.

The role of National Parks in conserving medicinal plants could become crucial as human health faces novel threats under conditions of globalization and climate change that create new conditions and promote rapid movement of pathogens, as in the case of SARS, severe acute respiratory syndrome, which originated in China in 2002 and soon spread to many countries in Asia, Europe, and North America. A little-known benefit to human health is that protected areas and the biodiversity they support can also reduce the emergence and transmission of infectious diseases<sup>188</sup>.

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## THE ROLE OF NATIONAL PARKS IN CONSERVING MEDICINAL PLANTS COULD BECOME CRUCIAL AS HUMAN HEALTH FACES NOVEL THREATS UNDER CONDITIONS OF GLOBALIZATION AND CLIMATE CHANGE THAT CREATE NEW CONDITIONS AND PROMOTE RAPID MOVEMENT OF PATHOGENS, AS IN THE CASE OF SARS, SEVERE ACUTE RESPIRATORY SYNDROME

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*King cobras and other poisonous snakes that are found in our National Parks are milked by Thailand's Red Cross to make antivenom that can be used to treat snakebite. These venoms can also be developed into other kinds of pharmaceuticals that can treat blood circulation problems, strokes, and pain.*





National Parks support thousands of species of plants that provide substances that have medicinal value, either consumed directly or included in pharmaceuticals. Many of these are alkaloids, naturally occurring chemicals that usually have a bitter taste (which may have evolved by discouraging insects and other animals from eating the plant) but are the basis of numerous pharmaceuticals and stimulants such as nicotine in tobacco and caffeine in coffee. These medicinal plants have alkaloids in their seeds, bark, or leaves. Properly used, they support human health in rural areas, in cities where some plant-based medicines are still in wide use, and among researchers in Thailand who find medicinal plants to be useful in seeking treatments for many diseases, including cancer<sup>189</sup>. Under the current laws, medicinal plants cannot be harvested from within protected areas. But special permission may be provided to collect small samples that can then be further investigated in the laboratory, without depleting the wild species from which the samples are collected.

More than 1,500 species of animals, from insects to bears, have been identified as having therapeutic use in Traditional Chinese Medicine<sup>190</sup>, and many of these are used in Thailand even though their use often is illegal, and in any case not very effective when compared with modern pharmaceuticals. For example, bear bile collected from protected species is alleged to be effective in treating inflammation, tumors, and liver disease, though modern pharmaceuticals are cheaper and proven far superior and both species of Thai bears are strictly protected by law.



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## MORE THAN 1500 SPECIES OF ANIMALS, FROM INSECTS TO BEARS, HAVE BEEN IDENTIFIED AS HAVING THERAPEUTIC USE IN TRADITIONAL CHINESE MEDICINE

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*Thailand's National Parks support two species of pangolins or spiny anteaters. These species are now Critically Endangered because they are being grievously overharvested for their alleged medicinal use. Well-managed National Parks that effectively control poaching offer their best chance of continued survival.*

Other animals are not protected, such the various species of poisonous snakes that are kept in captivity and milked for their venom that is made into antivenom to treat snakebite by Red Cross Thailand and, in a modified version, is used to treat high blood pressure<sup>191</sup>.

While National Parks can provide snakes to the Red Cross without significantly affecting the species, many other Thai wildlife species are seriously threatened by the trade in medicinal animals, including pangolins, sea horses, bears, and tigers. National Parks are essential in keeping such species alive. Thailand's two species of rhinoceros have already been hunted to extinction at the national level because of their alleged

medicinal values, and the kind of protection provided by National Parks may be essential to conserving the surviving animals that are targeted by poachers who sell the body parts from species that have alleged medicinal value to unscrupulous drug dealers. Perhaps more important, National Parks also have populations of medicinal plants that may be developed to replace the illegal trade in wildlife with a legal trade in pharmaceuticals that may also be safer for humans<sup>192</sup>.

### National Parks support micro-organisms that deliver benefits to human health

National Parks also provide habitats for micro-organisms that contribute to the development of antibiotics. One indication is that about 75% of the new drugs to fight bacterial infections, viruses, and parasites developed since 1981 come from natural products<sup>193</sup>, many of which prosper in the National Parks that have a rich diversity of species that may be of medicinal value.

Modern biotechnology has offered new potentials to protected areas with remarkable habitats. Perhaps the best example is the discovery of a bacterium (called *Thermus aquaticus*) in the hotsprings of Yellowstone National Park, USA. This tiny species was able to survive, even prosper, in water temperatures as high as 80 degrees C, making it ideal as a key component in the high-temperature process of copying

**“POLYMERASE CHAIN REACTION”, IS NOW WIDELY USED IN MEDICAL DIAGNOSIS AND OTHER KINDS OF RESEARCH, WITH A MARKET VALUE NOW EXCEEDING US\$300 MILLION PER YEAR**

*Some of the hot springs in northern Thailand's National Parks have been assessed for some of their major chemical content. Their microbial species may be far more important but remain poorly studied.*



DNA (the hereditary molecule that contains the genetic instructions for how an organism is going to develop, unique to each species). This process, technically called “polymerase chain reaction”, is now widely used in medical diagnosis and other kinds of research, with a market value now exceeding US\$300 million per year. Based on this pioneering effort, numerous other species of heat-loving bacteria are now being explored, a potential billion-dollar asset made possible because the Yellowstone hotsprings have been protected and regulations on the collection of micro-organisms have been established. These ensure that the microbial research has no negative impact on the hotsprings, requiring only tiny samples for subsequent laboratory development<sup>194</sup>.

The hot springs from Thailand's National Parks, such as Lam Nam Kok National Park in Chiang Rai Province, may have similar heat-loving enzymes awaiting discovery, development, and marketing. The Yellowstone experience indicates that the best-protected hot springs are the most promising source of useful new bacteria awaiting discovery, and National Parks may be a productive source of valuable discoveries among the many bacteria and other micro-organisms living in extreme environments.

New technologies are developing faster and provide more effective ways of testing natural substances for their biochemical values, helping scientists to discover novel biochemical compounds that may be useful as pharmaceuticals. As found in the experience from Yellowstone National Park, a strong set of regulations is required if the National Park is to benefit from valuable discoveries from the species it is protecting. Properly designed, such rules can lead to mutually beneficial partnerships between Thailand's National Parks and businesses capable of collecting, analyzing, patenting, and developing the potential of these natural resources<sup>195</sup>.

### **Ecosystems in protected areas regulate disease transmission**

Research has shown that the diversity of species, including micro-organisms, in National Parks helps to limit disease transmission, and that maintaining these habitats helps reduce exposure to infectious agents<sup>196, 197</sup>, including malaria<sup>198</sup>. Villages closest to forests tend to have lower incidence of malaria than those located far from forests, and the destruction of forests has led to substantial increases of malaria in many countries, including Thailand<sup>199</sup>.

Part of this benefit may be due to the diverse ecosystems supported by National Parks helping to prevent outbreaks of pest insects that can damage agriculture or affect human health. For example, the diverse mosquito fauna in National Parks prevents any species from becoming dominant, thereby helping to limit the spread of malaria and other mosquito-borne diseases<sup>200</sup>. Insectivores such as bats and birds prey on substantial quantities of insects that prey on crops and spread disease, and snakes, owls, and various other species prey on rats and mice that carry and transmit disease<sup>201</sup>.



*Birdwatching is a healthy pastime that gives happiness and exercise to growing numbers of people in Thailand, with many companies promoting this effort. These birdwatchers are in Kaeng Krachan National Park, but similar scenes can be seen in many other National Parks throughout the country.*



*People, especially children, are happy when they are playing in the water that is such an important feature of many of our National Parks. Studies have shown that happier people tend to be healthier people, another valuable service provided by National Parks.*

### **National Parks provide emotional and psychological benefits**

The sense of well-being that nature brings to many people is a value of National Parks that is beyond a monetary price. Research has found that visits to protected areas can enhance feelings of calmness, speed recovery from stress, and improve concentration<sup>202, 203</sup>. Visits to National Parks are also helpful in overcoming depression, which affects about 10% of the Thai population that suffers from some degree of these feelings of unhappiness<sup>204</sup>, increasing to almost 30% among those over 45<sup>205, 206</sup>. Research in Japan has found that walking for two hours in a forest can improve

the quality of sleep and help cure insomnia<sup>207</sup>. Contact with nature lowers blood pressure, reduces stress levels, and strengthens the immune system – all significant health benefits<sup>208</sup>.

Further, international research has found that access to recreational opportunities such as National Parks greatly reduces socioeconomic inequities in mental well-being, so encouraging greater access to these natural areas would be broadly beneficial<sup>209</sup>.

Children who are able to interact with nature are healthier and better balanced socially<sup>210</sup>. When children are able to play in natural environments like those found in National Parks, they better develop skills in problem solving, creativity, imagination, risk-identification, and observation<sup>211</sup>. Children experiencing National Parks build a positive relationship to nature that lasts until they are adults<sup>212</sup>. This helps illustrate that these health and well-being benefits are life-long, stimulating an international movement called “Healthy Parks, Healthy People”<sup>213</sup>.

Other research has shown that people have an enhanced sense of well-being when they are close to water, which helps explain the great popularity of waterfalls in National Parks<sup>214</sup>. Virtually all of Thailand’s major waterfalls are in protected areas, and they typically provide one of the greatest attractions to visitors. The ocean provides a similar sense of well-being, judging from the popularity of beaches for both domestic and international tourists.

People feel happy when watching gibbons frolic in the trees of Khao Yai National Park, visiting herds of wild elephants and gaur at Kui Buri National Park, diving on the coral reefs of Koh Similan National Park, seeing fields of wildflowers on the plateau of Phu Kradeung National Park, or walking among the mossy cloud forests of Doi Inthanon National Park. These important emotional benefits help send the message that visiting National Parks is fun, and happiness often leads to better health<sup>215</sup>.

**Our basic conclusion is that contact with nature is essential to human health and well-being. By providing an opportunity for access to nature, National Parks improve and maintain human health and well-being at both individual and community levels. And through this improvement, National Parks can reduce the burden on the health care system through supporting a holistic approach to health that can give people a sense of empowerment and control over their own health and well-being. National Parks also contain many species that have contributed directly to human health through their development as pharmaceuticals, some of which are worth much more than the budget of Thailand’s entire protected area system. Capturing the benefits of such species will require careful management of the National Park, especially ensuring the continued flourishing of the medicinal species.**



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INDIVIDUAL AND  
COMMUNITY  
LEVELS**

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8

NATIONAL PARKS ARE ADDRESSING  
THAILAND'S CLIMATE CHANGE  
PROBLEMS

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**PARKS FOR LIFE:** Why We Love Thailand's National Parks



NOBODY IS SUGGESTING THAT WE STOP BREATHING,  
BUT FAR GREATER AMOUNTS OF CARBON DIOXIDE ARE  
RELEASED BY BURNING OUR FORESTS AND FIELDS

## NATIONAL PARKS ARE ADDRESSING THAILAND'S CLIMATE CHANGE PROBLEMS

People are now becoming aware that our climate is changing, and the effects are being felt throughout our country. Sea-level rise is affecting the coastlines, rainfall patterns are becoming less predictable, extreme storms and droughts are becoming more frequent, and the changing chemistry of the oceans is affecting many species. This climate change is being driven by a common chemical, carbon dioxide, that we all produce every time we exhale. Nobody is suggesting that we stop breathing, but far greater amounts of carbon dioxide are released by burning our forests and fields. This problem especially affects the North during the dry season but all parts of the country are burned at various times, making this a major source of Thailand's carbon emissions.

*Conserving old trees such as this one in Chiang Rai, which is being given spiritual protection, makes a significant contribution to climate change by storing the carbon that is being emitted by the burning of coal and petroleum products. The National Parks that have large areas of mature forests are Thailand's most important contribution to "sequestering" carbon and thereby contributing to global efforts to address the threats to society posed by climate change.*





But the biggest problem, at least globally, is from the burning of coal, oil, and gas (known as “fossil fuels” because they are derived from the remains of species that died many millions of years ago). This is a global problem, but we here in Thailand are likely to find climate change especially painful as salt water comes up our rivers, our coastlines move further inland and flood coastal communities, droughts and floods make agriculture a riskier proposition, and the changing chemistry of the sea damages coral reefs and shellfish<sup>216, 217</sup>.

National Parks are of crucial importance at this time of rapid climate change. They contribute to slowing the rate of climate change (known as “mitigation”) as well as contributing to the capacity to adapt to whatever climate changes the future may bring despite any efforts at mitigation (known as “adaptation”).



*The mature forests found in National Parks are the most effective ecosystems in Thailand to store carbon and produce oxygen, thereby making a major contribution to mitigating climate change. Thailand can take advantage of this contribution of National Parks by identifying how valuable they are to the Kingdom's climate change strategy.*

In terms of mitigation, recent research has shown that mature forests, even up to 800 years old, continue to accumulate carbon at an increasing rate, in both trees and the soil, far more than the new forests that are commonly advocated as a climate change mitigation measure<sup>218, 219, 220</sup>. More important, much of the carbon stored by mature forests is likely to return to the atmosphere if the mature forests are disturbed through logging, clearing, or burning. This is a strong argument for conserving the mature forests contained within the terrestrial National Parks of Thailand. Coastal National Parks, especially those supporting mangrove ecosystems, may be even more significant.

### **National Parks provide economic benefits by addressing climate change**

National Parks and other protected areas are important parts of the global response to the risks posed by climate change. Their contribution is poorly recognized.

But recall that a major objective of these legally established sites is conserving biodiversity, an important contributor to climate mitigation. For example, ecosystem change through deforestation globally accounts for as much as 25% of the carbon dioxide emissions that are driving climate change<sup>221</sup>, but National Parks are managed to stop deforestation that releases carbon and to conserve the mature trees and soils that store this critically important element. These sites are protected by law to be permanent, thereby potentially storing carbon for the foreseeable future.

In the near future, it is possible that the main economic benefits from National Parks may come from climate change mitigation and adaptation. The carbon stored in protected area soils and plants is already of considerable economic value<sup>222</sup>, and its value is likely to increase as more governments become more aware of the urgency of mitigating climate change. Forests are estimated to store about 2.4 billion metric tons of carbon per year<sup>223</sup>, and forest protected areas store more carbon than other land uses, with the global system of protected areas storing over 15% of the world's terrestrial carbon stock<sup>224</sup>, and perhaps as much as 25% of Thailand's carbon. The mature rainforests in Thailand's National Parks store over 300 tons of carbon per hectare. Since mature forests continue to store more carbon as they get older, this argues strongly for conserving the mature forests that form the core of many terrestrial National Parks and other protected areas.

The total value of the carbon stored within Southeast Asia's protected areas is estimated to be worth between US\$250 billion and over \$500 billion, depending on the price of carbon (a volatile figure). Thailand's negotiators at meetings of the Climate Change Convention can readily compute the value of the carbon that is stored in our National Parks, and claim this value as an asset when haggling with the major carbon-emitting economies that are willing to pay for such storage in the long term.

*The carbon stored in the forests that characterize our National Parks are worth billions of dollars, based on international negotiations under the Framework Convention on Climate Change. Their potential role in Thailand's National Strategy on Climate Change is substantial, and requires only the effective management of these sites.*



Some studies suggest that tropical forests are increasing their uptake of CO<sub>2</sub> as more of this pollutant enters the atmosphere<sup>225</sup>, so conserving mature forests such as those found in Thailand's National Parks is both an important strategic aim of protected areas and a major contributor to climate change mitigation.

In the marine environment, ecosystems that typically are healthiest in National Parks include coral reefs, which sequester an estimated 700 million tons of carbon per year globally<sup>226</sup>. Seagrass beds store over 110 tons of carbon per hectare per year, a significant contribution<sup>227</sup>. And mangroves are among the world's most carbon-rich forests, storing up to 1000 tons per hectare (three times the rate of rainforests) because their deep and complex soils store over half the carbon in these ecosystems<sup>228</sup>. Most of Thailand's mature mangroves on the coasts of the Gulf and the Andaman Sea are found in National Parks, a clear indication of their importance in their natural state.



*We have earlier pointed out the many contributions that the coral reefs and mangroves protected by our National Parks are making to biodiversity, tourism, and productive fisheries. In addition, these ecosystems are making critical contributions to both mitigating climate change and helping adapt to whatever climate changes may be coming. They store about 160 million tons of carbon and help to limit the damage from the extreme storms that are expected to pound our shorelines with even greater frequency in the future.*

### **National Parks provide relief against extremely hot weather**

Current projections tell us to expect the climate to continue to warm, with tropical countries like Thailand likely to suffer the worst consequences. People seeking relief from the heat will find National Parks a welcome respite from the hot weather, both in the Marine National Parks and in the mountains where most of our terrestrial National Parks are found. On the higher National Parks, such as Doi Suthep Pui, Mae Wong, Mae Yom, Doi Pha Klong, and Doi Inthanon, jackets may be required even on days when the sweltering lowlands are suffering from heatwaves.

So National Parks provide climate-related benefits that go beyond the long-term global public good of carbon storage. Through evapotranspiration, forests also help to generate cloud cover. This has been demonstrated by deforestation in tropical

*Hot weather in Chiang Mai brings crowds of people to the cooler summit of Doi Inthanon National Park. Numerous other mountainous National Parks throughout the country offer similar relief.*



lowlands that reduces cloud formation and thereby rainfall in protected mountain cloud forests that then retreat and even lose species<sup>229, 230</sup>. More locally, the cooling shade and air movement generated by forests help to reduce temperatures by several degrees, providing some relief both to visitors to the forested National Park and to forest communities living nearby<sup>231</sup>.

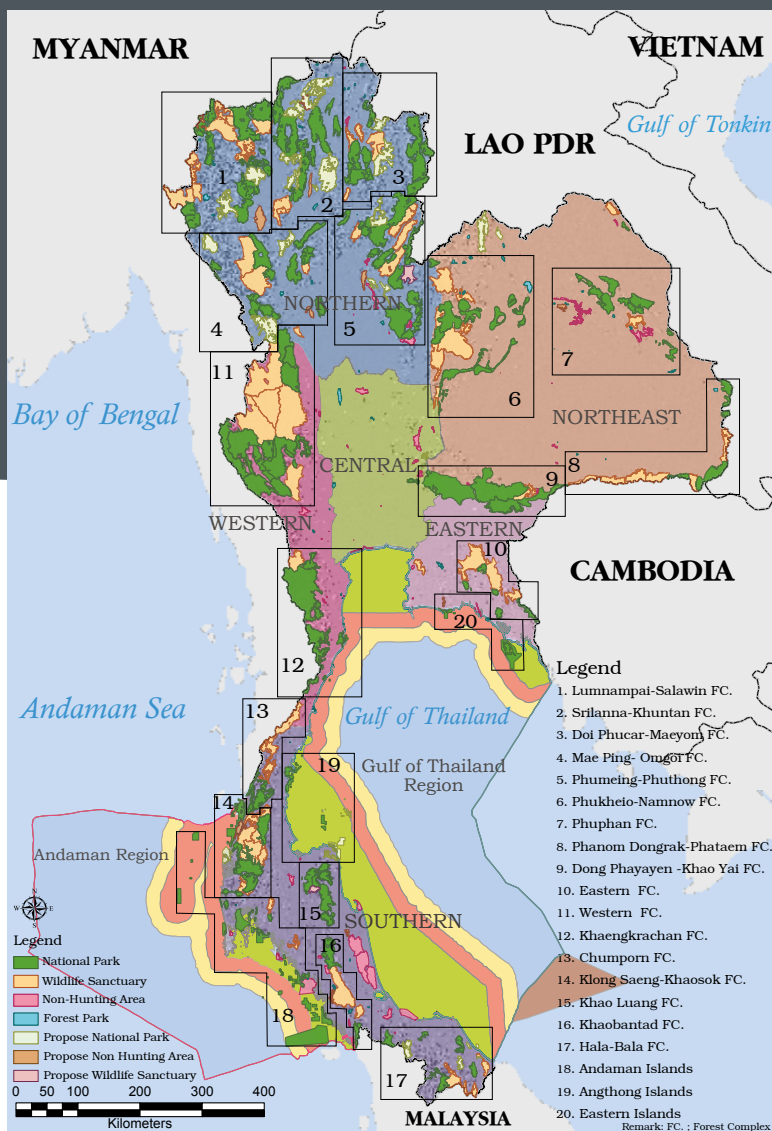
### **National Parks help Thailand adapt to climate change**

A considerable body of evidence indicates that large expanses of natural habitats, extending north-south and from lowlands to highlands to better adapt to changing temperatures, are most likely to contain the genetic, species, and ecosystem diversity that will be needed to adapt to climate change<sup>232</sup>. The complexes of National Parks and other protected areas, such as those along the western boundary with Myanmar and along the Petchabun Range, can provide increased capacity to adapt to climate change, by linking habitats that could enable species and ecosystems to move north or south as changing temperature and rainfall affect the habitats of these species. Maintaining healthy ecosystems in the National Parks will also help enable the rural villages in and around the parks to adapt to these changes.

Thailand's coasts are already feeling the impacts of the rising sea, as more beaches are eroded and the high tides come closer and closer to sea-side homes and businesses. Continued sea-level rise must be expected as the icecaps of Antarctica melt at an accelerating pace<sup>233</sup>. And recall that as recently as 8,000 years ago, the sea lapped on the shores of what is now Ayutthaya, so such a rise in sea level is hardly unprecedented. So how can National Parks help? Their major contribution will be to protect the coastline, with walls of mangroves, sea pines, and other vegetation helping to slow the impact of the rising tides. Making the best of a bad situation, these coastal wetlands may become productive as breeding grounds for fish and other important species for the human diet. National Parks cannot by themselves stop the rising seas, but can help reduce their impact.

Coral reefs are already feeling the effects of the oceans becoming more acidic, but under reasonably good growing conditions, branching corals can grow 10 to

The map is for illustration purpose only and international boundaries are not definitive.



**THAILAND'S COASTS ARE ALREADY FEELING THE IMPACTS OF THE RISING SEA, AS MORE BEACHES ARE ERODED AND THE HIGH TIDES COME CLOSER AND CLOSER TO SEA-SIDE HOMES AND BUSINESSES**

*Forest complexes running north-south can help species and ecosystems adapt to changing climates, with those seeking cooler conditions gradually moving northwards.*

20 cm per year, far faster than the sea level is currently rising. But coral reefs as ecosystems tend to grow much more slowly, with upward growth averaging only about 4 mm per year<sup>234</sup>, barely keeping pace with sea-level rise. The coral reefs in National Parks are likely to grow much faster than those lacking protection, thereby helping Thailand adapt to climate change.

### **National Parks reduce the risk from natural disasters**

Storms and seasonal floods have long been a fact of life in Thailand, and historically these were treated as opportunities by an essentially agricultural society. But Thailand has now become much more dependent on industry, which today provides nearly 40% of the country's GDP. The factories depend on a functioning infrastructure that can be so threatened by extreme natural events that they can become "natural disasters" and may carry heavy economic costs. For example, the World Bank

*Heavy rainfall and floods are expected to hit Thailand as part of climate change. National Parks and other protected areas cannot prevent damage, but their watershed protection values should be included as part of disaster relief and their forest management can reduce negative impacts.*



estimates that the floods in 2011 cost US\$13 billion to the Thai taxpayer and caused overall damages amounting to \$48 billion. Seven major industrial estates were flooded with over 3 meters of water.

The increasing frequency of such disasters is linked to global climate change<sup>235</sup>, and the extreme climatic events are likely to increase as the climate warms<sup>236</sup>. The Convention on Biological Diversity explicitly linked climate change with biodiversity and disaster risk reduction at its meeting in 2014, calling for its Parties (including Thailand) to build stronger support for this link. National Parks provide a means of doing so, and they need to be included in the national plans for adapting to climate change and reducing the risk of disasters.

*Freshwater wetlands, such as Beung Boraphet in Nakhon Sawan, are important contributors to flood control in Thailand. Many of these are protected as Wetlands of International Importance (Ramsar Sites), and the most important ones are National Parks that offer multiple benefits beyond flood control. Coastal wetlands provide storm protection that can prevent damage worth up to a million baht per hectare.*



National Parks and other kinds of protected areas are important contributors to reducing such risks. Most already have trained staff in place, and many will have included disaster relief in their training and management plans. The benefits are substantial. For example, the loss of each hectare of coastal wetlands in the US led to an increase in storm damage, especially to cities, of an average of US\$33,000<sup>237</sup>, a good indication of how valuable protecting coastal wetlands can be. A study supported by Swiss Re, a major reinsurance company, found that each dollar invested in conserving the mangroves of a marine national park provided benefits of US\$20 in protection against severe storms<sup>238</sup>.

Adapting to extreme climatic events also includes converting immediate disasters into longer-term benefits. For example, protected areas that include wetlands are adapted to flooding, a natural process that helps to provide nutrients to the system, enables fish to migrate, and recharges aquifers. Changing climates may make it possible to enlarge the wetlands within some protected areas, such as those along coastlines where the sea level is rising or inland areas that are receiving significantly increased rainfall (at least seasonally). This could make them more effective in dealing with changing climate conditions, and help them carry out their process of recharging the ground water and aquifers that provide a significant proportion of the water consumed by humans.

National Parks more generally provide healthy ecosystems that can help restore floodplains after a heavy rainfall and provide emergency resources if required<sup>239</sup>.

National Parks also address other kinds of extreme natural events that can become disasters, and are worth considering here because they also contribute to climate-related disasters. Perhaps most dramatic, experience from the tsunami that struck Thailand's Andaman Sea coast on 26 December 2004 was devastating, but the areas that were protected by mature mangrove forests suffered far less damage than those where the mangroves had been cleared<sup>240</sup>. Located at the dynamic meeting place of land and sea, mangroves provide a link between marine and freshwater systems that demonstrates a remarkable capacity to adapt to changing conditions<sup>241</sup>, with growth roughly in equilibrium with erosion. They can therefore help the coastal zone keep up with climate change, at least to some extent.

**In short, National Parks and other kinds of protected areas have many characteristics that make them unique contributors to climate change adaptation and mitigation. Their legal status gives them permanence, and having trained staff helps ensure the quality of their management in the long term to both continue storing carbon and adapting to climate change. These two significant advantages can be delivered when these sites receive the necessary management support.**





# 9

## HOW YOU CAN HELP SUPPORT NATIONAL PARKS





THESE PROTECTED AREAS ARE MANAGED ON BEHALF OF THE PEOPLE OF THAILAND BY THE DEPARTMENT OF NATIONAL PARKS, WILDLIFE AND PLANT CONSERVATION, BUT DNP CANNOT BE EXPECTED TO CARRY THIS AWESOME RESPONSIBILITY BY ITSELF

## CHAPTER 9

# HOW YOU CAN HELP SUPPORT NATIONAL PARKS

This book has shown that National Parks and other protected areas provide numerous benefits to people throughout the country. These protected areas are managed on behalf of the people of Thailand by the Department of National Parks, Wildlife and Plant Conservation, but DNP cannot be expected to carry this awesome responsibility by itself. Through an open dialogue with the many interest groups benefitting from protected areas, DNP is seeking broad support from other government agencies, the private sector, farmers and fishermen, city dwellers, students, not-for-profit organizations, and many others. In this chapter we will suggest some ways for all interest groups to contribute.

While helping to conserve the natural and cultural heritage of the Kingdom may seem like sufficient motivation, we have illustrated some of the economic and social benefits that various groups may receive from National Parks. Gaining these benefits also brings some responsibilities and opportunities to contribute to the sustainable management of National Parks.

The strongest support often comes when people are able to feel part of a group with a positive message or image, like many political movements and religions. Chapter 2 covered the role of Buddhism in some detail, indicating the strong and continuing support of Buddhism for conservation. But industrialization and participating in the global economy requires all of us to give much more attention to our National Parks as part of modern development. Of particular interest are the many conservation organizations that have long been the drivers of conservation in Thailand, beginning with the Association for Conservation of Wildlife, established in 1953 by the renowned conservation pioneer, Dr. Boonsong Lekagul. As the Thai economy grew along with more disruption of natural habitats, more conservation organizations also emerged. Thailand now has numerous such groups that welcome new members, including, among others, Bird Conservation Society of Thailand; Seub Nakhasathien Foundation; Thailand Environment Foundation; Wetlands International Thailand Program; Wildlife Fund Thailand; Green World Foundation; The Rabbit in the Moon Foundation; Thai Elephant Conservation Center; and no doubt many others. They would welcome your support.

*The best way to support National Parks is to visit them as often as you can, and respect their regulations that ensure the conservation of species such as these on their way to another attraction in their National Park.*





You can also contribute more directly to management. Many tourism agencies encourage volunteer participation from the public in at least some National Parks, with considerable benefits to both the visitor/volunteer and the National Park from such ecotourism. Among others, the following may be of interest: Reef Guardian Thailand ([www.change.org/th](http://www.change.org/th)) (mostly in the Andaman Sea); ISV ([www.isvolunteers.org/destination/thailand/volunteer-projects](http://www.isvolunteers.org/destination/thailand/volunteer-projects)); Foundation for the Protection of Environment and Tourism; Wildlife Friends Foundation Thailand (species oriented); Naucrates (mostly marine conservation)([www.naucrates.org](http://www.naucrates.org)); World Endeavors ([www.worldendeavors.com](http://www.worldendeavors.com)); Projects Abroad ([www.projects-abroad.org](http://www.projects-abroad.org)) (marine conservation); and Go Abroad.com ([www.goabroad.com](http://www.goabroad.com)) (currently 244 projects in Thailand).

Other organizations welcome volunteers interested in community development, which can extend to National Parks for appropriate projects. Examples include Thai Environment and Community Development Association; Think Earth Association; Responsible Ecological Social Tours Project; Thailand Environment Institute; and certainly others as well.

Experience has shown that volunteering in protected areas benefit the protected areas, the volunteers, and the communities in and around the protected areas. These benefits come in the form of social contact, fitness and wellbeing, and overall motivation in support of conservation. In Thailand, these volunteers come from all age groups and are reasonably balanced by gender. In some cases, especially in Marine Protected Areas, volunteers account for up to 30% of the total time devoted to PA management, and this volunteer time could be used to help generate new funding by providing a matching contribution from donors. Volunteers are especially helpful in improving relations with local communities, a role that could be very useful in Thailand.



*Volunteers working on reforestation in Phu Sa Dok bua National Park, Northeast Thailand.*

In many countries, people are also able to contribute to conservation through “citizen science”. Thousands of projects that draw on the contributions of volunteers are being implemented in National Parks throughout the world. One study of nearly 400 biodiversity-focused citizen science projects that involved unpaid volunteers collecting or processing data found that (just for these projects) 1.36 to 2.28 million people contributed each year, giving on average about three days of their time. This contribution was calculated to be worth between US\$700 million and \$2.5 billion, with most projects devoted to monitoring birds and mammals. Their work helped to contribute to assessing global change in ecosystems, a contribution that becomes more valuable as the many factors changing national resources accelerate<sup>242</sup>.

One example from Thailand is the long-term collection of data by Buddhist monks from the harvest of bat guano from Khao Chong Phran cave in Ratchaburi, which is within their temple grounds and has been designated a Non-hunting Area to protect the bats. An estimated 100 million Wrinkled-lipped Bats live in this cave, and each evening they go out to collect about 3 grams of insects each, making their daily harvest about 300,000 kilograms of insects that might otherwise be feeding on the crops of farmers or requiring heavy application of pesticides. The data collected by the monks have helped to inform policies on harvest of bat guano, a fertilizer that is also useful to farmers<sup>243</sup>.

After hearing how much National Parks contribute to the social, economic, cultural, and environmental development of Thailand, you might want to help support them. Here is a list of ways you can help:



*The millions of Wrinkled-nosed Bats at Wat Khao Chong Phran in Ratchaburi Province provided a source of long-term citizen science by the monks at the temple, working over a decade to assess how to harvest bat guano fertilizer sustainably. Other kinds of citizen science could be applied to National Parks.*



THOUSANDS OF PROJECTS THAT DRAW ON THE CONTRIBUTIONS OF VOLUNTEERS ARE BEING IMPLEMENTED IN NATIONAL PARKS THROUGHOUT THE WORLD. ONE STUDY OF NEARLY 400 BIODIVERSITY-FOCUSED CITIZEN SCIENCE PROJECTS THAT INVOLVED UNPAID VOLUNTEERS COLLECTING OR PROCESSING DATA FOUND THAT (JUST FOR THESE PROJECTS) 1.36 TO 2.28 MILLION PEOPLE CONTRIBUTED EACH YEAR, GIVING ON AVERAGE ABOUT THREE DAYS OF THEIR TIME

- Enjoy nature by visiting National Parks as often as possible, and avoid any actions that will harm them (such as littering);
- Join non-government conservation organizations and support their campaigns in support of National Parks and other protected areas;
- Spread the word about National Parks and how important they are;
- Write to local, provincial, and national government leaders encouraging them to support National Parks, including new protected areas laws that are more effective;
- Vote for elected officials who support National Parks, and encourage them to speak out in support of our natural heritage;
- Buy products from companies that are supporting National Parks, and send messages to tell them how much you appreciate their support;
- Purchase fish and other products from only reputable sources that have not been harvesting products from National Parks, including Marine National Parks (this includes avoiding eating game meat);
- Purchase organic products from farms and fields that are located around the National Parks and serve as a buffer zone that helps to protect them;
- Speak out, in appropriate ways, against poaching and instead support poachers becoming game guards or guides for wildlife photographers;
- Never buy anything made from ivory or any other product harvested from threatened species, including pangolins, sea horses, and other forms of traditional medicines that threaten native species;
- Consider becoming a citizen scientist, assisting professional scientists in their work;
- Ensure that you do not keep non-native species as pets, because they can escape and become invasive species that harm Thailand's native ecosystems;
- Control your pet cats and dogs to ensure that they do not consume wild animals;
- Seek to use renewable forms of energy, as a contribution to controlling climate change;
- Support forest temples, especially those that actively encourage conservation;
- Feel happy when you are with nature!

**Our National Parks will enable our natural heritage to flourish, today and long into the future.**









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# ANNEX 1:

## THAILAND'S PROTECTED AREAS

### NATIONAL PARKS

#### Terrestrial National Parks

No.	Name	Province	Area (km <sup>2</sup> )	government gazette
1	Khao Yai	Nakhon Ratchasima Nakhon Nayok, Prachinburi	2168.635	1962
2	Phu Kradueng	Loei	348.12	1962
3	Thung Salaeng Luang	Phitsanulok Phetchabun	1262.4	1963
4	Nam Nao	Phetchabun	966	1972
5	Doi Inthanon	Chiang Mai	482.4	1972
6	Phu Phan	Sakon Nakhon, Kalasin	664.7	1972
7	Khao Luang	Nakhon Si Thammarat	570	1974
8	Doi Khun Tan	Lamphun, Lampang	255.29	1975
9	Namtok Phlio	Chanthaburi	134.5	1975
10	Erawan	Kanchanaburi	549.98	1975
11	Khao Chamao-Khao Wong	Rayong, Chanthaburi	83.68	1975
12	Khao Khitchakut	Chanthaburi	58.31	1977
13	Lan Sang	Tak	104	1979
14	Phu Ruea	Loei	120.84	1979
15	Chaloem Rattanakosin	Kanchanaburi	59	1980
16	Ramkhamhaeng	Sukhothai	341	1980
17	Sai Yok	Kanchanaburi	500	1980
18	Khao Sok	Surat Thani	738.74	1980
19	Tat Ton	Chaiyaphum	217.18	1980
20	Doi Suthep-Pui	Chiang Mai	261.06	1981
21	Si Satchanalai	Sukhothai	213.2	1981
22	Namtok Sam Lan	Saraburi	44.57	1981
23	Kaeng Krachan	Phetchaburi Prachuap Khiri Khan	2,914.7	1981

No.	Name	Province	Area (km2)	government gazette
24	Khao Phanom Bencha	Krabi	50.12	1981
25	Mae Ping	Lamphun, Tak, Chiang Mai	1,003.75	1981
26	Kaeng Tana	Ubon Ratchathani	80	1981
27	Wiang Kosai	Phrae, Lampang	410	1981
28	Namtok Mae Surin	Mae Hong Son	396.6	1981
29	Taksin Maharat	Tak	149	1981
30	Khuean Srinagarindra	Kanchanaburi	1,532	1981
31	Thap Lan	Prachinburi, Nakhon Ratchasima	2,235.8	1981
32	Pang Sida	Sa Kaeo, Prachinburi	844	1982
33	Khao Pu-Khao Ya	Phattalung, Trang, Nakhon Si Thammarat	694	1982
34	Khlong Lan	Kamphaeng Phet	300	1982
35	Phu Hin Rong Kla	Phitsanulok, Loei	307	1984
36	Phu Kao-Phu Phan Kham	Khon Kaen, Nong Bua Lamphu	322	1985
37	Mae Yom	Phrae, Lampang	454.75	1986
38	Phu Chong-Na Yoi	Ubon Ratchathani	686	1987
39	Mae Wong	Kamphaeng Phet, Nakhon Sawan	894	1987
40	Namtok Chat Trakan	Phitsanulok	543	1987
41	Si Phang-nga	Phang Nga	246.08	1988
42	Phu Pha Yon	Sakon Nakhon, Nakhon Phanom, Mukdahan	828.56	1988
43	Chae Son	Lampang	592	1988
44	Phu Pha Thoep	Mukdahan	48.5	1988
45	Si Lanna	Chiang Mai	1,406	1989
46	Doi Luang	Chiang Rai, Phayao, Lampang	1170	1990
47	Khlong Wang Chao	Kamphaeng Phet, Tak	747	1990
48	Namtok Yong	Nakhon Si Thammarat	205	1991
49	Khao Nam Khang	Songkhla	212	1991
50	Khao Laem	Kanchanaburi	1497	1991
51	Op Luang	Chiang Mai	553	1991
52	Kaeng Krung	Surat Thani	541	1991
53	Namtok Huai Yang	Prachuap Khiri Khan	161	1991

No.	Name	Province	Area (km <sup>2</sup> )	government gazette
54	Phu Wiang	Khon Kaen	325	1991
55	Phu Pha Man	Khon Kaen, Loei	340	1991
56	Tai Rom Yen	Surat Thani	425	1991
57	Pha Taem	Ubon Ratchathani	350	1991
58	Phu Sa Dok Bua	Mukdahan, Amnat Charoen, Yasothon	231	1992
59	Sai Thong	Chaiyaphum	319	1992
60	Salawin	Mae Hong Son	721.52	1994
61	Phu Suan Sai	Loei	117.16	1994
62	Khun Chae	Chiang Rai	270	1995
63	Huai Nam Dang	Chiang Mai	1,252.12	1995
64	Ta Phraya	Buriram, Sa Kaeo	594	1996
65	Khao Phra Wihan	Si Sa Ket, Ubon Ratchathani	130	1998
66	Lam Nam Nan	Uttaradit, Phrae	999.15	1998
67	Phu Toei	Suphanburi	317.48	1998
68	Tat Mok	Phetchabun	290	1998
69	Bang Lang	Yala	261	1999
70	Kui Buri	Prachuap Khiri Khan	969	1999
71	Mae Moei	Tak	185.28	1999
72	Namtok Ngao	Ranong, Chumphon	668	1999
73	Doi Phu Kha	Nan	1,704	1999
74	Namtok Si Khit	Nakhon Si Thammarat, Surat Thani	145	1999
75	Budo-Su-ngai Padi	Narathiwat, Pattani, Yala	341	1999
76	Doi Pha Hom Pok	Chiang Mai	524	2000
77	Phu Sang	Phayao, Chiang Rai	284.88	2000
78	Pha Daeng	Chiang Mai	1154.92	2000
79	Nam Phong	Khon Kaen, Chaiyaphum	197	2000
80	Mae Wa	Lampang, Tak	587	2000
81	Khlong Phanom	Surat Thani	410.4	2000
82	Ton Sak Yai	Uttaradit	520	2003
83	Si Nan	Nan	1024	2007
84	Pa Hin Ngam	Chaiyaphum	112	2007
85	Mae Charim	Nan	432	2007

No.	Name	Province	Area (km2)	government gazette
86	Doi Pha Klong	Phrae	189	2007
87	Phu Laenkha	Chaiyaphum	201	2007
88	Phu Soi Dao	Uttaradit, Phitsanulok	340	2008
89	Namtok Sai Khao	Pattani, Yala, Songkhla	70	2008
90	Khun Nan	Nan	208	2009
91	Mae Wang	Chiang Mai [2]	120	2009
92	Khao Nan	Nakhon Si Thammarat	410	2009
93	Thong Pha Phum	Kanchanaburi	1120	2009
94	Khun Phawo	Tak	220	2009
95	Tham Pla–Namtok Pha Suea	Mae Hong Son	511	2009
96	Phu Langka	Nakhon Phanom, Bueng Kan	50	2009
97	Phu Pha Lek	Sakon Nakhon, Udon Thani, Kalasin	404	2009
98	Mae Puem	Phayao, Chiang Rai	350.948	2009
99	Namtok Khlong Kaeo	Trat	198	2009
100	Khao Sip Ha Chan	Chanthaburi	118	2009
101	Lam Khlong Ngu	Kanchanaburi	673	2009
102	Chaloem Phrakiat Thai Prachan	Ratchaburi	329	2012
103	Khao Kho	Phetchabun	483	2012
104	Khun Khan	Chiang Mai	208	2012
105	Doi Phu Nang	Phayao	860	2012

## Marine National Parks

No.	Name	Province	Area (km2)	government gazette
1	Khao Sam Roi Yot	Prachuap Khiri Khan	98.08	1966
2	Tarutao	Satun	1,490	1974
3	Thale Ban	Satun	196	1980
4	Mu Ko Ang Thong	Surat Thani	102	1980
5	Ao Phang-nga	Phang Nga	400	1981
6	Mu Ko Surin	Phang Nga	135	1981
7	Sirinath	Phuket	90	1981
8	Khao Laem Ya–Mu Ko Samet	Rayong	131	1981

No.	Name	Province	Area (km <sup>2</sup> )	government gazette
9	Hat Chao Mai	Trang	230.87	1981
10	Mu Ko Similan	Phang Nga	140	1982
11	Mu Ko Chang	Trat	650	1982
12	Laem Son	Ranong, Phang Nga	315	1983
13	Hat Noppharat Thara–Mu Ko Phi Phi	Krabi	387.9	1983
14	Mu Ko Phetra	Satun, Trang	494.38	1984
15	Khao Lampi–Hat Thai Mueang	Phang Nga	72	1986
16	Mu Ko Lanta	Krabi	134	1990
17	Khao Lak–Lam Ru	Phang Nga	125	1991
18	Hat Wanakon	Prachuap Khiri Khan	38	1992
19	Than Bok Khorani	Krabi	104	1998
20	Mu Ko Chumphon	Chumphon	317	1999
21	Lam Nam Kra Buri	Ranong	160	1999
22	Mu Ko Ranong	Ranong	357	2009

### Not yet gazetted

No.	Name	Province	Area (km <sup>2</sup> )
1	Mae Ngao	Mae Hong Son, Tak, Chiang Mai	412
2	Op Khan	Chiang Mai	484
3	Than Sadet–Ko Pha-ngan	Surat Thani	65.93
4	Hat Khanom–Mu Ko Thale Tai	Nakhon Si Thammarat, Surat Thani	739
5	Ao Manao–Khao Tanyong	Narathiwat	37
6	Namtok Sipo	Narathiwat, Pattani	289
7	San Kala Khiri	Songkhla, Yala	215
8	Namtok Chet Sao Noi	Saraburi	28
9	Na Yung–Nam Som	Udon Thani, Loei, Nong Khai	344
10	Lam Nam Kok	Chiang Rai	733
11	Doi Wiang Pha	Chiang Mai, Chiang Rai	583
12	Mae Takhrui	Chiang Mai	1,114
13	Mae Tho	Chiang Mai	491
14	Namtok Pha Charoen	Tak	855
15	Khun Sathan	Nan	419

No.	Name	Province	Area (km2)
16	Tham Sakoen	Nan	248
17	Nanthaburi	Nan	877
18	Kaeng Chet Khwae	Phitsanulok	261
19	Doi Chong	Lampang, Lamphun	332
20	Tham Pha Thai	Lampang	1214

*Note that more details on the National Parks are available from the Department of National Parks, Wildlife and Plant Conservation website indicated in Annex 2.*

## **WILDLIFE SANCTUARIES**

No.	Name	Province	Area (km2)	government gazette
1	Salak Pra	Kanchanaburi	858.55	1965
2	Khlong Nakha	Ranong, Surat Thani	530.33	1972
3	Phu Khiao	Chaiyaphum	1,560	1972
4	Khao Soi Dao	Chanthaburi	744.96	1972
5	Huai Kha Khaeng	Uthai Thani, Tak	2,780.14	1972
6	Lum Nam Pai	Mae Hong Son	1,180.94	1972
7	Thungyai Naresuan	Kanchanaburi, Tak	3,647.20	1974
8	Khao Khiao - Khao Chomphu	Chon Buri	144.70	1974
9	Khlong Saeng	Surat Thani	1,155.31	1974
10	Phu Luang	Loei	896.95	1974
11	Phu Wua	Nong Khai	186.50	1975
12	Kho Ban Tat	Trang, Phutthalung, Songkhla, Satun	1,266.96	1975
13	Yot Dom	Ubon Ratchathani	225.35	1977
14	Khao Ang Rue Nai	Chachoengsao, Prachin Buri, Chanthaburi	1,078.96	1977
15	Phu Miang-Phu Thong	Uttaradit, Phitsanulok	696.51	1977
16	Ton Nga-Chang	Songkhla, Satun	181.95	1978
17	Mae Nam Phachi	Ratchaburi	489.31	1978
18	Mae Tuen	Tak	1,173	1978
19	Chiang Dao	Chiang Mai	521	1978
20	Salawin	Mae Hong Son	955	1978
21	Phanom Dong Rak	Si Sa Ket	316	1978

No.	Name	Province	Area (km <sup>2</sup> )	government gazette
22	Doi Pha Muang	Lampang, Lamphun	687.12	1980
23	Khlong Phraya	Krabi, Surat Thani	153.58	1980
24	Doi Pha Chang	Phayao, Nan	571.08	1980
25	Om Koi	Chiang Mai, Tak	1,224	1983
26	Doi Luang	Phrae	97	1984
27	Khao Sanam Priang	Kamphaeng Phet	101	1985
28	Mae Yom Phang Khwa	Mae Hong Son	292	1986
29	Sap Langka	Lop Buri	155	1986
30	Prince Chumphon (North)	Prachuap Khiri Khan, Chumphon	664.99	1988
31	Prince Chumphon (South)	Chumphon, Ranong	315	1988
32	Umphang	Tak	2,590.85	1989
33	Phu Si Tan	Mukdahan, Kalasin	303.27	1990
34	Huai Sala	Si Sa Ket	380	1990
35	Chaloem Phra Kiat Somdet Prathep Rattana Rachasuda	Narathiwat	196.81	1991
36	Khlong Yan	Surat Thani	488	1992
37	Khao Pra Bang Khram	Krabi, Trang	156.32	1993
38	Huai Thap than-Huai Samran	Surin	502	1995
39	Thung Raya Nasak	Ranong, Chumphon	338.64	1996
40	Hala-Bala	Narathiwat, Yala	626.70	1996
41	Mae Lao-Mae Sae	Chiang Mai, Mae Hong Son	514	1996
42	Dong Yai	Buri Ram	312.78	1996
43	Tabo-Huai Yai	Phetchabun, Chaiyaphum	653.93	1997
44	Wiang Lor	Phayao	371	1997
45	Mae Charim	Uttaradit	660	1998
46	Khlong Khrua Wai	Chanthaburi	265.27	1998
47	Khuan Mae Yai Mon	Ranong, Chumphon	464	1999
48	Phu Pha Daeng	Phetchabun	234.95	1999
49	San Pan Daen	Mae Hong Son	277	2000
50	Lam Nam Nan Phang Kha	Phrae, Uttaradit	235	2000
51	Samoeng	Chiang Mai	194	2000
52	Doi Wiang La	Mae Hong Son	466.58	2000
53	Pha Phueng	Chaiyaphum	189.44	2000



No.	Name	Province	Area (km2)	government gazette
54	Tham Chao Ram	Sukhothai, Lampang	341	2001
55	Nam Pat	Uttaradit	512.32	2001
56	Phu Kho-Phu Kratae	Loei	232.46	2007
57	Ton Pariwat	Phuang-nga	221.94	2007
58	Buntharik-Yot Mon	Ubon Ratchathani	350.65	2009

## NON-HUNTING AREAS

No.	Name	Province	Area (km2)	government gazette
1	Thale Noi	Songkhla, Phattalung, Nakok Sri Thammarat	457	1975
2	Bueng Borapet	Nakhonsawan	106	1975
3	Pa-Phru	Narathiwat	1,600	1975
4	Nong Thung Thong	Suratthani	61.50	1975
5	Wat Tan En	Pranakhon Sri Ayutthaya	0.16	1976
6	Ang Keb Nam Bangphra	Chonburi	18.56	1976
7	Tham Lawa Dao Wa Dueng	Kanchanaburi	41.56	1976
8	Doi Suthep	Chiang Mai	16.54	1976
9	Thale Sap Songkhla	Songkhla, Phattalung	364.67	1976
10	Khao Tha Phet	Suratthani	4.65	1977
11	Wat Ratsatthakayaram	Samut Sakhon	0.08	1977
12	Wat Phai Lom	Pathumthani	0.12	1978
13	Bueng Kroeng Kawia	Kanchanaburi	512	1979
14	Muko-Li-Bong	Trang	447.50	1979
15	Khao Nam Prai	Trang	20.80	1979
16	Khao Phra Thaeo	Phuket	22.28	1980
17	Nong Prag Praya	Satun	20.43	1980
18	Aang Keb Nam Huai Cha Rakhe Mag	Buriram	6.20	1980
19	Aang Keb Nam Sa-Nam Bin	Buriram	5.70	1980
20	Aang Keb Nam Huai Ta Lat	Buriram	7.09	1980
21	Nong Waeng	Chaiyaphum	0.17	1980
22	Khao Kra Dong	Buriram	2.32	1980
23	Tham Ra Khang Khao Phran Non	Ratchaburi	0.16	1982

No.	Name	Province	Area (km <sup>2</sup> )	government gazette
24	Tham Khang Khao-Khao Chong Phran	Ratchaburi	0.12	1982
25	Pa Krat	Songkhla	4.12	1982
26	Bueng Khong Long	Nongkhai	10.94	1982
27	Bueng Cha Wak	Chainat, Suphanburi	3.20	1983
28	Tham Pha Ta Pol	Phitsanulok	2.84	1983
29	Khao Yai, Khao Pha Na Tang	Uttaradit	24	1984
30	Khlong Lam Chan	Trang	54	1984
31	Pa Rang Kai	Pattani	0.25	1984
32	Laem Ta Lum Phuk	Nakhon Sri Thammarat	56.72	1984
33	Mae Lao Mae Sae	Chiang Mai	245	1984
34	Nong Hua Khu	Udon Thani	0.11	1985
35	Khao Chi On	Chonburi	3.67	1985
36	Khao Pa Chang Laemkham	Songkhla	235	1985
37	Nong Bong Khai	Chiang Rai	4.33	1985
38	Nong Nam Khao	Phitsanulok	0.57	1985
39	Phru Khang Khao	Songkhla	0.76	1986
40	Khao Kho	Phetchabun	43.52	1986
41	Khao Pra Thap Chang	Ratchaburi	2.02	1986
42	Wang Pong Chon Daen	Phetchabun	148	1987
43	Khao Pra Bang Chram	Krabi, Trang	186.40	1987
44	Khao Reng	Songkhla	109.20	1987
45	Tham Pha Nam Thip	Mukdahan, Kalasin, Roi Et	241.98	1988
46	Lam Pao	Kalasin, Udon Thani, Khon Kaen	337.50	1988
47	Utthayan Somdet Phrasi Nakha Rin	Kanchanaburi	90	1989
48	Tham Chao Ram	Sukhothai	25.40	1990
49	Khao Som Phot	Lopburi	13.50	1996
50	Khao Noi-Khao Pradu	Phitsanulok	129.44	1998
51	Tham Pra Thun	Udon Thani	20.88	1999
52	Khao Kra Puk-Khao Tao Mo	Phetchaburi	7.76	1999
53	Dun Lam Phan	Maharakham	0.54	1999
54	Khung Kra Ben	Chanthaburi	18.19	1999
55	Thung Thale	Krabi	49.01	1999

No.	Name	Province	Area (km2)	government gazette
56	Cha Am	Phetchaburi	0.99	2004
57	Tha Le Luang	Songkhla, Phuttalung	600	2007
58	Kao-e-rawan	Lop Buri	2.40	2007
59	Kuaen Phasakchonlasit	Saraburi, Lop Buri	170.57	2008
60	Doi Phabat	Lampang	113.60	2008
61	Nonghan Kumpawapi	Udon Thani	17	2008
62	Khao Pang Ma	Nakhon Ratchasima	8	2011
63	Pantainorasing	Samut Sakhon	23.08	2011
64	Kaengkoi	Saraburi	55.54	2011
65	Lam Nang Rong	Buriram	13.44	2012
66	Thab Pa Ya Lo	Chiang Rai, Payao	28.91	2012
67	Bolor	Nakhon Sri Thammarat	100.15	2012



## ANNEX 2:

### **LEARNING MORE ABOUT THAILAND'S NATIONAL PARKS**

Numerous websites are already on line about Thailand's National Parks. The most important is the DNP site ([www.dnp.go.th](http://www.dnp.go.th), which has numerous links). Private websites (such as [www.wildlifethailand.com](http://www.wildlifethailand.com)) are also very helpful. Information on many of Thailand's protected areas is available on Wikipedia [www.en.wikipedia.org/wiki/Protected\\_areas\\_of\\_Thailand](http://www.en.wikipedia.org/wiki/Protected_areas_of_Thailand), but the coverage is patchy and even the sites that are well known, such as Khao Yai, are not well presented. A few of the best-supported protected areas, such as Huay Kha Khaeng Wildlife Sanctuary, have their own website and these tend to be very good ([www.huaikhakhaeng.net](http://www.huaikhakhaeng.net)). The Bangkok Post has a website that also contains some information about protected areas, but this too is very light on details ([www.bangkokpost.com](http://www.bangkokpost.com)). The private sector has some useful sites that focus on areas where tourist agencies hope to take their customers, such as Khao Yai ([www.khaoyainaturelifetours.com](http://www.khaoyainaturelifetours.com)). The best-known travel guides for foreign tourists, such as Lonely Planet, list only a few of Thailand's protected areas and provide only limited information ([www.lonelyplanet.com](http://www.lonelyplanet.com)), and the Trip Advisor site, which provides a ranking to the tourist attractions of Thailand and includes an "owner description", is similarly limited ([www.tripadvisor.com](http://www.tripadvisor.com)). But this does offer an opportunity for visitors to offer feedback to the National Park managers about what they liked and what they thought should be improved.

The popular website [www.YouTube.com](http://www.YouTube.com) also has numerous privately-produced videos of various Thai protected areas, taken by tourists and posted for general access. For example, Bird's Eye View Chiang Mai's post of the "Grand Canyon of Thailand" (Ob Luang National Park), taken with a pilotless drone aircraft, has had nearly 2500 "views", indicating the outreach potential of this medium ([www.youtube.com/watch?v=H2zek3j2Lc](http://www.youtube.com/watch?v=H2zek3j2Lc), seen on 19 April 2014). Facebook also is widely used, including for Thai protected areas. The Department of National Parks, Wildlife and Plant Conservation, The National Parks Association, National Parks of Thailand, and many individual National Parks all have Facebook pages that provide useful information.



## ANNEX 3:

### FOOTNOTES FROM THE TEXT

1. FAO, 2009
2. Shari, 1989
3. Higham and Thosarat, 2012
4. Revire and Murphy, 2014
5. Baker and Phongpaichit, 2014
6. Woodruff, 2010
7. Brown, et al., 2004
8. Tochari, et al., 2007
9. Jungers, et al., 2007
10. Etler, 1996
11. Pope, et al., 1978
12. Higham and Thosarat, 2012
13. Louys, 2007
14. Joordens, et al., 2015
15. Woodruff, 2010
16. Breining, 2007
17. Louys, 2012
18. Timmreck, et al., 2010
19. Self, 2006
20. Rose and Chesner, 1990
21. McNeely, 1978
22. Louys, et al., 2007
23. Martin and Klein, 1984
24. Anderson, 1990
25. Howells, 1993
26. Hill, et al., 2006
27. Posey, 1999
28. Bharuche and Pretty, 2010
29. Higham and Thosarat, 2012
30. Wharton, 1968
31. Padoch and Pinedo-Vasquez, 2010
32. Siisunthorn, et al., 2006
33. Diamond, 2014
34. Revire and Murphy, 2014
35. Gorman, 1971
36. Spencer, 1966
37. Schmidt-Vogt, 2001
38. Wharton, 1968
39. Ziegler, et al., 2009
40. Ziegler, et al., 2011
41. Woodruff, 2010
42. Hill, et al., 2006
43. Castillo, 2011
44. Endres and Lauser, 2011
45. van Liere, 1989
46. Higham, et al., 1979
47. Castillo, 2011
48. Schlesinger, 2010
49. Audric, 1972
50. Higham and Thosarat, 2012
51. Raphael, 1988
52. Cho, 2000
53. Lekagul and McNeely, 1977
54. Usher, 2009
55. Cropper, et al., 1996
56. Mollerup, 2012
57. Jumsai, 1989
58. Kitisarsa, 2005
59. McNely and Sochaczewski, 1988
60. Endres and Lauser, 2011
61. Podhista, 1985
62. Laohavanich, 1989
63. Vogt, 2013
64. Tiyavanich, 2003
65. Tiyavanich, 1997
66. Tambiah, 1984
67. Darlington, 2012
68. Bhikku, 1989
69. Gari, 2006
70. Dudley, et al., 2005
71. Poonsawad, 2013
72. Brockelman, 2013
73. Srirachang, 2004
74. Grassman, et al., 2005
75. Grassman, et al., 1998
76. McNeely, 1994
77. Reinius and Fredman, 2007
78. Santoni, et al., 1986
79. Higham and Thosarat, 2012
80. Eklof, 2006
81. Itharat, et al., 2004
82. Ford, et al., 2014
83. Mescher and de Moraes, 2014
84. Escobar and Fenoll, 2015
85. Pholprasert and Tiranasar, 2015
86. Wharton, 1968
87. Padoch and Pinedo-Vasquez, 2010
88. Cairns, 2007
89. Engelhardt, 1989
90. Rojchanaprasart, et al., 2014
91. Berkes, et al., 2000
92. Louv, 2005
93. Treerukuarkul, 2015
94. Arrow, et al., 2013
95. Gray, 2013
96. Mittermeier, et al., 1999
97. Olson and Dlnstein, 2002
98. Vichit-Vadakan, 1989
99. Vichit-Vadakan, 1989
100. Woodruff, 2010
101. Rainboth, et al., 2010
102. Dugeon, 2005
103. Dugan, et al., 2010
104. Dugeon, 2011
105. McNeely, 2015
106. Mollerup, 2012
107. van Steenis, 1950
108. Woodruff, 2010
109. Hughes, et al., 2003
110. Woodruff and Turner, 2009
111. Hutchison, 1989
112. Subarya, et al., 2006
113. Moore and Tate, 1965
114. Lekagul and McNeely, 1987
115. Sidsunthorn, et al., 2006
116. Boonchai, et al., 2009
117. Buffetaut and Sutathorn, 1998
118. IUCN, 2014
119. Steven, et al., 2013
120. MEA, 2005
121. Regan, et al., 2015
122. Prasanai, 2012
123. Aureggi, 2006
124. Fast and Menasveta, 2003
125. Duarte, 2013
126. Sumantal, et al, 2004
127. Kinnaird and O'Brien, 2007
128. Gallai, 2008
129. Ninan, 2009
130. Kumar, 2010
131. Lomborg, 2015
132. Woodruff, 2013
133. Peel, et al., 2000
134. Dudley and Stolton, 2003
135. Dean, et al., 2013
136. MEAb, 2005
137. Whyte, 2008
138. Tan-Soo, et al., 2014
139. Woodward and Wui, 2001
140. IPCC, 2014
141. Phuwanich and Tokrisna, 2007
142. Chitradon, et al., 2009
143. Bushnell and Eagles, 2007
144. Balmford, et al., 2015
145. Andam, et al., 2010
146. Norman and Catlin, 2007

147. Seenprachawong, 2003  
 148. Hockings, et al., 2012  
 149. www.dive-the-world.com/reefs-and-parks-thailand.php  
 150. O'Connor, et al., 2009  
 151. www.greenfins-thailand.org  
 152. Sandwith, et al., 2003  
 153. Sriburi, 2008  
 154. Thitiprasert, et al., 2007  
 155. Price, 1997  
 156. Bharucha and Pretty, 2010  
 157. Somnasang, et al., 1998  
 158. Nabangchang, et al., 158  
 159. Flaming, 2008  
 160. Wanger, et al., 2015  
 161. Hanski and Cambefort, 1991  
 162. Lee and Wood, 1971  
 163. Eilers, et al., 2011  
 164. Chaplin-Kramer, 2014  
 165. Eilers, et al., 2011  
 166. Bachman and Nabhan, 1996  
 167. Gallai, 2009  
 168. Boreux, et al., 2013  
 169. Klein, et al., 2007  
 170. Garibaldi, et al., 2011  
 171. Bruno and Selig, 2007  
 172. Fogarty and Murawski, 2004  
 173. Edgar, et al., 2014  
 174. Gold, 2001  
 175. Davies, et al., 2012  
 176. Fogarty and Murawski, 2004  
 177. Hockings, et al., 2012  
 178. Sathirathai and Barbier, 2001  
 179. Patz, et al., 2004  
 180. Plotkin, 2000  
 181. Huffman, 2003  
 182. Krief, 2004  
 183. Huffman, 2003  
 184. Palit and Dutta, 2005  
 185. Ping, 1999  
 186. Chivian and Bernstein, 2008  
 187. Saralamp, et al., 1996  
 188. Keesing, et al., 2010  
 189. Saetung, et al., 2005  
 190. Cavaliere, 2010  
 191. Sriprapat, et al., 2003  
 192. Cavaliere, 2010  
 193. CBD and Who, 2015  
 194. Brock, 1997  
 195. Laird, et al., 2003  
 196. CBD and WHO, 2015  
 197. Pongsiri, et al., 2009  
 198. Pattanayak, et al., 2009  
 199. van der Kaay, 1998  
 200. Laporta, 2013  
 201. van Liere and McNeely, 2005  
 202. Maller, et al., 2002  
 203. Russell, et al., 2013  
 204. Nuntatikul, 2009  
 205. Wongtonkum et al., 2008  
 206. Haseen and Prasartkul, 2011  
 207. Morita, et al., 2007  
 208. Li, et al., 2011  
 209. Mitchell, et al., 2015  
 210. Louv, 2005  
 211. Wells and Lekies, 2006  
 212. Cheng and Monroe, 2012  
 213. www.hphcentral.com  
 214. Nichols, 2014  
 215. Nisbet, et al., 2011  
 216. IPCC, 2014  
 217. Gattuso and Hansson, 2011  
 218. Stephenson, et al., 2014  
 219. Luyssaert, et al., 2008  
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 223. Pan, 2014  
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 233. Pritchard, et al., 2012  
 234. Wells, 2006  
 235. IPCC, 2014  
 236. Cai, et al., 2015  
 237. Costanza, et al., 2008  
 238. Mueller and Bresch, 2014  
 239. Stolton, et al., 2008  
 240. Chang, et al., 240  
 241. Maiti and Chowdhury, 2013  
 242. Theobald, et al., 2015  
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Dr. Songtam Suksawang is currently an Expert for Forest and Wildlife Conservation and Advisor to the Department of National Parks Wildlife and Plant Conservation (DNP), Ministry of Natural Resources and Environment (MONRE), Thailand. He began at Royal Forest Department in 1986, He served as Superintendent of Marine National Park and Director of the National Parks Research Division from 1999-2010. He was named as Director of National Parks and Protected Areas Innovation Institute and Natural World Heritage Office in 2011. He was CATSPA Project Director in 2011. He was assigned to Expert of Forest and Wildlife Conservation in 2012. Now, he is appointed as advisor of the Department responsible for all DNP scientific works and advisor to Director General of DNP. Dr. Songtam as a conservation scientist is one of reputation of Thai researcher. His major research interests are Protected Areas Management and Biodiversity Conservation. He also conducted research relates to the conservation of natural resources particularly national park management and watershed management especially ecological conservation corridor in Thailand, payment for ecosystem services in protected areas, human impacts on protected areas and integration of economic development with environment conservation. He also produced a variety of technical publications in protected areas conservation and articles on a wide range of conservation issues in Thailand, GMS and ASEAN. He serves as the advisory board of the Thailand Research Fund. Prior to his appointments at DNP, Dr. Songtam Suksawang worked in Project of GMS-BCI for seven years, on a range of development and biodiversity-related topics in Biodiversity Corridor Initiative. Today, he continues working on protected areas management cooperation program with ADB, GEF and UNDP.



### **Professor Jeff A. McNeely**

Jeffrey A. McNeely started working on Thailand's protected areas in 1970, writing "Mammals of Thailand" with Dr. Boonsong Lekagul, who is often considered the Father of Thai Conservation. Spending 5 years with Dr. Boonsong, they travelled throughout the country and visited many of the areas that now are national parks. He moved to Indonesia in 1977 to help that country prepare its national system of protected areas. In 1980 he joined the International Union for Conservation of Nature (IUCN) as Executive Officer of the Commission on National Parks. During his 30 years at IUCN, he was Deputy Secretary General of the 1982 World Parks Congress in Bali and Secretary General of the 1992 World Parks Congress in Caracas. At IUCN, he organized numerous events on protected areas, wrote a dozen books and over 100 published papers on various aspects of protected areas, supported the preparation and implementation of the Convention on Biological Diversity, and became IUCN's Chief Scientist before retiring in 2009. He has now returned to Thailand and joined the Department of National Parks, Wildlife and Plants Conservation's project on Catalyzing Sustainability of Thailand's Protected Areas (CATSPA) as a consultant on preparation of Thailand's national system of protected areas. This book is one product of that assignment, and draws from his 45 years of international experience to communicate the many lessons learned about the multiple value of protected areas for both the nature and the people of Thailand.