

# A Chinese Perspective on U.S. Protected Areas

— A Resource for China's Protected Area Managers

Edited by *Guangzhi Yu*, PhD

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# **FOREWORD**

## *I*

Biodiversity is a condition which human beings depend upon for their very existence, and is also the basis for sustainable economic and social development. Furthermore, the establishment of nature reserves (protected areas) is one of the most direct and effective means to preserve biodiversity.

The history of the establishment of nature reserves by human beings already spans more than a century. The German naturalist Alexander von Humboldt (1769-1859) established the first natural monuments at the beginning of the 19th Century in order to protect natural ecology. Internationally, the designation by the U.S. government in 1872 of the first national park at Yellowstone is generally considered the first case in the world of a nature reserve. Since the advent of the 20th century, undertakings concerning nature reserves have developed very rapidly. In particular, since the end of the Second World War on the global level we have seen the establishment of several international organizations that have been engaged in publicity, cooperation, scientific research, and other activities in this area. For example, there are UNESCO, the International Union for Conservation of Nature (IUCN) and the Nature Conservancy (TNC). Throughout the world, nature reserves have been constantly increasing in terms of number and the amount of physical area devoted to them, and they have also become symbols of national culture and progress.

China is one of the twelve top nations in the world in terms of biodiversity, and enjoys a very important and distinctive position as far as global biodiversity and its protection are concerned. Since the establishment of its first nature reserve in 1956, China already has a

history of developing nature reserves that exceeds 50 years. By the end of 2010, China had already established 2,588 nature reserves with a total area of approximately 148 million hectares, accounting for 14.7% of the nation's total terrestrial land area.

As the government agency responsible for managing all these nature protection areas throughout the country, China's State Forestry Administration has been implementing the National Construction and Development Plan for Forestry Protected Areas of China initiated in 2006, and at the same time has been engaged in the process of promoting the establishment of model nature reserves, selecting 51 national-level nature reserves to serve as prototypes for other nature reserves. Concurrently, the SFA has launched demonstration projects for the development of these nature reserves and selected 51 national model reserves. The agency plans to gather together and summarize the administrative experiences and methods that are most appropriate for China's nature reserves by bolstering management and development within these model reserves in order to promote effective management of China's nature reserves.

In order to develop the management capacity of senior administrators, especially those in State-level nature reserves, the Forestry Administration has promoted interchanges together with the Nature Conservancy (TNC), and in 2008 they jointly initiated the "China (State-level) Protected Areas Leadership Alliance Project" (CPALAP). Based on the project agreement, from 2008 to 2010 a total of 78 managers and practitioners from China's 51 model nature reserves and senior officials from government agencies with authority over protected areas participated in one month of training and study, which consisted of systematic understanding and exchanges regarding various aspects of protected areas in the United States, including the history of protected areas in the United States, administrative principles, management techniques and modes, etc., needed to establish a stable, nature reserves network, expand interchanges and provide a stable platform.

This book, "A Chinese Perspective on U.S. Protected Areas: A Resource for China's Protected Area Managers," has been compiled based on the training and TNC study materials with the objective of facilitating our working together to give further scope to the guidance

and model usage of the cooperative program for the establishment of capabilities for senior managers in protected areas. The book offers systematic presentation of facts and analysis concerning U.S. protected area management strategies, threats, wetlands management, ecotourism management, commentaries, community education, management tools and techniques, and various other facets, so as to effectively bolster their usability and sustainability. I am confident that this book can serve as an important tool for managers of China's nature reserves to understand and study advanced principles derived from management and experiences in U.S. protected areas. I hope that we will be able to take our cooperation with the U.S. side one step further concerning the establishment of protection for wild flora and fauna and the establishment of nature reserves, and thus jointly be able to make greater contributions to the mission of protecting biodiversity throughout the world.

A handwritten signature in black ink, consisting of a stylized 'S' followed by 'M' and 'M'.

**Su Ming**

**Deputy Managing Director  
International Cooperation Center  
State Forestry Administration**

# FOREWORD

## II

For more than 50 years, the East-West Center has been promoting better relations and understanding among the peoples and nations of Asia, the Pacific and the US through collaborative, high-quality programs that expand knowledge, address critical policy issues, and build capacity in the region. The China Protected Areas Leadership Alliance Project (CPALAP) is an outstanding example of this.

Launched in 2008, CPALAP is a partnership of the East-West Center, The Nature Conservancy's China Program, and China's State Forestry Administration. The primary goal of CPALAP has been to build human capacity for effective management of China's protected areas.

Between 2008 and 2011, CPALAP provided nature reserve managers and key government officials with hands-on learning opportunities focused on innovative conservation management practices taking place in a wide range of protected areas across the United States, including federal, state, local, and private parks, reserves, and wildlife refuges. To date, three month-long study tours have connected SFA management with their peers and with the government officials responsible for their legal and financial support. Workshops and field studies in Beijing, Honolulu, and across the U.S. have also opened participants' eyes to innovative thinking—both in China and the United States—about ways to resolve vital protected area management challenges. Nature reserve managers from 36 of China's 51 National Model Nature Reserves; 42 State Forestry Administration officials from key central and provincial government posts; and 15 conservation management advisors and educators from throughout the country have participated in the

project, sharing experiences and management challenges with 208 of their U.S. colleagues.

This reference book is the direct outcome of the need for information identified during these CPALAP study tours. We are grateful to the editor, Dr. Lucy Yu (Yu Guangzhi), who served as a liaison between the three partners for three years. She accompanied all or part of all three study tours, and then spent six months at the East-West Center working very hard to pull together the information she believed would be most helpful to her colleagues in China, producing the text in both Chinese and English.

The East-West Center, The Nature Conservancy's China Program, and China's State Forestry Administration hope conservation managers in China find this reference manual helpful. We also hope to continue working together to protect valuable natural and cultural resources while strengthening the relationship between our two nations.

A handwritten signature in black ink that reads "Charles E. Morrison". The signature is written in a cursive style with a long horizontal flourish at the end.

**Charles E. Morrison, PhD**

**President  
East-West Center**

# **FORWORD**

## *III*

China and the United States, located respectively on the western and eastern shores of the Pacific Ocean, are two nations endowed with abundant natural resources. However, one is a developing country, while the other is an established economic power.

In today's China, the lifestyles of people are undergoing enormous changes, with many people enjoying opportunities to acquire automobiles, build homes or travel the world. Nevertheless, at the same time we are faced with a calamity in regards to the excessive use of natural resources, and before our eyes this conflict between protection of nature and economic development is becoming more acute by the day. In accordance with national policies for sustainable development, we need to search for feasible and effective schemes for avoiding these kinds of conflicts and mitigating any threats.

China can boast of the greatest number of nature reserves and various other kinds of protected areas (more than 2,600) in the world. But at the same time don't we need to be worried as to whether these areas which are already under the scope of legal protection truly are receiving the effective protection they require?

During the past decade the Chinese government has been steadily researching and drawing up a group of laws for the protection of natural resources compatible with the needs of economic development. Indeed, the need for such a course has become more and more pressing. More than at any time in the past, it is clear to us that although China may have enjoyed abundant biodiversity and incomparably beautiful mountains and rivers—providing the natural resources and capital whose use has enriched our lives—we cannot

ignore the threat posed by the unrelenting depletion with each passing day of our natural resources which is staring us in the face.

Four years ago, the Chinese branch of TNC (The Nature Conservancy) and that organization's headquarters held a training course in cooperation with the East-West Center in Hawaii designed to enhance leadership capabilities for China's national-level organized system of designated model nature reserves. With financial support from TNC, managers from these 51 model protected areas and officials from the State Forestry Administration responsible for work in the protected areas successively underwent a systematic course of training, and separately conducted on-the-spot investigations within various types of U.S. protected areas introduced in this book. Just as the book describes, they carried out extensive interchanges and friendly discussions with their U.S. counterparts concerning problems in China. Later, we entrusted Dr. Yu Guangzhi, who had been in charge of the training, to edit this book, comprised of various kinds of research and reference materials. We hope that it will prove somewhat helpful for those friends who would like to pay more attention to China's efforts at nature protection and sustainable development.

"A Chinese Perspective on U.S. Protected Areas: A Resource for China's Protected Area Managers" offers a systematic introduction to various protection efforts in the United States designed to protect that nation's precious natural heritage and resources, ranging from those of the Federal Government down to the actions of various members of the general public, along with the diverse U.S. laws related to protection which have been formulated. The book also explains where the funds for nature preservation have come from, how during the process of economic development the United States was able to preserve intact its natural resources, and how what is most important is that at the same time the United States was able to build the kind of great prosperity it enjoys today. Of course, during the course of both economic development and nature preservation, Americans had to negotiate a tortuous path filled with many twists and turns and were forced to learn many lessons. These too are discussed within this book. They can serve as valuable lessons for us.

As part of its efforts to protect nature, in 1998 TNC first entered

China, and in cooperation with kindred spirits and various groups in society has since then been indefatigably pioneering new aspects of environmental protection. Looking at things from this juncture, we can see that following two years of investigations, explorations and preparations, and with the support of local governments and business leaders who have a strong sense of social responsibility concerning nature protection, we were able to establish the Western Sichuan Nature Protection Fund. This fund has in turn been able to manage China's first public welfare-type scientific nature reserve. Among other things, we have also drawn lessons from the several experiences overseas, so as to introduce to China internationally advanced scientific protection concepts and methods.

The power of learning is tremendous and astonishing. I hope that the concepts, methods and examples presented in this book will afford you many pleasurable insights and much inspiration, and prove helpful you in all the protection work you engage in.

Let us work together to bring a more beautiful spring to environmental protection efforts in China.



**Zhang Shuang**

**Director  
The Nature Conservancy China Program**

# ***PREFACE***

## **Background**

*The China Protected Areas Leadership Alliance Project (CPALAP)* is a multi-year initiative launched in 2008 as a partnership between the China State Forestry Administration, the East-West Center, and The Nature Conservancy China Program. CPALAP focuses on informing leaders and training trainers through formal and informal activities that facilitate shared learning. The primary objective is to strengthen capacity for effective management of China's protected areas by exposing nature reserve managers and appropriate government officials throughout China to successful and innovative conservation management strategies, practices, tools and techniques being utilized in protected areas across the United States.

Between 2008 and 2010, CPALAP organized and conducted three, annual, month-long programs that combined intensive classroom training in China and collaborative planning workshops at the East-West Center in Hawaii with broad-ranging field studies of protected areas across the U.S. All activities were designed specifically to share America's conservation management experiences with China; promote solid relationships between U.S. and Chinese conservation experts; and create real opportunities to work together to more effectively address conservation management challenges in both countries.

## **Study Tour Participants**

During these three years, a total of 301 China and US representatives participated in CPALAP: 93 from China and 208 from the United States. The 93 participants from China included high level State Forestry Administration officials in key central and provincial government posts throughout the country; directors from

36 of China's 51 national model nature reserves; national park policy advisors; and educators from Beijing Forestry University.

The 208 conservation management experts from the United States enthusiastically participated in the program, sharing their time, expertise, information, experiences and insights on conservation management issues and current practices with their counterparts from China. U.S. participants included national park superintendents and concession and facilities managers; state park directors and planners; wildlife refuge managers; forest rangers; fisheries, wildlife, natural resource, watershed and wetlands biologists; botanists and vegetation management specialists; fire management officers; environmental, solid waste, and natural resource engineers; interpretive rangers, docents, and nature museum curators; and environmental educators, community outreach and volunteer program coordinators. The project was guided by Meril Dobrin Fujiki, Seminars Development Coordinator, East-West Center Seminars Program.

## **Partner Biographies**

### The East-West Center

Officially known as the Center for Cultural and Technical Interchange Between East and West, the East-West Center is a public, nonprofit national and regional research and education institution with an international board of governors. The East-West Center was established by the United States Congress in 1960 to strengthen relations among the peoples and nations of Asia, the Pacific, and the United States. The Center serves as an international hub for education, dialogue, training and cooperative research on critical issues of common concern throughout the region. The East-West Center has a network of nearly 60,000 program alumni and 600 partner organizations from around the region and the world.

### China State Forestry Administration

The State Forestry Administration (SFA) is the central governmental agency in China responsible for managing all forestry and other natural conservation initiatives. The Government of China recognizes that ecological development is a long-term commitment

and has identified “building an ecological civilization” to be important to achieving the harmonious development of human beings and nature. To accomplish this, the SFA is accelerating the development of modern forestry and rehabilitation of wetland and grassland ecosystems to strengthen natural conservation efforts.

### The Nature Conservancy China Program

The Nature Conservancy China Program (TNC China) was officially established in 1998. Since then, TNC China has worked with communities, government agencies, academic experts and other partners to help protect the fragile ecosystems, magnificent landscapes and ancient traditions of greater China, from the rugged mountains of Yunnan Province to the waters of the South China Sea.

In 1997, The Nature Conservancy introduced the concept of a national park system to government officials and began advising the government on how best to establish this type of protected area. An official MOU for the Yunnan Great Rivers Project (YGRP) was signed in 1998, and in 2001, President Jiang Zemin asked that the YGRP serve as a model for all of China. TNC China began working in partnership with government officials at many levels to conduct a nationwide assessment of China’s conservation priorities. The result is a comprehensive, scientific “blueprint” (map) of the country’s important biodiversity along with a plan to redesign and expand the nature reserve system. In 2007, China established the first national park—Pudacuo National Park—in China’s Yunnan Province. This park now serves as a model for additional protected areas which are being added as China builds its national park system.

### **A Resource for China’s Protected Area Managers**

*A Chinese Perspective on U.S. Protected Areas*, has been compiled to fill a need that became apparent during the three CPALAP study tours. Although China’s conservation managers were eager to understand the U.S. protected areas system, there was no comprehensive summary available. Valuable time was spent identifying and explaining things such as management authority, types of protection, tools and strategies, and eventually, project participants agreed on the need to capture relevant information in a

manner that would be useful in China.

The book focuses on seven main issues: Conservation Management Strategies, Threats, Wetlands Management, Visitor Management, Interpretation, Community Outreach, and Tools and Technologies. It will be a useful tool for all China State Forestry Administration protected area management training programs and may serve as a reference for China's next Five-Year Plan for Nature Reserves, and will also be available for use by colleges and universities in China.

### **About the Editor**

Dr. Guangzhi (Lucy) Yu was the ideal candidate to compile this book. She joined The Nature Conservancy China Program in 2003, and was responsible for coordinating eco-regional management of targeted existing nature reserves in the northwestern part of China's Yunnan Province. Her work included providing technical support and guidance to nature reserve managers, adapting conservation methodologies, building partner capacity, both locally and nationally, and developing conservation plans based on the best science available, as well as demonstrating conservation practices on the ground. Dr. Yu holds a doctorate in conservation biology from the Institute of Zoology, Chinese Academy of Sciences. She served as TNC's manager of the China Protected Areas Leadership Alliance Project, helping to design and teach the Beijing segment and personally accompanying the first two study tours. She accompanied high level SFA officials and joined in the East-West Center wrap-up sessions for the third tour. Her strong academic background, and her experience in the field and with the study tours, made her the ideal person to create a resource that would meet the needs of China's nature reserve managers and government officials as they strive to bring world-class management to China.

**Carol M. Fox**

**Director, Special Projects  
East-West Center**

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# *1*

## **OVERVIEW OF PROTECTED AREA SYSTEMS IN USA**

A protected area is an area managed in a manner that protects the resource value of the area. As the core component of the Convention on Biological Diversity (CBD), these areas have been recognized as a standard tool for protection, maintenance or resilience of valuable natural and cultural resources worldwide. Protected areas are valued due to their immense contributions to the conservation of natural and cultural biodiversity as well as ecosystems. Protected areas are also regarded as a natural vehicle for coping with climate change (Dudley *et al.*, 2010). Other values inherent to protected areas benefit human society by providing spiritual enjoyment, enhancing well-being for surrounding communities, and providing economic opportunities through resource management and enjoyment. The United States of America is the earliest pioneer in promoting a protected area system. Its first protected area, Yellowstone National Park, was established in 1872. The World Commission on Protected Areas (WCPA) 2009 database shows that 10,480 protected area entries are listed for the United States, including both public and private lands (WCPA, 2009).

As a successful pioneer in the stewardship of protected areas, the United States has a lot of experience to share with counterparts in other countries. The protection of sensitive areas worldwide is important for the future of our societies and planet. The world cannot afford to make mistakes in protecting its biodiversity and resources. Therefore, it is important to learn from the experience and mistakes of others as we move forward with this important task.

The Government of China has set aside eighteen percent of its land as protected areas including but not limited to nature reserves, forest parks, scenic areas, and national parks. These protected areas are China's treasures and serve as the basis for the future prosperity of people throughout China, and beyond. Properly designed and managed, these protected areas are critical to the protection of China's vital watersheds and other natural resources (such as animals, forests, plants and medicinal herbs), cultural resources (including those of China's indigenous minorities), and some of the world's most beautiful and historic landscapes. These areas are not only critical to the protection of China's natural resources, but are also a source of national pride, of employment and income for rural populations, and serves as a major draw for tourism. However, the inadequate capacity of protected area management has become the bottleneck to effective management of the protected areas network in China. Under such circumstances, the State Forestry Administration (SFA), The Nature Conservancy (TNC) and the East-West Center co-sponsored the China Protected Areas Leadership Alliance Project (CPALAP) to help improve the skills and knowledge of managers, decision-makers and planners of protected areas in China by communicating with their counterparts in the United States on updated innovative conservation concepts and best practices. CPALAP has two phases: (1) Classroom training and field study, and (2) Follow up workshops and networking building among participants within China. Classroom training and field study is a one-month learning experience comprised of a one-week training in China and a three-week field study in the United States. This arrangement helps to strengthen the communication among protected areas' managers, decision-makers and planners from different conservation lands, and also facilitates mutual

understanding of conservation efforts about protected areas between the United States and China. In response to the training needs identified by SFA, CPALAP focused on the following topics during the whole learning period: (a) laws, regulation and enforcement; (2) Management systems; (3) scientific research and monitoring; (4) public outreach and awareness building; (5) strategies for engaging local communities in resource management; and (6) sustainable use strategies.

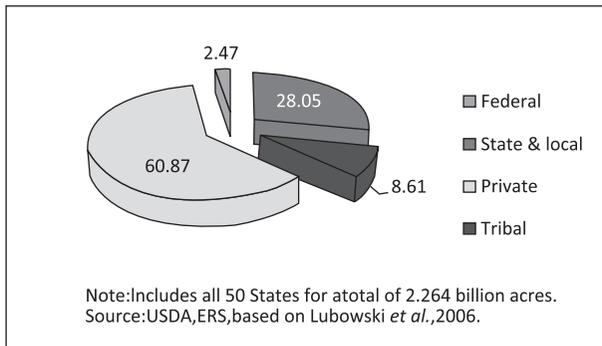
In this guidebook, we will systematically explore protected area systems in the United States through a system-wide overview and specific case studies from sites visited during the CPALAP from 2008-2010 (For a full description of all parks and natural areas visited on the study tours, see Appendix 1.7).

## **1.1 LAND TENURE IN THE UNITED STATES**

Secure land tenure is a necessary condition for the long-term conservation and sustainable use of protected areas (Fisher *et al.*, 2005; González and Martin, 2007) since it determines who can use what resources, for how long, and under what conditions (FAO, 2002). Land tenure impacts the social, political, technical, legal, and economic structures locally and nationally (FAO, 2002). Therefore, it is helpful to review the land tenure of a nation before looking comprehensively into its protected area systems.

Land tenure defines how land and associated natural resources are used by law or custom (FAO, 2002), and has a significant economic and environmental impact on landowners and on society as a whole. According to the U.S. census of land in 2002, 635 million acres of land are held by the federal government, 195 million acres of land are owned by state and local governments, 56 million acres of land are reserved for Native Americans, and 1,378 million acres of land are privately owned (Fig. 1.1) (Lubowski *et al.*, 2006).

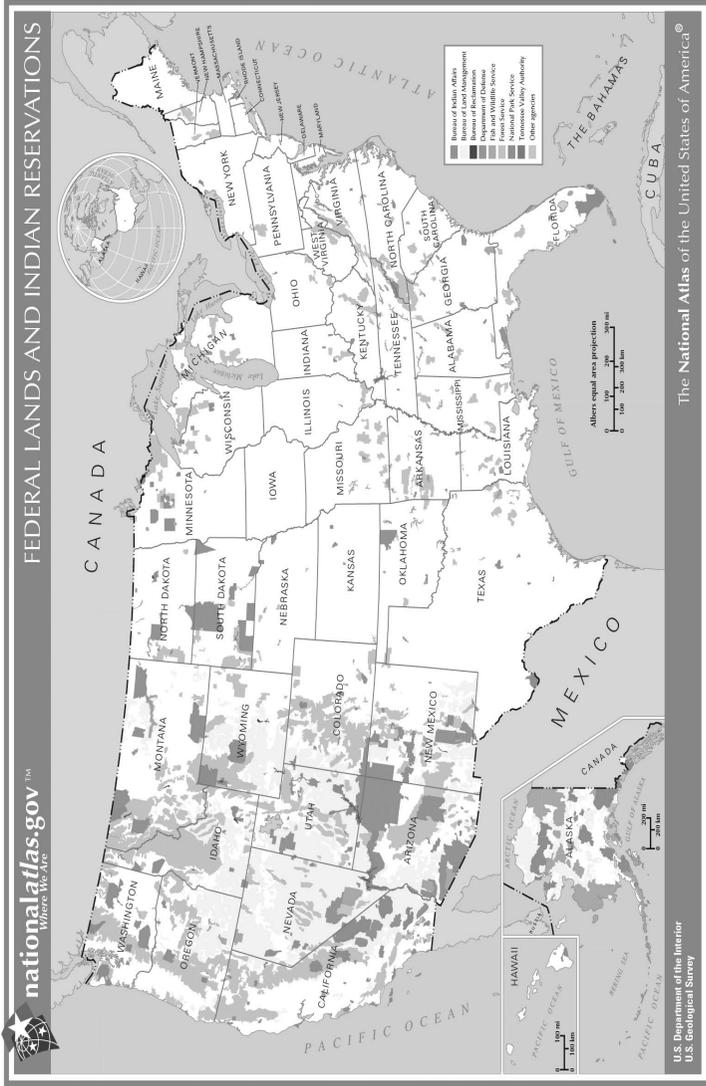
**Figure 1.1 Ownership of U.S. Land in 2002**



### 1.1.1 FEDERAL LANDS

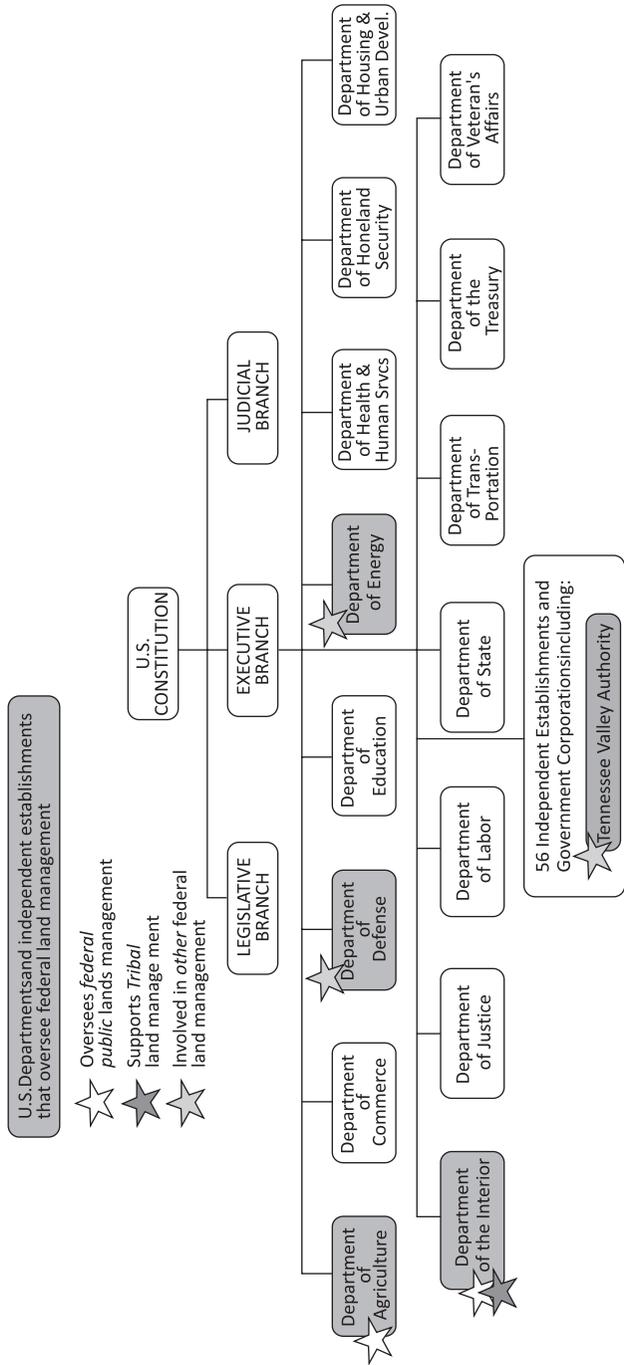
Federal lands are mainly in the western region of the United States, including Alaska and Hawaii (Fig. 1.2). There is an uneven distribution of federal lands in different states, ranging from 0.5% in Connecticut to 91.9% in Nevada (Vincent, 2004). Federal lands are managed by four different departments, including the Department of the Interior, the Department of Agriculture, the Department of Defense, and the Department of Energy (Fig. 1.3). In total, there are nine agencies within these four departments that are responsible for federal land management (Fig. 1.4). The Bureau of Land Management (BLM) manages the largest portion of Federal lands—245 million acres of land; followed by the U.S. Forest Service (USFS)—193 million acres of land; the U.S. Fish and Wildlife Service (USFWS)—150 million acres of land; the National Park Service (NPS)—84 million acres of land; the Department of Defense (DOD)—30 million acres of land; the U.S. Army Corps of Engineers (USACE)—12 million acres of land; the Department of Energy (DOE)—2.4 million acres of land and the Tennessee Valley Authority (TVA)—0.3 million acres of land (Table 1.1). The four key agencies—BLM, USFS, USFWS and NPS—administer approximately 93.8% of federal land for multiple purposes, primarily regarding preservation, recreation, and development of natural resources (Vincent, 2004).

Figure 1.2 Distribution of Federal Land in the United States<sup>1</sup>



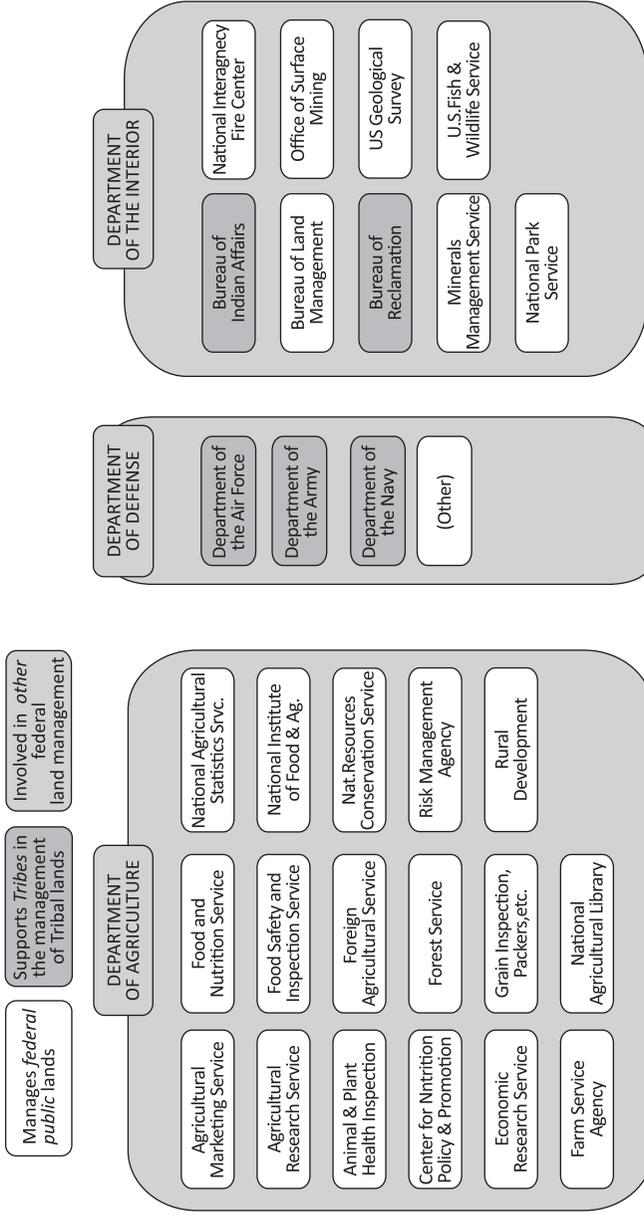
1. Map extracted from: <http://www.nationalatlas.gov/printable/images/pdf/fedlands/fedlands3.pdf>

**Figure 1.3 U.S. Federal Government Departments Structure<sup>1</sup>**



<sup>1</sup> Figure source: Kram M. 2009. U. S. Land Tenure and Federal Land Management. Unpublished report.

**Figure 1.4 Federal Government Agencies Responsible for Federal Land Management in the United States<sup>1</sup>**



1. Figure source: Kram M. 2009. U. S. Land Tenure and Federal Land Management. Unpublished report.

U.S. federal lands can be divided into three types (Kram, 2009):

- Federal public lands, which are managed by federal agencies for the people of the United States and to which citizens generally have access for recreation or other purposes (e.g., Yosemite National Park);
- Tribal lands, which are managed by Native American tribes (e.g., the Navajo Nation and the Ute Mountain Ute Reservation); and
- Other federal lands, which federal agencies manage, but to which the general public may not have access (e.g., lands managed by the Department of Defense for military training purposes, such as Fort Carson).

On federally owned lands, private individuals and corporations share a variety of partial interests, including rights of way, mineral, grazing, oil and gas leases (Laitos and Westfall, 1987). Such use rights can be limited by governmental regulations (federal, state, and county), conservation easements, contractual agreements, zoning ordinances and other instruments defined by laws, customs, and the operation of private markets (Vincent, 2004).

**Table 1.1 Agency Jurisdictions over Federally Owned Land in the United States**

Agency	Acreage (million acres)	Percent	Remark
BLM	245	34.18%	as of January 2011 <sup>1</sup>
USFS	193	26.93%	as of January 2011 <sup>2</sup>
USFWS	150	20.93%	as of January 2011 <sup>3</sup>
NPS	84	11.72%	as of January 2011
DOD	30	4.19%	as of January 2011 <sup>4</sup>

1 Data source: [http://www.blm.gov/wo/st/en/info/About\\_BLM.html](http://www.blm.gov/wo/st/en/info/About_BLM.html)

2 Data source: <http://www.fs.fed.us/aboutus/>

3 Data source: <http://www.fws.gov/refuges/>

4 Data source: <http://www.defense.gov/about/dod101.aspx>

Continued

Agency	Acreage (million acres)	Percent	Remark
TVA	0.3	0.04%	as of January 2011 <sup>1</sup>
USACE	12	1.67%	See website listed in reference
DOE	2.4	0.33%	as of February 2004
Total	716.7	100%	NOTE: This number is higher than that in 2002 (635m acres) due to land acquisition and disposal.

### 1.1.2 STATE AND LOCAL PUBLIC LANDS

State and local governments hold nearly 9% of the land in the United States (Lubowski *et al.*, 2006). State and local governments consist of different jurisdictions, including state, county, township, city, town, and village. All states in the United States have some lands under state jurisdiction in the form of state parks, management areas, state forests, or others. Likewise, counties and cities often own parks and open space.

As an example of state-owned lands, the New York State Department of Environmental Conservation (NYSDEC) is responsible for managing over 4.5 million acres of forest preserves, state forests, wildlife management areas, and conservation easements. The ability of individuals or corporations to hold rights to use lands owned by state or local governments varies from state to state. In New York State, government may proactively protect desirable natural resources through diverse ways such as cooperating with private entities such as land conservancies to act as quick land purchase and transfer agents. These agents can be more agile and timely than a state bureaucracy when developing and consummating land purchase agreements.

The 6 million acre (2.4 million hectare) New York State (NYS) Adirondack Park is almost equally divided into public and private

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<sup>1</sup> Data source: <http://www.tva.com/environment/land/index.htm>

lands. The public lands are classified as forest preserve, a highly protective designation found in the state constitution which requires that these lands be forever kept as wild forest lands. Forest preserve lands may not be leased, sold, or exchanged; taken by any corporation, public or private; nor shall the timber thereon be sold, removed or destroyed. The public lands are ordered by a hierarchical land classification system found in the Adirondack Park State Land Master Plan (APSLMP) which controls recreational uses such as hiking, canoeing, bicycling, skiing and snowmobiling within each land classification category. The private lands within the Park are classified into land use areas of hierarchical levels of use intensity according to the Adirondack Park Land Use and Development Plan (APLUDP). The land use classification was based on the ability of the land to accept varying levels of land use and development. The NYS Adirondack Park Agency (NYSAPA) administers the APLUDP on private lands. The NYS Department of Environmental Conservation (NYSDEC) administers the APSLMP on State lands in consultation with the NYSAPA.

### **1.1.3 PRIVATE LANDS**

Most of the private lands lie in central and eastern U.S. Private lands can be held by individuals, families or corporations. Most of the croplands, forests, grasslands, and ranges are privately owned. Specifically, approximately 60% of grassland pastures and ranges (352 million acres), as well as more than half of the forest land (420 million acres), are privately owned (Barnard *et al.*, 2006).

A variety of tools enable the protection of private land for conservation purposes. Federal programs are created to promote conservation on privately owned land through regulatory and non-regulatory measures, such as the Conservation Reserve Program and the Wetland Reserve Program (Wiebe, 1997). In addition, state and local government agencies and non-governmental organizations also seek partial interests in private land for conservation purposes, including the preservation of farmland, wetland, and wildlife habitat, through property, income, estate tax incentives, and conservation easements (Wiebe, 1997).

#### 1.1.4 NATIVE AMERICAN LANDS

Across 26 states in the United States, 275 Native American Reservations, covering 56 million acres of Native American land, are managed in trust by the Bureau of Indian Affairs (BIA) (Yang, 2007). Three basic categories of land tenure can be seen in Native American lands: (1) tribal trust lands; (2) allotted trust lands; and (3) fee lands. Trust lands are held in trust by the U.S. government for the use of a tribe; allotted trust lands are held in trust for the use of individual Indians (or their heirs); and fee lands are held by an owner, whether Indian or non-Indian<sup>1</sup>. The federal government holds the legal title of both tribal and allotted trust lands, and Native Americans hold the beneficial interest. The lands in reservations are owned by both individual Native Americans and non-Native Americans due to the Dawes Act (1887 General Allotment Act) which aimed to abolish reservations and assimilate Native Americans into the general American society as farmers. Land tenure for fee lands held by Native Americans and non-Native Americans is the same as that of private lands. For lands owned by tribes, the land tenure is communal. Tribes have the right to plan and zone their land and to use their natural resources for economic development, ranching, tourism, agriculture, and mining, among other activities (Tiller, 1996). There are also some lands held by federal, state, or local (nontribal) governments that are reserved as protected areas, e.g., national wildlife refuges and state parks.

In conclusion, transfers of ownership and rights to use natural resources in the U.S. are highly common. Lands can be transferred between different kinds of land owners, such as from federal to private and vice-versa. Land owners, regardless of whether they are governmental or private individuals, have the authority to acquire or dispose of their lands according to their management goals, land use plans, and applicable laws, regulations, and policies. That being said, the frequency and ease of such transfers, for example, the use of federal lands, is much more constrained than that of private lands. Likewise, the transfer and sale of federal lands occurs much less

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1 Definition extracted from: [ftp://ftp-fc.sc.egov.usda.gov/MI/AI/AI\\_land\\_def.pdf](ftp://ftp-fc.sc.egov.usda.gov/MI/AI/AI_land_def.pdf)

frequently and is much more restricted than the transfer and sale of private lands.

In addition, the transfer of use rights, instead of outright ownership, is also common, and allowable versus prohibited uses are changeable. For example, the federal government determines allowable and prohibited uses through land use planning, and will grant or revoke permits for grazing, timber harvest, energy development, and other activities in accordance with the land use plans (U.S. Department of Agriculture, Forest Service, 1991). Similarly, local government creates zoning plans to guide which types of development are allowable, where they can be located, as well as whether variances are possible.

Since the rules of land tenure determine how lands and natural resources are administered, they can have a profound influence on conservation at large. In the remainder of this guidebook, we will address how different land management tools influence land conservation of protected areas on different land tenures.

## **1.2 PROTECTED AREAS CATEGORIZATION AND MANAGEMENT SECTORS**

### **1.2.1 CATEGORIES AND GOVERNANCE OF PROTECTED AREAS**

In 1872, Yellowstone National Park was established as the first protected area in the U.S. Since then, an extensive protected area system has been established across the country and ownership types: federal public lands (e.g., national parks, national wildlife refuges, wilderness areas, wild and scenic rivers); state lands (e.g., state parks); and private lands (e.g., private preserves, conservation easements) (Fig. 1.5). WCPA 2009 database included 10,480 protected area records of the United States (WCPA, 2009). These protected areas are not only conserving unique natural and cultural heritages in the United States but are also providing healthier ecosystems and enhanced biodiversity throughout the U.S. Some of the side

benefits of conserving natural areas are cleaner air, cleaner water, and increased opportunities for recreation, which generate increased revenue for protection. Fig. 1.5 shows that population growth patterns in the U.S. impacted where preservation areas were set aside and purchased. The eastern coast of the U.S. was densely settled when preservation efforts began. Thus, the majority of areas set aside are in the western United States. This is similar to China, where protected areas that have been set aside have been impacted by long-term interaction among economic, cultural, and social evolution.

Statistical data provided by the National Biological Information Infrastructure (NBII) of the U.S. Geological Survey (USGS) (2010) tells us that 30.8% of the total area of the United States (land and water) is under some degree of protection, ranging from strict conservation (GAP status 1), to continued maintenance of the natural state (GAP status 2), to allowance for intensive resource use (GAP status 3) (Fig. 1.6). Even with strict screening criteria, such as taking only protected areas recognized by the International Union for the Conservation of Nature (IUCN) into account (Dudley, 2008), the acreage of such protected areas still amount to 14% of the total area of the whole nation. The relationship of the two different protected areas classification schemes is listed in Table 1.2.

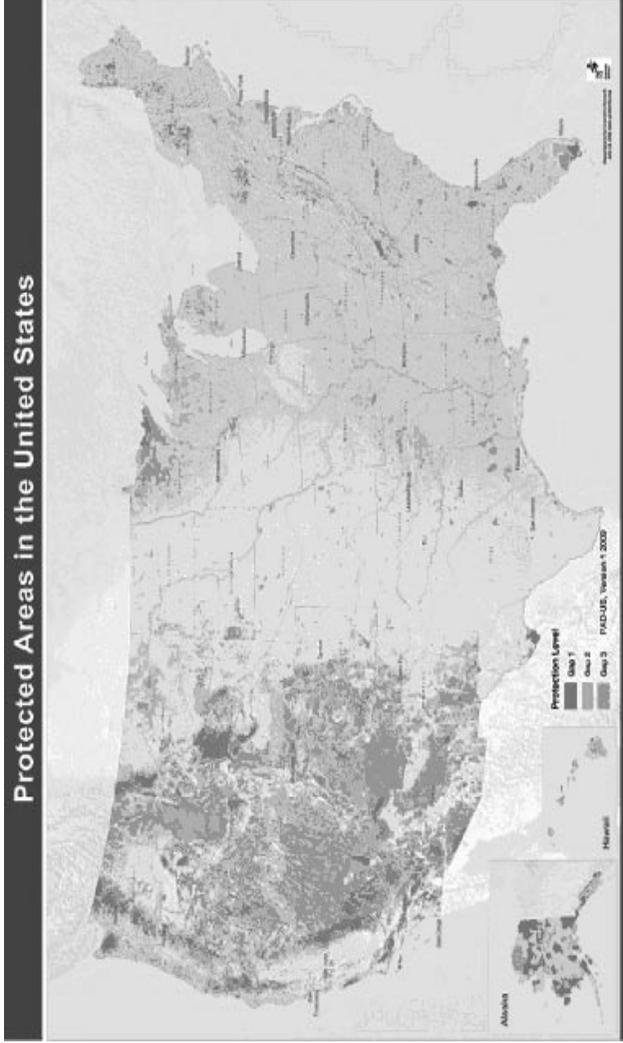
IUCN defines four types of governance for protected areas—governance by government, shared governance, private governance, and governance by indigenous people and local communities (Dudley, 2008). The governance type often is determined by the type of resource being protected and can be diverse and complicated, with multiple levels of jurisdiction (Balloffet and Martin, 2007). Here, we simply analyzed the governance types of all visited sites during CPALAP (2008-2010) to illustrate the linkage in Table 1.3.

Figure 1.5 The Distribution of Protected Areas in the United States<sup>1</sup>



1 Source: PAD-US, 2009, [#http://gap.uidaho.edu:8081/padus/padus2.do](http://gap.uidaho.edu:8081/padus/padus2.do) #

Figure 1.6 Conservation Status of Protected Areas in the United States<sup>1</sup>



1 Source: PAD-US, 2009, [http://www.protectedlands.net/images/PADUS\\_map.jpg](http://www.protectedlands.net/images/PADUS_map.jpg)

**Table 1.2 Relation between two Different Protected Areas Classification Schemes<sup>1</sup>**

IUCN Category/Definition	GAP Category/Definition
Category Ia: Strict Nature Reserves	GAP Status 1: (a) permanent protection from natural land cover conversion; (b) mandated management plan in operation; (c) maintain natural state, only natural disturbance events or mimicked disturbances allowed
Category Ib: Wilderness Areas	
Category II: National Park	
Category III: Natural Monument or Feature	GAP Status 2: (a) permanent protection from natural land cover conversion; (b) mandated management plan in operation; (c) maintain a primarily natural state, allowed certain degradation from uses or management practices, including intervening natural disturbance.
Category IV: Habitat/species management	
Category V: Protected landscape/seascape	
Category VI: Protected area with sustainable use of natural resources	
IUCN categorization for Conservation Easements underway, currently "Temporarily Unassigned"	GAP Status 3: (a) majority area permanent protection from natural land cover conversion; (b) extractive uses of either broad, low-intensity type (e.g., logging) allowed.
Not applicable	
Not applicable	GAP Status 4: No known public/private institutional mandates/legally recognized easements.

<sup>1</sup> NBII of USGS, 2010. Detailed information can be accessible from: [http://www.nbii.gov/portal/server.pt/gateway/PTARGS\\_0\\_0\\_21307\\_1484\\_6068\\_43/http%3B/cbi-lap7.cbi.cr.usgs.gov%3B7097/publishedcontent/publish/gap/public\\_sections/projects/gap\\_stewardship\\_categories/gap\\_stewardship\\_categories.html](http://www.nbii.gov/portal/server.pt/gateway/PTARGS_0_0_21307_1484_6068_43/http%3B/cbi-lap7.cbi.cr.usgs.gov%3B7097/publishedcontent/publish/gap/public_sections/projects/gap_stewardship_categories/gap_stewardship_categories.html)

**Table 1.3 Governance Type of all Visited Sites in CPALAP (2008-2010)** <sup>1</sup>

	Federal or National Ministry or Agency in Charge	Local/Municipal Ministry or Agency in Charge	Government-delegated Management (to an NGO)	Trans-boundary Management	Collaborative Management (Various Pluralist Influences & Structures)	Declared and Run by Landowner	Declared and Run by Non-profit Organizations (NGOs, Universities)	Declared and Run by Profit Organizations (Corporate Landowners)	Declared and Run by Indigenous Peoples	Declared and Run by Local Communities
	IUCN Governance Types									
Protected Area Type: IUCN Category (Management Objective)	A. State-Governed Protected Areas									
I. Strict Nature Reserve or Wilderness Area										
	B. Protected Areas with Shared Governance									
	C. Private Protected Areas									
	D. Community Conserved Areas									

<sup>1</sup> Data for protected areas in Bold from: <http://www.wdpa.org/MultiResult.aspx?Country=222>. Data for protected areas in Italic that are not searched in website above is identified by the compiler of this guidebook. In this table: NP=National Park, NRA=National Recreation Area, NIM=National Monument, SP=State Park, Pr=Preserve

Continued

II. Ecosystem Conservation & Protection	<b>Yellowstone NP</b> <b>Yosemite NP</b> <i>Hawaii Volcano NP</i> <i>Great Falls NP</i>									<i>American Prairie Reserve</i>				
III. Natural Monument														
IV. Conservation through Active Management	<b>Bowdoin NWR</b> <b>Charles M. Russell NWR</b>									<i>Consumnes River Pr.</i> <i>Waikamoi Pr.</i> <i>Ka'u Pr.</i>				
V. Landscape / Seascape Conservation & Recreation	<b>Muir NM</b> <b>Golden Gate NRA</b> <b>Gateway NRA</b>	<i>Hanauma Bay SP</i>	<i>Central Park</i>					<i>Presidio NP</i>						
VI. Sustainable Use of Natural Resources	Great Swamp NWR									Adirondack SP (with I category inside)				

## 1.2.2 PROTECTED AREAS ON FEDERAL PUBLIC LANDS

How to balance development and preservation of lands is always a controversial topic in modern society. The United States is no exception. In the early 1900s, rapid development threatened the natural resources and scenic beauty of the land. A nationwide preservation and conservation movement sprang from concern over land use by current and future generations. The creation of national parks and forest reserves set the stage for the current development of federal agencies, whose primary purposes is managing natural resources on federal lands. Land preservation has been strengthened during the 20th century with the enactment of conservation laws and the creation of the major federal land management agencies including the U.S. Forest Service in 1905, the National Park Service in 1916, the Bureau of Land Management in 1946 and the U.S. Fish & Wildlife Service in 1966 (Vincent, 2004).

Today, nearly 94% of lands in federal ownership are managed by these four agencies. USFWS and NPS have more protection-oriented mandates, and manage lands primarily for preservation and recreation (Lubowski *et al.*, 2006). In contrast, USFS and BLM have “multiple use” mandates and manage lands for a variety of uses, including recreation, range, timber, minerals, watershed, wildlife and fish, and conservation (Lubowski *et al.*, 2006; Gorte *et al.*, 2008). BLM manages most range lands and all development of federal minerals underlying federal and other ownerships, while USFS manages most federal forest lands, as well as assists in non-federal forest management via cooperative programs that are unique to the agency (Gorte *et al.*, 2008).

To conserve and draw special attention to special features and characteristics on lands under federal ownership, Congress also created other protected areas systems within the lands managed by BLM, USFS, NPS, and USFWS. Congress entrusts the existing agencies to administer these systems within their authority/mandate rather than to establish new agencies (Vincent, 2004). Below, we will review agency-specific protected area systems and cross-agency protected areas established by the U.S. Congress, respectively.

### 1.2.2.1 AGENCY-SPECIFIC PROTECTED AREA SYSTEM

Two federal land management agencies, NPS and USFWS, were created with the mission of protecting lands and resources. NPS, USFWS, BLM and USFS hold agency-specific protected areas designated through legislation, e.g., the National Park System, the National Wildlife Refuge System, the National Landscape Conservation System and the National Forest System.

#### 1.2.2.1.1 National Park Service (NPS)—National Park System

**Background.** One could argue that the National Park Service holds the “crown jewel” of the protected area system. NPS, created by President Woodrow Wilson in 1916, currently manages 392 units with different designation names as of October 2009 (Table 1.4) (NPS, 2009a) (Fig. 1.7). They vary in size, from Wrangell-St. Elias National Park and Preserve in Alaska (13.2 million acres) to Thaddeus Kosciuszko National Memorial in Pennsylvania (0.02 acre). In fact, NPS administers the most diversified parklands of all federal land management agencies (Vincent, 2004). In terms of National Park System designation units, the 58 National Parks rank only third in the number of units, while the National Historic Sites (260 units) and the National Monuments (74 units) rank first and second, respectively (Table 1.4).

**Table 1.4 Designated Name of National Park Units**

Designated Name	No.	Designated Name	No.
National Historic Sites	77	National Wild and Scenic Rivers	10
National Monuments	74	National Military Parks	9
National Parks	58	National Rivers	5
National Historical Parks	45	National Lakeshores	4
National Memorials	28	National Parkways	4
National Preserves	18	National Battlefield Parks	3
National Recreation Areas	18	National Scenic Trails	3
Parks (Other Designations)	11	National Reserves	2
National Battlefields	11	International Historic Site	1
National Seashores	10	National Battlefield Site	1
<b>TOTAL</b>	<b>392</b>		

Figure 1.7 Distribution of National Park Units managed by NPS<sup>1</sup>



1 Map source: [http://www.lib.utexas.edu/maps/national\\_parks/nps\\_map99.pdf](http://www.lib.utexas.edu/maps/national_parks/nps_map99.pdf)

The National Park System has evolved from the first national park in the world—Yellowstone National Park. Highlights of the National Park System’s evolution are illustrated in Figure 1.8.

**Figure 1.8 Milestones of National Park System Development in the United States**

Mar.1,1872	<ul style="list-style-type: none"> <li>• Yellowstone National Park established</li> <li>• Managed by Secretay of the Interior</li> </ul>
1906	<ul style="list-style-type: none"> <li>• National monuments created after enactment of Antiquities Act by Congress</li> </ul>
1906-1916	<ul style="list-style-type: none"> <li>• National parks and natioanl monuments authorized or proclaimed mainlyin the Westto protect splendid natural and cultural resources there</li> <li>• Administrated by Department of Interior with the help of U.S.Army initially</li> </ul>
Aug.25, 1915	<ul style="list-style-type: none"> <li>• National park Service established after president Woodrow Wilson si gned the act</li> <li>• Under the Department of Interior</li> <li>• Protect national parks and some national monuments</li> </ul>
1933	<ul style="list-style-type: none"> <li>• National Park Sytem truly formed after President Franklin D.Roosevlet transferred63 national monuments and military sites from the Forestry Serice and War Department to the National Park Service</li> </ul>
1970	<ul style="list-style-type: none"> <li>• National park System General Authorities Act of 1970 stated all units of national park system have equal value</li> </ul>
1978	<ul style="list-style-type: none"> <li>• Redwood National Park Expanslon Act requested system-wide standard protection for all designation units of national park system</li> </ul>

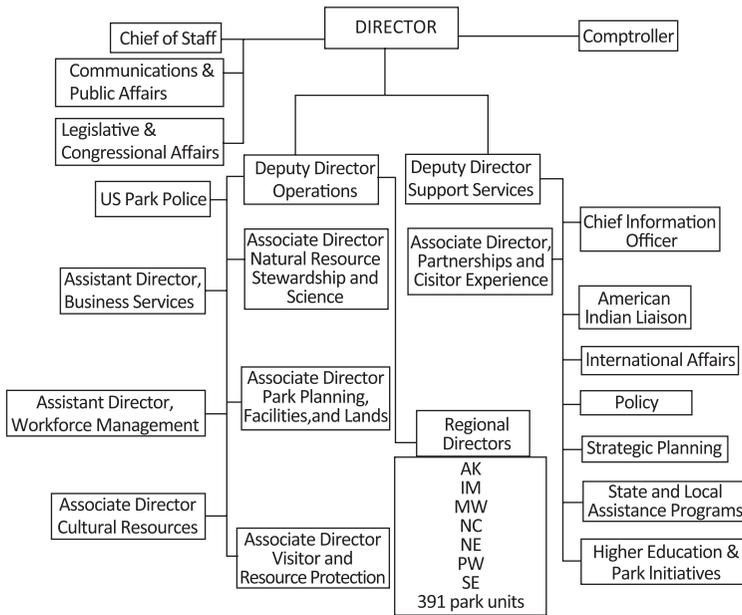
**Organization and Management.** The NPS is a federal agency in the Department of the Interior (Fig. 1.4). Under the leadership of the Director of the NPS, more than 20,000 employees, including full-time, temporary and seasonal employees, work for the NPS to protect valuable land. In addition, approximately 176,000 volunteers assisted in the management of parks in 2008, equivalent to the work of 2,600

full-time employees (NPS, 2009b). The latest NPS management structure, updated in March 2009, is shown in Figure 1.9 (NPS, 2009c). Although there have been some minor changes in NPS management structure over time, the framework has remained relatively stable. For instance, the National Park Service Advisory Board was authorized in 1935, expired in January 1, 2007, and was reauthorized in 2010.

Like all of the federal land management agencies, the headquarters of NPS is located in Washington, D.C. The chief administrative officer of NPS is the Director, who is directly assisted and supported by two Deputy Directors, a Comptroller, Chief of Staff, and Offices of Communication and Public Affairs, and Legislative and Congressional Affairs. The current Director is Jon Jarvis, the 18<sup>th</sup> Director. The Deputy Director is responsible for operations and oversees individual park units classified in seven regional offices. Each region contains many park units such as National Parks, National Preserves, National Monument, National Memorials, National Historic Sites, National Seashores, etc. For each park unit, a park superintendent who reports to a regional director is responsible for the protection of the resource and management of the activities within the park. Each superintendent manages a staff whose size is commensurate with the protection and management needs of the unit (Vincent, 2004). Alaska is an exception. Compared with its huge area, the workforce level is low, due to the remoteness of the area and the lack of intense use by the public. This is similar to some nature reserves in the west of China, such as Kekexili National Nature Reserve and Sanjiangyuan National Nature Reserve.

NPS strives to: (1) conserve, preserve, protect, and interpret the natural, cultural, and historic resources of the nation for the public, and (2) provide for their enjoyment by the public. In line with the mission of the NPS, only certain outdoor recreational activities and scientific research can be conducted in the National Park System. Resource harvest or removal from any unit of the National Park System is generally prohibited (e.g., mining) unless Congress specifically allows it. For instance, mining and certain resource uses (e.g., oil and gas development, hunting) are allowed in few units of the National Park System.

**Figure 1.9 Organizational Chart of National Park Service in the United States**



**Designation and Land Ownership.** It is up to Congress (which establishes National Park units except National Monuments) or the President (who establishes National Monuments) to designate a new national park unit, rather than NPS. To establish a new national park unit, Congress first enacts a law requesting the Secretary of the Interior to evaluate the feasibility of adding a new national park. NPS is usually delegated by the Secretary to conduct studies that take into account public opinion, significance, representativeness, and congressional support. The study for a specific area must be completed in three fiscal years. The Secretary is responsible for nominating to Congress new national units every year, in order of priority, based on survey results provided by NPS. Afterwards, the Congress issues an act to identify the boundary of the national park unit and to authorize the NPS to acquire inholdings within park boundaries (Vincent, 2004; Corte, 2007).

Congress delegates the authority to acquire and dispose of lands

to federal land management agencies by enacting laws over time. However, NPS has the most limited authority for land acquisition and disposal among the four main federal land management agencies (Corte, 2007). The National Park System covers more than 84 million acres of land—79 million acres of federal land (93.6%), 1.2 million acres of other public land (1.4%), and 4.2 million acres of private land (5%) (Vincent, 2004). Regarding the latter, NPS still manages some non-federally owned parkland, including inholdings that were authorized before July 1959.

NPS prioritizes inholding acquisition every year within available appropriations. In Fiscal Year 2011, NPS budgeted US \$7 million for activities pertaining to inholdings, including inholdings acquisition, titles and appraisals, required surveys and clearances. If an inholding valued amount exceeds US \$150,000, clearance from the appropriate House and Senate Committees is required. At least every three years, the Secretary must submit a report to Congress of all authorized but unacquired lands, as well as priority for acquisition within the boundaries of national park units (Vincent, 2004; Corte, 2007). The NPS may leverage its purchasing power through partnerships with non-profits. This tool is discussed in later chapters.

Once a designation unit is established, the Secretary is authorized to identify criteria to evaluate proposed boundary adjustments. For a minor boundary adjustment, the Secretary has the authority to make the decision, including the acquisition of nonfederal lands within the adjusted boundary.

Although minor non-federal lands encompassed by a boundary adjustment can be acquired through exchange, no lands in the national park system can be disposed of without an act of Congress (Corte, 2007, Vincent, 2004). Due to the strict management of land acquisition and disposal, the acreage of the national park system has remained relatively stable in recent years, compared with other protected areas on federal lands.

#### **1.2.2.1.2 U.S. Fish and Wildlife Service (USFWS)—National Wildlife Refuge System**

**Background.** The National Wildlife Refuge System (NWRS) has

expanded to the whole nation from its first base—Florida’s Pelican Island, established by President Franklin D. Roosevelt in 1903. The mission of the NWRS is to conserve America’s fish, wildlife and plants. By September 30, 2009, the NWRS included 551 national wildlife refuges, 206 Waterfowl Protection Area (WPA) districts, and 49 Coordination Areas (CA) (Table 1.5) (USFWS, 2009) (Fig. 1.10). WPAs are federally owned lands that are part of NWRS and are managed by the USFWS. CA are lands owned by USFWS but managed by state agencies in accordance with agreements with the USFWS. The vast majority of the NWRS lies in Alaska—Alaska has 16 refuges, which encompasses 82.7% of NWRS in acreage. There are 82 Wilderness Areas (WA) designated by Congress that occur within NWRS, except Mount Massive Wilderness Area, which is situated at the Leadville National Fish Hatchery (USFWS, 2008). USFWS also administers 59 National Fish Hatcheries (NFH) to replenish depleted stocks, to help fishery resources management on federal and Native American land, and to enhance recreational fisheries(USFWS, 2008).

**Table 1.5 Categories of Protected Areas in the National Wildlife Refuge System**

Category	No.	Total Acres
National Wildlife Refuges	551	145,150,938
Waterfowl Production Areas	206	3,428,635
Cooperation Areas	49	252,649.85
National Fish Hatcheries	69	21,727
National Monuments	6	157,067,994
Grand Total	881	305,921,944

**Figure 1.10 Distribution of National Wildlife Refuge System in the United States<sup>1</sup>**



By Executive Order on March 14, 1903, President Theodore Roosevelt established Pelican Island National Wildlife Refuge, along Florida’s central Atlantic coast, as the first unit of the present National Wildlife Refuge System. Following the modest trend begun with Pelican Island, many other islands and parcels of land and water were quickly dedicated for the protection of various species of colonial nesting birds that were being destroyed for their plumes and other feathers. By the end of his administration in 1909, Roosevelt had issued a total of 51 Executive Orders that established wildlife reservations in 17 states and three territories. Congress also had continued to respond to the public mood recognized by Roosevelt by establishing the Wichita Mountains Forest and Game Preserve in 1905, the National Bison Range in 1908, and the National Elk Refuge in 1912. The latter was the first unit of the present system to be referred to as a “refuge”. The Federal government first exerted authority over migratory birds by legislation, the Migratory Bird Act, which was enacted in 1913 to protect migratory bird species. An interesting historical footnote is that this landmark legislation was attached as a

<sup>1</sup> Map extracted from: [http://www.fws.gov/refuges/pdfs/refugeMap0930\\_2008.pdf](http://www.fws.gov/refuges/pdfs/refugeMap0930_2008.pdf)

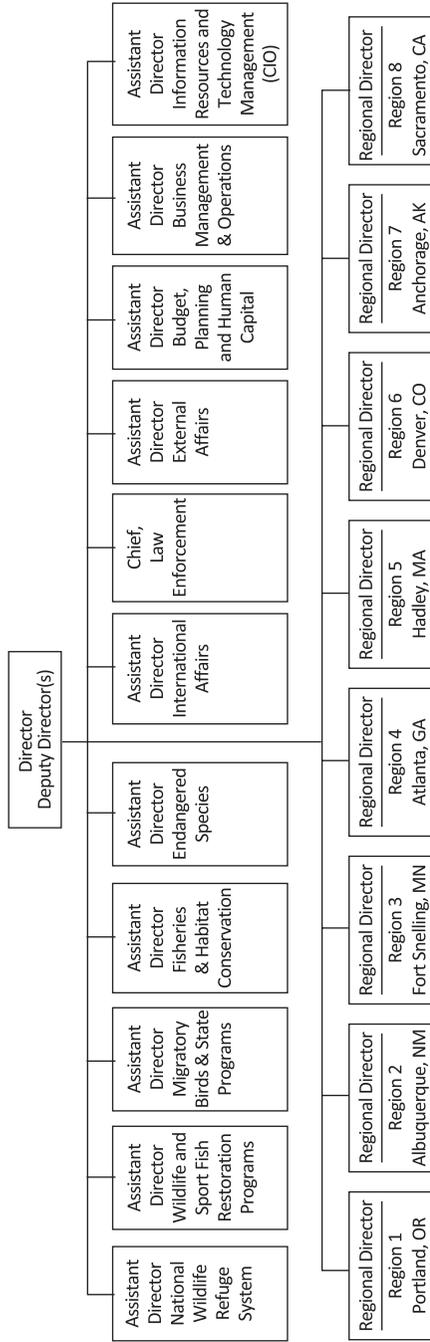
rider to an agricultural appropriation bill and signed unknowingly by outgoing President Taft. Subsequently, the Migratory Bird Treaty was concluded between the United States and Great Britain (for Canada) in 1916. This treaty, implemented by Congress in 1918, created an even larger role for the Federal government in managing migratory birds. A major stimulus for the Refuge System came in 1934 with the passage of the Migratory Bird Hunting and Conservation Stamp Act (known as the Duck Stamp Act). The Act's later amendments increased the price of the stamp providing a continuing source of revenue for the acquisition of migratory bird habitats. In addition, the 1966 law established the standard of "compatibility," requiring that uses of refuge lands must be determined to be compatible with the purposes for which individual refuges were established. This standard was later strengthened and clarified in the National Wildlife Refuge System Improvement Act passed by Congress in 1997. This much-needed organic legislation amended the National Wildlife Refuge System Administration Act of 1966 and provided significant new guidance for the management of the Refuge System. It provided a new statutory mission statement and directed the Refuge System to be managed as a national system of lands and waters devoted to conserving wildlife and maintaining biological integrity of ecosystems.

**Organization and Management.** All units under the NWRS are divided into eight regions: Pacific Region, Southwest Region, Midwest Region, Southeast Region, Northeast Region, Mountain-Prairie Region, Alaska Region, and Pacific Southwest Region (Fig. 1.10 and Fig. 1.11). Each region is managed by a Regional Director who reports to the head of USFWS—The Director is assisted by two Deputy Directors and 11 Assistant Directors overseeing not only NWRS programs, but also Wildlife and Sport Fish Restoration, Migratory Birds, Fisheries and Habitat Conservation, Endangered Species, Law Enforcement, International Affairs, External Affairs, Budget, Planning and Human Capital, Business Management and Operations, as well as Information Resources and Technology Management. Except for the Budget, Planning and Human Capital sector, the remaining ten Assistant Directors are supported by their own Deputy Assistant Director. The whole organizational chart can be obtained at <http://www.fws.gov/offices/orgcht.html>. The three-tier organization chart of USFWS can be seen in Figure 1.11.



# U. S. Fish & Wildlife Service

Figure 1.11 Organizational Chart of USFWS



The ultimate goal of the NWRS is to conserve, manage, and, where appropriate, restore the fish, wildlife, and plant resources and their habitats (USFWS, 2005). The National Wildlife Refuge System Improvement Act (NWRSIA) of 1997 allows compatible wildlife—dependent recreation uses within NWRS, including hunting, fishing, wildlife observation, photography, environmental education, and interpretation. However, some outdoor recreation, e.g., off-road vehicles and personal watercraft, are still not allowed. Hunting, fishing, and other recreational uses must be compatible with wildlife protection (Vincent, 2004).

Some resource use activities that are not wildlife-dependent but are compatible with wildlife, e.g., grazing, growing hay, and alternative energy development, may be permitted in certain refuges under certain circumstances (Vincent, 2004). The strictness of conservation measures of NWRS lies somewhere between that of the National Park System and that of protected area systems on lands managed by BLM and USFS.

**Designation and Land Ownership.** To better achieve management goals, USFWS can add new land to its NWRS. According to the Migratory Bird Treaty Act (MBTA) of 1929, the Secretary of the Interior is authorized to recommend appropriate areas for the conservation of migratory birds to the Migratory Bird Conservation Commission (MBCC), which has seven members. The MBCC may issue their approval after consulting with relevant state governors and local governmental officials. MBCC owns the final rights to review and approve land and/or water acquisition or rental, and to fix the price or prices. In addition, MBCC also considers the establishment of new waterfowl refuges. MBCC, supported by Division of Realty of U.S. Fish and Wildlife Service, usually convenes three times (March, June and September) annually or as needed (USFWS, 2010). Secondly, other laws also give USFWS authority to enlarge NWRS, including the Fish and Wildlife Coordination Act of 1934, the Fish and Wildlife Act of 1956, and the Endangered Species Act of 1973 (Corte, 2007). All these laws ensure that USFWS may acquire lands without any special congressional acts, and significantly, acquire lands beyond authorized unit boundary, unlike NPS and USFS, which must have an authorization acquisition boundary to purchase.

New lands are added to NWRS through land transfer within the public domain and land acquisition from other land owners. Funds for land acquisition come mainly from the Migratory Bird Conservation

Fund (MBCF) which focuses on lands for migratory waterfowl and the Land and Water Conservation Fund (LWCF) which emphasizes the entire expansion of NWRS (Vincent, 2004). The MBCF has four funding sources: (1) sale of Migratory Bird Hunting and Conservation Stamps (known as Duck Stamps); (2) import duties collected on arms and ammunition; (3) sale of refuge admission permits; and (4) sale of products from rights-of-way across NWRS (USFWS, 2010). Revenues may also be raised through disposal of refuge lands and reverted Federal Aid funds, which, unlike the previous four, provides a non-consistent revenue (USFWS, 2010).

Unlike its broad authority for land acquisition, USFWS has more limited land disposal authority than NPS. Only by a Congressional Act can a refuge be removed from the NWRS. For NWRS lands reserved from the public domain, once they are added to NWRS, no disposal is allowed. However, acquired lands of NWRS can be disposed of if either the land exchange is authorized, or the lands add no value to conservation as identified by MBCC (Vincent, 2004; Corte 2007).

### **1.2.2.1.3 Bureau of Land Management (BLM)—National Landscape Conservation System**

**Background.** As the largest land management entity in the United States, BLM oversees 40% of federal lands, amounting to 11% of lands in the United States. The lands range from forests to rangelands. Importantly, BLM manages all mineral resources on federal lands and all federal minerals underlying other ownerships. BLM was established in 1946 after merging the General Land Office, organized in 1812 to take charge of land conveyance to private parties and local governments, and the U.S. Grazing Service, set up in 1934 to manage livestock grazing on public lands (Vincent, 2004). The Federal Government took several years to decide which path to follow—to continue to administer federal lands or to allot administration to private interests during the 1960s-1970s. The debate finally ended with the issuance of the Federal Land Policy and Management Act (FLPMA) in 1976, which is the guiding law or the “Organic Act” of the agency. FLPMA requires that BLM manage lands for multiple uses to embody its mission—“to sustain the health, diversity, and productivity of public land for the use and enjoyment of present and future generations.” As a result, diverse resources uses and management

activities are allowed on the federal lands managed by BLM, including timber harvesting, energy and mineral development, livestock grazing, recreation, wild horses and burros, fish and wildlife habitat management, and preservation of natural and cultural resources.

Over time, BLM has shifted from emphasizing uses such as mining, logging, grazing, and oil and gas extraction to ensuring a more sound balance with conservation of natural and cultural resources. The creation of the first national monument on BLM lands—the Grand Staircase-Escalante National Monument—proclaimed by President Clinton in 1996 demonstrated this shift. Then in 2000, BLM created the National Landscape Conservation System (NLCS) by combining existing protected areas within BLM lands, such as National Monuments and National Conservation Areas. The creation of the NLCS was designed to heighten awareness of these “jewels” of the BLM lands, to attract more tourists and federal funding. Furthermore, NLCS helps to conserve ecosystems and watersheds in the West, to preserve wildlife and their habitat, to protect the integrity of ecosystems and to provide people with opportunities to experience the natural and historical legacy. The NLCS Act was included in the Omnibus Public Land Management Act of 2009. NLCS embraces ten different protected areas, stretching over more than 27 million acres (Table 1.6) (Fig. 1. 12).

**Table 1.6 Categories of Protected Areas in the National Landscape Conservation System<sup>1</sup>**

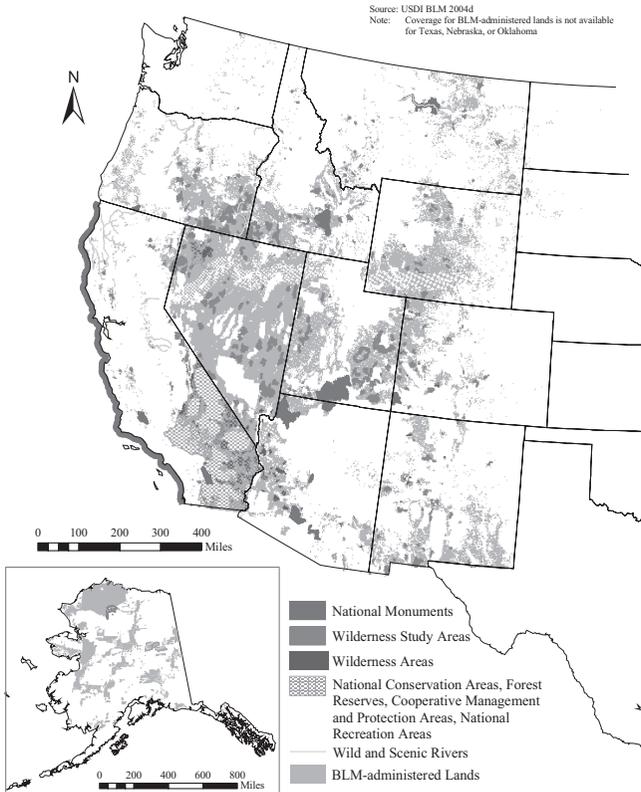
Designated Name	No.	BLM Acres	Other Federal Acres	Non-federal Acres
National Monuments	16	4,819,263	768,686	446,282
National Conservation Areas & Similarly Designated Lands	21	4,097,728	22,755	306,325
Wilderness Areas	224	8,741,566	--	--
Wilderness Study Areas	545	1,007,506	--	--

<sup>1</sup> Data adapted in this Table from the relevant subdirectories of NLCS on BLM website below. However, only raw data of each designation unit is cited rather than grand total number due to inconsistency in BLM’s tables. [http://www.blm.gov/wo/st/en/prog/blm\\_special\\_areas/NLCS.html](http://www.blm.gov/wo/st/en/prog/blm_special_areas/NLCS.html)

Continued

Designated Name	No.	BLM Acres	Other Federal Acres	Non-federal Acres
TOTAL ACRES		18,666,063		
Wild and Scenic Rivers	67	2,425 miles	--	--
National Scenic Trails	--	664 miles	--	--
National Historic Trails		5,342 miles		
TOTAL MILES		8,431 miles		

**Figure 1.12 Distribution of Protected Areas in the National Landscape Conservation System<sup>1</sup>**



1 Map source: [http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning\\_and\\_Renewable\\_Resources/veis.Par.78566.File.dat/ER\\_Map\\_3-12.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/veis.Par.78566.File.dat/ER_Map_3-12.pdf)

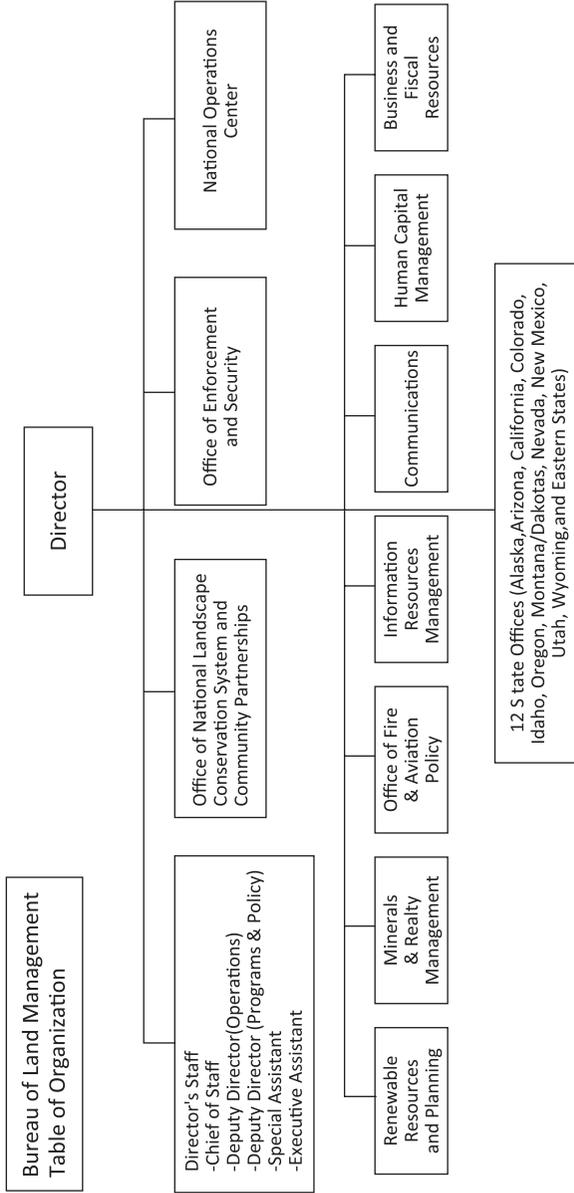
**Organization and Management.** The BLM organizational chart is three tiered. The Director is appointed by the President and reports to the Secretary of the Interior. BLM has its headquarters in Washington D.C. and is supported by 12 state offices, each headed by a State Director. Under each state office, field offices are headed by Field Managers. The NLCS program is in the office of NLCS that is directly under the BLM Director (Fig. 1.13).

BLM manages resources on federal surfaces (on land managed by BLM) and subsurfaces (for federal minerals underlying BLM and other lands). Approximately 700 million acres of subsurface minerals on federal lands are administered by BLM. Mineral development is generally allowed, with some exceptions. For example, about 165 million acres of subsurface minerals distributed in specific protected area systems, e.g., the National Park System (National Recreation Areas exclusively), Wilderness System, and the Arctic National Wildlife Refuge (ANWR), are not allowed to be developed except for valid existing rights (Vincent, 2004). For some mineral development on lands that other federal land management agencies hold secondary jurisdiction over, approval from these land management agencies is required, e.g., NWRS (ANWR exclusive), wilderness study areas, and identified roadless areas.

As for rangelands, 162 million acres of land managed by BLM allow grazing with permits (Vincent, 2004). The BLM administers more than 18,000 grazing permits and leases (BLM, 2010a). To strengthen protection, a Voluntary Grazing Permit Buyout project has been implemented to permanently withdraw grazing permits or leases through paying ranchers a fair market price. Finally, BLM plays an important role in fire management both on federal and non-federal lands, along with USFS, which focuses on fire management for national forests.

**Designation and Land Ownership.** BLM holds the broadest authority of land acquisition among the largest four federal land management bureaus. BLM can acquire lands or interests in lands (especially inholdings) as long as BLM decides that it is necessary for any reasonable cause, ranging from protecting threatened resources, providing recreational opportunities for the public, restoring land functions, or improving land management. Importantly, since there is no designation unit under NLCS that is BLM—specific, designation of NLCS unit must be consistent with applicable laws.

**Figure 1.13 Organizational Chart of Bureau of Land Management<sup>1</sup>**



<sup>1</sup> Information source: [http://www.blm.gov/pgdata/etc/medialib/blm/wo/Business\\_and\\_Fiscal\\_Resources.Par.27384.File.dat/blm\\_org\\_chart.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/Business_and_Fiscal_Resources.Par.27384.File.dat/blm_org_chart.pdf)

BLM can dispose of lands through sales, patents, and transfers. Usually, if a land tract for sale is larger than 2,500 acres, approval from Congress is required. Finally, BLM is also responsible for reviewing withdrawals that restrict the use of disposition of public lands, e.g., withdrawal of mining from NPS, as mentioned above.

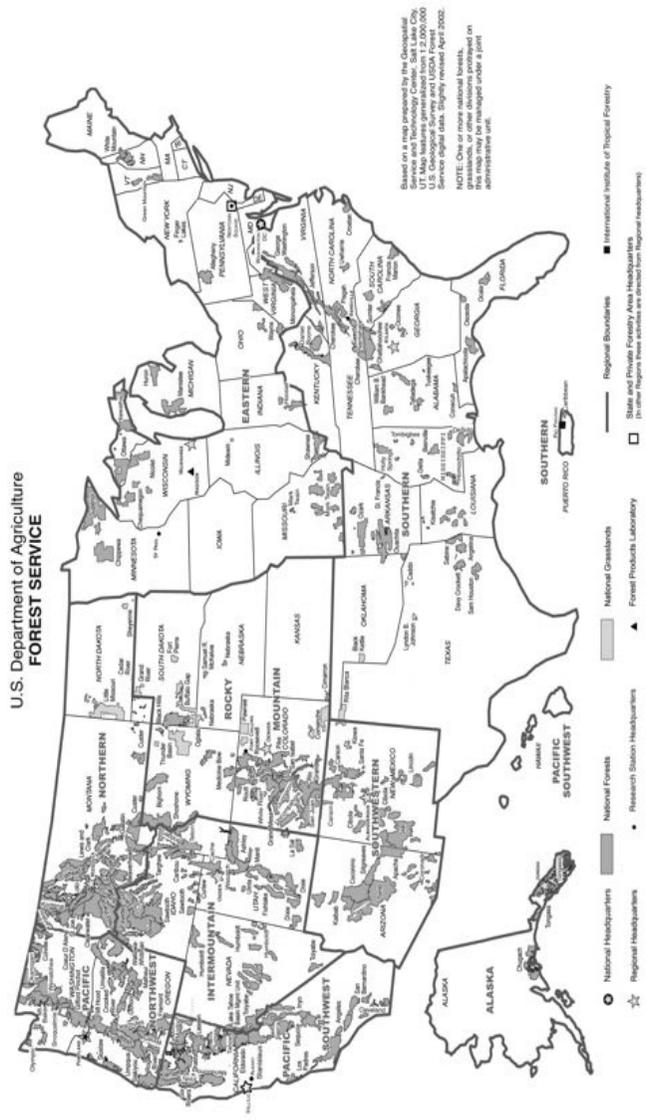
#### 1.2.2.1.4 U.S. Forest Service (USFS)—National Forest System (NFS)

**Background.** The National Forest System (NFS) originates from forest reserves that were initially proclaimed by the President in 1891 (Vincent, 2004). The Forest Service in the U.S. Department of Agriculture instantly took over the administration of these forest reserves from the Division of Forestry in the General Land Office of the Department of the Interior in 1905. Forest reserves were renamed as national forests in 1907. Now, the NFS covers nearly 193 million acres of lands with different types of land designations as showed in Table 1.7 (USFS, 2010). About nine percent of the total land areas of the United States are under the stewardship of USFS. 155 national forest and 20 national grasslands administered by the USFS are illustrated in Figure 1.14. The ultimate management goals of NFS are sustained health, diversity, and productivity of NFS lands.

**Table 1.7 Acreage of the National Forest System as of September 30, 2010**

Designation Unit	No. Units	NFS Acreage	Non-NFS Acreage
National Forests	155	188,228,177	37,361,670
Purchase Units	59	388,307	1,903,361
National Grasslands	20	3,837,470	427,330
Land Utilization Projects	5	847	0
Research and Experimental Areas	19	64,727	8,282
Other Areas	37	300,177	63,216
National Preserves	1	89,716	0
Grand Total	296	192,909,421	39,763,859

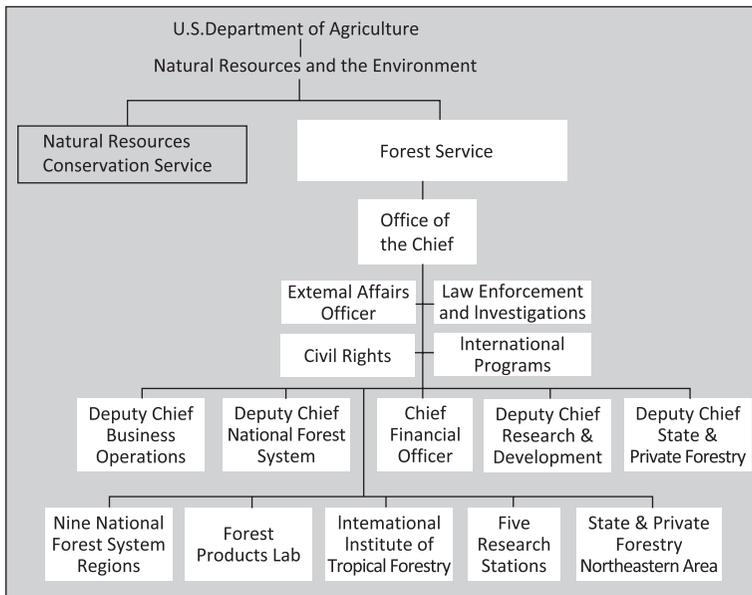
Figure 1.14 Distribution Map of National Forests and National Grasslands in NFS<sup>1</sup>



1. Map extracted from: [http://www.fs.fed.us/documents/USFS\\_An\\_Overview\\_0106MJS.pdf](http://www.fs.fed.us/documents/USFS_An_Overview_0106MJS.pdf)

**Organization and Management.** USFS, headquartered in Washington DC, achieves its functions through a decentralized organization encompassing administrative regions, research stations and the Northeastern Area (Fig. 1.15). All NFS units are divided into the following nine administrative regions: Northern, Rocky Mountain, Southwestern, Intermountain, Pacific Southwest, Pacific Northwest, South, Eastern, and Alaska (Fig. 1.14). Each administrative region is presided over by a Regional Forester who reports to the Chief of USFS (Fig. 1.15). Sometimes USFS will combine two or more of NFS units for management efficiency. For example, there is one Forest Supervisor for the Pike National Forest, San Isabel National Forest, and Comanche National Grasslands.

**Figure 1.15 Organizational Chart of USFS<sup>1</sup>**



NFS units are managed with a multiple-use approach to meet its management goals defined by the Multiple-Use Sustained—Yield Act of 1960, including outdoor recreation, livestock grazing, timber

<sup>1</sup> Information extracted from: [http://www.fs.fed.us/documents/USFS\\_An\\_Overview\\_0106MJS.pdf](http://www.fs.fed.us/documents/USFS_An_Overview_0106MJS.pdf)

harvesting, watershed protection, and fish and wildlife habitats (Vincent, 2004). Furthermore, many other laws or statutes also influence or direct the mission of USFS significantly. For instance, the Forest and Rangeland Renewable Resources Planning Act of 1974 along with the National Forest Management Act of 1976 collectively require USFS to develop a five-year strategic plan for all activities through assessing all renewable natural resources on all NFS units every ten years (Vincent, 2004; USFS, 2011). USFS's strategic plan (FY2007-2012) addresses that four-level hierarchy planning is necessary to effectively manage NFS lands: strategic planning, business planning, unit planning, and annual work planning (USFS, 2007). Special designations for some NFS lands which are nominated by Congress direct intensive management of NFS units, such as wilderness areas and wild and scenic rivers. Forest health, wildland fires, and road development are increasingly challenging. Non-NFS lands within NFS boundaries somehow increase management difficulties for USFS due to the lack of regulatory authority over these lands, which are common in the Southern and Eastern Regions (Corte and Vincent, 2007).

**Designation and Land Ownership.** The Presidents' authority to proclaim forest reserves (renamed as national forests in 1907) from the public domain was not terminated until 1976. Since then, only Congress can create new national forests and modify national forest boundaries. Forest reserves were mainly established in the West from 1891-1907 and national forests in the East were generally created between 1910-1950 (Vincent, 2004). However, NFS has expanded slowly since 1919 with an area of 154 million acres. The Secretary of Agriculture is authorized to acquire lands within proclaimed boundaries of national forests. About 17 percent of lands within proclaimed NFS are nonfederal lands (USFS, 2010). According to applicable laws, the Secretary of Agriculture has numerous authorities to dispose of NFS lands. For instance, the 1897 Act and the 1911 Weeks Law regulates that some lands can be taken out from NFS for agriculture.

### **1.2.2.2 CROSS-AGENCY PROTECTED AREA SYSTEM**

Certain types of protected areas may be designated on any federal

public lands and form a network across them: the National Wilderness Preservation System, the National Trail System, and the Wild & Scenic River System. No single agency manages each system in its entirety. Rather, the existing land management agencies administer directly these protected areas within their jurisdiction. For example, BLM manages the wilderness areas on its lands, while NPS manages those on its lands. Relative consistency in establishment and management across the agencies is ensured by laws, such as the Wilderness Act of 1964. It is important to note that while these systems exist, additions to the systems are typically highly controversial, particularly for wilderness and wild and scenic river systems.

#### **1.2.2.2.1 National Wilderness Preservation System**

**Background.** The National Wilderness Preservation System (NWPS), encompassing 109 million acres, was created in 1964 with the enactment of the Wilderness Act. Usually, land that meets the minimum conditions listed below can be recommended as a wilderness: (a) undeveloped federal land with an area larger than 5,000 acres or adequate size to ensure permanent preservation; (b) primarily affected by the forces of nature; (c) relatively uninfluenced by human activities; (d) providing opportunities to experience primitiveness. In response to Congress's request in 1964, USFS, NPS, and USFWS took 10 years to assess their lands as eligible to be identified as wildernesses, and BLM subsequently conducted a similar review in 1976 that was finished in 1991. All wilderness recommendation reports have been submitted to Congress through the Presidents. By August of 2010, 756 wildernesses, comprising 109 million acres, have been established across the whole nation. The smallest wilderness is Pelican Island Wilderness in northern Florida with an area of 6 acres, while the largest one is Wrangell-Saint Elias Wilderness in Alaska, with an area of 9,078,675 acres. Not every state has wilderness. USFS manages the most wilderness areas and NPS manages the most wilderness acres.

**Organization and Management.** NWPS is managed by the four federal public land managers (Table 1.8). It is important to know that

a wilderness may partially or totally overlap with another designation unit managed by these federal land managers. For example, over 94% of Yosemite National Park is designated as Yosemite Wilderness. Vincent (2004) reported that more than 50% of NPS lands and 22% of USFWS lands are designated as wilderness.

**Table 1.8 Management Agencies of National Wilderness Preservation System<sup>1</sup>**

Agency	Units	Federal Acreage (million)	Note
Bureau of Land Management	222	8.7	The inconsistency with numbers mentioned in body text due to some wildernesses managed by more than one agency and counted by each agency as a unit.
U.S. Fish and Wildlife Service	71	20.7	
U. S. Forest Service	439	36.2	
National Park Service	60	43.9	
Total	792*	109.5	

As stated in the Wilderness Act, wilderness is set aside to protect and preserve its natural condition. Accordingly, commercial enterprise, permanent improvements (e.g., roads, buildings), and activities altering natural conditions (e.g., timber harvest) are generally prohibited. As for mineral exploration and leasing, existing livestock grazing, and motorboats as well as aircrafts (airstrip use), special provisions are made to allow them.

**Designation.** Only Congress has the authority to designate wilderness areas although anyone can propose wilderness area designation. For example, environmental groups have organized and created their own inventories to propose Citizens' Wilderness Areas to the agencies for their consideration. Once a particular site is recommended to Congress, the House and Senate will review it and decide the exact boundary if they approve the recommendation. Then the President will either sign the wilderness bill into law or veto it.

<sup>1</sup> Data source: Wildnerness.net 2010. <http://www.wilderness.net/factsheet.cfm>

For USFWS and NPS, before submitting a recommendation proposal to the Department of the Interior for review, they usually conduct an eligibility assessment for a particular area and a formal wilderness study to determine the final recommendation to the Secretary of the Interior. Once the recommendation is approved by the Secretary, the proposal is then sent to the President for review. If approved, it is then sent to Congress for review. The designation process for a land managed by USFS to be a wilderness can be obtained at <http://www.wilderness.net/NWPS/documents/FS/FSDesignationFigure.pdf>.

After finishing a wilderness review in 1991, BLM designated Wilderness Study Areas (WSA) on land federally owned by BLM. WSAs are included in the NWPS, but congressional legislation has not yet been enacted to formally establish them as wilderness. WSAs share features similar to wilderness areas (WAs) in terms of size, naturalness, and opportunities and are included in NLCS for management. Some WSAs will be designated as wilderness but the fate of others is uncertain. Despite this, WSAs are managed as wilderness now. It should be noted that in response to a lawsuit in the early 2000s and the associated settlement (Norton-Leavitt Settlement of 2003), BLM no longer has the authority to designate WSAs. In its place, in 2010, the Secretary of the Interior issued an order authorizing BLM to designate “appropriate areas with wilderness characteristics under its jurisdiction as ‘Wild Lands’ and to manage them to protect their wilderness values”(BLM, 2010b).

#### **1.2.2.2 National Trail System**

**Background.** The National Trail System (NTS) was formed in 1968 to provide more outdoor opportunities and to protect resources along the trails. NTS is comprised of four types of trails: (1) national scenic trails; (2) national historic trails; (3) national recreation trails; and (4) connecting-and-side trails determined to be important to the system.

**Organization and Management.** The trails are managed by four main federal land management agencies: NPS, USFWS, USFS, and BLM.

**Designation.** Congress has the authority to designate national scenic trails and national historic trails, while national recreation trails and connecting-and-side trails are designated by the Secretary of the Interior or the Secretary of Agriculture. The Secretaries have authority

to acquire non-federal lands or interests through easements and other co-operative arrangements with state and local governments, as well as private owners to provide coordinated management of the entire trail area (Vincent, 2004).

#### **1.2.2.2.3 National Wild and Scenic River System**

**Background.** The National Wild and Scenic River System (NWSRS) came into being in 1968 through the Wild and Scenic River Act. NWSRS aims to protect three kinds of rivers—wild rivers, scenic rivers, and recreational rivers. The intent is to allow these rivers to flow freely for the enjoyment of present and future generations. As of 2008, 11,000 miles of 166 rivers are included in the NWSRS.

**Organization and Management.** Rivers in the NWSRS are managed by federal or state agencies. To protect rivers, river corridors are designated along rivers. Corridor boundaries are identified by the Secretary of the Interior or the Secretary of Agriculture, according to land ownership. Generally, corridor areas cannot exceed 320 acres per mile of a designated river (Averages change to 640 acres per mile in Alaska due to its vastness) within ¼ mile width apart from each side of a river (Vincent, 2004). Along designated rivers, most lands are federal lands that are managed by federal governmental agencies. Unlike other protected areas, federal agencies hold limited authority to acquire other public or private lands within the corridor boundary (Vincent, 2004). As a result, local governments and other partners frequently play an important role in land use dedication and planning in these areas. Development in the corridor boundary is not prohibited. However, it may be subject to stricter zoning and land use controls.

**Designation.** Both Congress (rivers recommended by a federal agency) and the Secretary (rivers nominated by state) can designate NWSRS units. Only a river with legal protection status under state law can be nominated to be a NWSRS unit by a State.

#### **1.2.2.2.4 Other Protected Area Systems**

**National Monuments.** Without approval of Congress, the President designates national monuments containing “historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest,” according to the Antiquities Act of 1906.

Establishment of a new national monument with non-federal land within the proposed boundary requires a presidential proclamation that the land will be acquired by the federal government (Vincent, 2004). Vincent (2006) says that approximately 120 national monuments have been established in the United States. Generally speaking, national monuments focus on historic protection rather than biological conservation. Several federal agencies manage national monuments, including NPS (74), BLM (16), and the remaining 20 are managed by USFS, USFWS, and National Oceanic and Atmospheric Administration (NOAA).

### **1.2.3 PROTECTED AREAS ON STATE AND LOCAL PUBLIC LANDS**

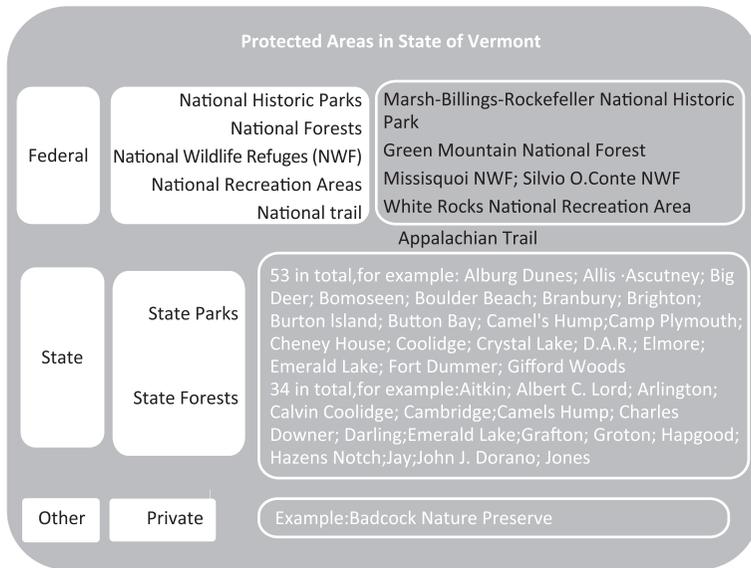
#### **1.2.3.1 INTRODUCTION**

In the United States, state government and local governments hold 8.61% of the land area in the country. Each state has its own protected area network composed of different combinations of varied protected areas, including forest preserves, state forests, state parks, gardens, state recreation areas, state monuments, and so forth. Protected area systems on state and local public lands supplement the federally protected area systems that are concentrated in the western United States. These protected areas are managed by one or more agencies or departments within state governments that are charged with protection or natural resources. Figure 1.16 shows protected area networks in the State of Vermont, including state parks and forests, and shows the importance of protected areas on other public domain beyond federal lands.

Protected areas on public lands administered by state and local governments also contribute to environmental protection and conservation, economic development, personal health, individual enrichment and recreation, and social or community harmony and stability (NASPD, 2010). Statistics from NASPD (the National Association of State Park Directors) for 2009 demonstrate that 6,624 state park units were in existence at the end of 2009, which generated more than US \$20 billion in revenue for the economy of communities and more than US \$725 million visits to these protected

areas annually. State forests function as biological reserves at multiple levels, including maintaining biological diversity, and the proper functioning of ecological systems (nutrient, water, and energy cycles). Different states make efforts to manage and protect state forests, too. For example, in Pennsylvania, The Bureau of Forestry of The Department of Conservation and Natural Resources has developed The State Forest Resource Management Plan that addresses strategies for enhancing state forest protection by creating a bioserve system, and by designating more natural areas, wild areas and so on.

**Figure 1.16 Protected Area Network in State of Vermont<sup>1</sup>**



Protected areas on state lands are administered by state governmental agencies. Each state protected area has a specific resource or reason for being so designated and managed. New York State and the State of Hawaii are examples of terrestrial and marine protected areas on state public lands.

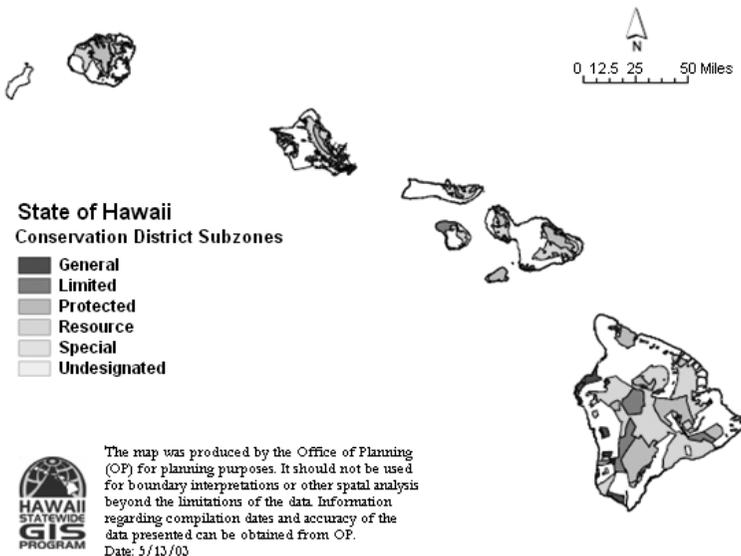
### 1.2.3.2 STATE PROTECTED AREAS IN THE STATE OF HAWAII

The State Land Use Commission (LUC) is authorized to zone all lands

<sup>1</sup> Information from Vermont Depart of Forest, Parks and Recreation. <http://www.vtfpr.org/>

in Hawaii into four districts: Agriculture, Conservation, Urban, and Rural. The State of Hawaii Department of Land and Natural Resources (DLNR) is delegated to manage conservation districts, including sub-zoning and regulating land use activities, to fulfill its mission: *“Enhance, protect, conserve and manage unique and limited natural, cultural and historic resources in Hawaii...in partnership with others from the public and private sectors”* (DLNR, 2010). The Conservation District has five subzones: protective, limited, resource, general, and special in a descending environmentally sensitive order (DLNR, 2010) (Fig. 1.17). Discretionary permits or approval from DLNR or the Board of Land and Natural Resources (BLNR) is required to conduct identified land uses in these subzones. Worth mentioning is that submerged lands beneath coastal waters are included in the Conservation District. The Conservation District is where most protected areas (including state parks, forest reserves, and natural area reserves) are located (Table 1.9). Approximately 18.8% of the total area of Hawaii has been set aside for the three dominant protected areas.

**Figure 1.17 Conservation District Subzones in State of Hawaii<sup>1</sup>**



1 Figure adopted from: <http://hawaii.gov/dlnr/occl/subzone-maps/subzone-maps>

**Table 1.9 Main Categories of Protected Areas in Hawaii State<sup>1</sup>**

Designated Name	No.	Acres
State Parks	53	25,000
Natural Area Reserves	19	115,446
Forest Reserves	53	637,000
Grand Total	125	777,446

A pie chart illustrating the distribution of protected areas in Hawaii. The largest segment is Forest Reserves at 82%, followed by Natural Area Reserves at 15%, and State Parks at 3%. A legend to the right of the chart identifies the categories: State Park (light gray), Natural Area Reserve (dark gray), and Forest Reserves (medium gray).

Hawaii is famous for its splendid marine life. Besides five marine protected areas federally established in Hawaii as of April 2009 (NMPAC, 2009), the State of Hawaii has also established a number of marine protected areas for the conservation of its marine resources. Some of these areas also meet the state’s economic development and recreation needs (Friedlander *et al.*, 2006; DAR, 2010). Hawaii began establishing these areas in the 1960s (Friedlander *et al.*, 2006; DAR, 2010). In addition to some marine natural reserves and wildlife sanctuaries, two dominant marine protected areas, Marine Life Conservation Districts (MLCDs) and Fishery Management Areas (FMAs), provide varying levels of protection for marine life in nearshore areas (Table 1.10). FMAs are less strictly protected, compared to MLCDs that aim to conserve and replenish marine resources and only allowing limited fishing or other consumptive uses. The distribution of marine protected areas in Hawaii can be seen in Fig. 1.18.

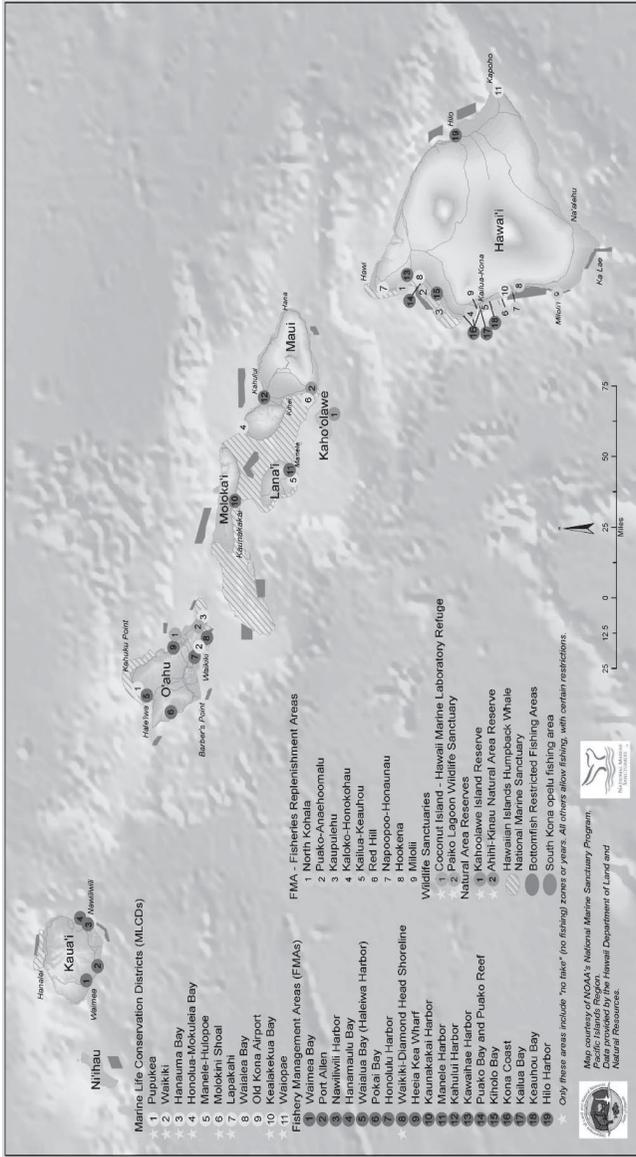
**Table 1.10 Marine Protected Area Network in the State of Hawaii<sup>2</sup>**

Designated Name	No.	Note
Wildlife Sanctuaries	2	2 of 2 is “no take” (no fishing)
Natural Area Reserves	2	2 of 2 “no take” (no fishing)
Fishery Management Areas (FMAs)	28	1 of 19 is “no take” (no fishing), 9 of 28 are fisheries replenishment areas
Marine Life Conservation Districts (MLCDs)	11	8 of 11 is “no take” (no fishing)
Grand Total	43	

1 Data from state park and natural area reserve from <http://hawaii.gov/dlnr/dofaw/>; Data for forest reserves from: <http://www.state.hi.us/dlnr/dofaw/frs/page6.htm>

2 Data source: <http://hawaii.gov/dlnr/dar/pubs/MPAmap.pdf>

Figure 1.18 Distribution of Marine Protected Areas in the State of Hawaii<sup>1</sup>



1 Map source: <http://hawaii.gov/dlnr/dar/pubs/MPAmap.pdf>

The process to create a new MLCD is shown in Figure 1.19 as stated by the Division of Aquatic Resources (DAR, 2010). The state legislature, general public or DAR of DLNR can recommend a particular site to be included in MLCDs. DAR will then evaluate the recommended site based on multiple criteria, including public accessibility, biological significance, future potential values, safety, compatibility with neighboring usage area and intact status, clarity of boundaries, and size. Once these criteria are met, DAR will conduct a comprehensive survey, including seeking comments from the public followed by public meetings being held to form the proposed regulation. Finally, a new MLCD is created, once the Board of Land and Natural Resources and the governor approve the regulation.

**Figure 1.19 Designation Process of MLCDs in the State of Hawaii**



An assessment report on protection effectiveness of marine protected areas in Hawaii conducted by NOAA and the State of Hawaii in 2006 has revealed that marine protected areas have higher coral fish in population, biomass, fish size, fish abundance, fish biodiversity, and coral cover (Friedlander *et al.*, 2006), while the macroalgae cover is lower, compared with neighboring unprotected open spaces. The research findings demonstrate the effectiveness of marine protected areas in fish biodiversity conservation. The intent of the original MLCD designation was to handle use conflicts, conservation, and public resource education, rather than comprehensive biological investigation regarding impacts of MLCDs on biodiversity, health of fish stocks, etc. The lesson is that the designation of rules governing the activities of marine areas can ensure full functioning of the marine protected areas ecosystems and promote biodiversity and healthy fish stocks (Friedlander *et al.*, 2006).

### **1.2.3.3 STATE PROTECTED AREAS IN THE STATE OF NEW YORK**

In New York State, 13% of the forest lands (about 4 million acres) are owned by the State of New York as a protected area network, and are

composed of Forest Preserve units, State Forests, Wildlife Management Areas, and State Parks (Table 1.11). These forest lands are mainly administered by the New York State Department of Environment Conservation (NYSDEC) and the Office of Parks, Recreation and Historic Preservation (OPRHP) of New York State. New York State has been successful in promoting forest values beyond timber harvesting. When timber harvesting was the primary forest value, forest coverage in the state declined from 63% in 1780 to 25% in 1880 (Larson, 2000). With the promotion of multiple values it was again at 63% in 1980 (Larson, 2000). The percentage of forest coverage is even higher today (Larson, 2000). Each classification has predominant land use priorities.

**Table 1.11 Categories of Protected Areas in State Public Lands of New York State<sup>1</sup>**

Designated Name	No.	Acres	Protection Strictness	Authority Agency
Forest Preserve	2	2,878,187	Very High	NYSDEC
State Forests	--	779,645	Low	Division of Lands and Forests, NYSDEC
Wildlife Management Areas	85	197,236	High	Division of Fish, Wildlife & Marine Resources, NYSDEC
State Parks	178 (parks) 36 (historic sites)	313,000	Medium	OPRHP
Grand Total		4,168,068		

Forest Preserve refers to state public lands in the Adirondack and Catskill Parks. Discreet areas of Forest Preserve land are called “units”. Forest Preserve units are further classified into ten categories, ranging from Wilderness and Wild Forest that are strictly protected and where the works of man are rare to Intensive Use and State Administrative areas that receive less strict protection and where more varied and

<sup>1</sup> Data sources: <http://www.dec.ny.gov/outdoor/59645.html>, and Evans D. J. & VanLuven D. E. 2007.

sometimes mechanized uses are allowed. In all Forest Preserve units, the lands *“...shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed”*. The management of Forest Preserve is addressed in detail in the Adirondack Park State Land Master Plan (completed in 1987, updated in 2001) and the Catskill Park State Land Master Plan (finished in 1985, updated in 2008) respectively.

State Forests play a unique role in New York’s landscape because they are managed under public ownership by professional foresters, allow for the sustainable use of natural resources, are open to recreational use, provide watershed protection, and cover large land areas throughout the state. From the beginning, State Forests were set aside to offset widespread trends of agricultural abandonment and deforestation as well as to restore the land’s ability to support vegetation. State Forests provide a positive impact on water quality and ecosystem health, serve as a proving ground for innovative forestry and as an example of good stewardship to private landowners, and offer a balance to the kind of management driven by short-term goals that sometimes occurs on private lands. Long-term sustainability of the forested landscape requires the sort of steady ownership and consistent management that exists for State Forests (NYS DEC, 2010). There are five classifications defined in the newly completed Draft Strategic Plan for State Forests Management (NYSDEC, 2010): (1) Reforestation Areas; (2) Multiple Use Areas; (3) Unique Areas; (4) State Nature and Historic Preserves; and (5) Miscellaneous. Each classification has predominant land use priorities. The Strategic Plan is a comprehensive forest management planning document for all of New York State and includes goals, resource information and implementation strategies for managing the State Forests for their highest, best and most important use. Similarly, Wildlife Management Areas are set aside to primarily protect, actively manage, and promote fish and wildlife resources. Wildlife Management Areas provide locations for research on wildlife, as well as opportunities for people to interact with wildlife through fishing, hunting, trapping, hiking, bird-watching, and similar activities (NYSDEC, 2010).

Finally, State Parks have similar functions to state parks across the United States by providing recreational and open space and conservation opportunities for the general public. Please note that these parks differ from the Adirondack and Catskill Parks by their small size, total public ownership of land, intensity of use, and entry and use fees.

In New York State, federally owned forest lands are less than 1% of the total area of the state. The 82% of privately owned lands periodically harvested and/or sold sometimes result in management problems, such as land development, fragmentation, and rapid turnover in ownership (NYSDEC, 2010). Recently, adoption of third-party forest certification programs by large forest land owners have gone a long way to inject professionally administered, science-based silvicultural practices into the management of forest lands. Never before has private forest land management been conducted in such a manner as to achieve multiple ecologic, economic and recreational goals sustainably and comprehensively. All in all, protected areas on state owned lands play a significant role in the eastern United States, where federally owned lands are relatively scarce and private forestry lands can result in unstable and ineffective management.

## **1.2.4 PROTECTED AREAS ON PRIVATE LANDS**

### **1.2.4.1 INTRODUCTION**

Today, private ownership is an important force in conservation although their contribution to conservation is less understood (Mitchell, 2005). Borrni-Feyerabend and others (2008) describe a private protected area as *“a land parcel owned by individuals, corporations or non-governmental organizations and managed for biodiversity conservation with or without formal government recognition”*. Private protected areas are generally managed by individuals, non-governmental organizations (NGOs) or corporate interests (Dudley, 2008). Although some private protected areas meet the criteria of IUCN categories IV-VI, some can be classified as meeting the criteria of IUCN categories I-III, especially those managed by NGOs for conservation (Dudley, 2008).

Nearly 61 percent of lands in the United States are privately

owned. Privately owned conservation lands in the U.S. are used for diverse purposes, e.g., settlement, agriculture, rangeland, silviculture, and so on. However, some private lands are also reserved as open space protected areas in the United States. Unfortunately, private protected areas are easily neglected when one is counting protected areas for a specific country. In this guidebook, we will describe some private protected areas established under varied incentives and mechanisms to demonstrate their contributions to conservation.

In the United States, land trusts<sup>1</sup> (also called land conservancy or conservation land trust) are the main vehicle for private protected areas. Land trusts have proven their worth in protecting small but significant areas. Land trusts are nonprofit organizations formed fully or partially to conserve lands through acquiring or assisting in acquiring lands or conservation easements, or through its stewardship of owned lands or easements (Aldrich and Wyerman, 2005). Often, state agencies rely on land trusts as intermediaries in land acquisitions because the land trust can be much more agile than the state in making cash disbursements. By 2005, land trusts had rocketed to 1,667 from 53 in 1950. A land trust can be national, state or locally-focused (Table 1.12). By 2005, there were 198 land trusts recorded in California (Aldrich and Wyerman, 2005).

**Table 1.12 Examples of Conservation Land Trusts in the State of California**

Level (Number)	Examples
National (10)	The Nature Conservancy; American Farmland Trust; American Land Conservancy, Trust for Public Land
State (5)	California Rangeland Trust, Golden State Land Conservancy, Pacific Coast Conservation Alliance
Local (93)	Elkhorn Slough Foundation, Great Basin Land and Water Trust, Friends of the Dunes

In the United States, land trusts operate mainly through land

<sup>1</sup> Land trusts can be classified as community land trusts, conservation land trusts and other land trust. In this guidebook, we only briefly introduce conservation land trusts.

acquisition or conservation easements, to protect lands. According to the National Land Trust Alliance (NLTA) census, national, state and local land trusts had conserved 37 million acres by 2005. 39 percent of the land protected by land trusts is dedicated for the protection of natural areas and wildlife habitat, 38 percent for open space and 26 percent for water resource protection, especially wetlands. They have concluded that five key reasons are responsible for the rapid growth of land trusts in the United States in the last several decades: (1) the application of custom-tailored conservation tools; (2) consideration of local communities' priority needs; (3) bond initiatives for conservation (bond fund); (4) decreased land acquisition funding for government agencies; and (5) the prevalence of unplanned development.

In three continual CPALAP projects (2008-2010), project participants were fortunate to have the opportunity to visit and experience private protected areas managed by NGOs in the United States. These private protected areas were created using the following two tools: (1) charitable contributions, e.g., The Nature Conservancy (TNC) and, (2) voluntary surrender of legal rights to land use on private property, e.g., conservation easements, and conservation management agreements.

#### **1.2.4.2 THE NATURE CONSERVANCY (TNC)**

Established in 1951 from its predecessor—Ecological Union, TNC's mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need in order to survive. TNC's protected area system can be traced back to the creation of its first preserve in 1955—Mianus River Gorge—with the Land Preservation Fund. In 1961, TNC received its first donated conservation easement on a 6-acre Bantam River salt marsh in Connecticut, which laid the foundation for conservation easements as a conservation tool. The lands under TNC protection, as of July 2010, are shown in Table 1.13. The lands protected in the United States by TNC total more than 23 million acres, which is almost equal to 1/3 of the lands managed by the NPS. The main tools used by TNC to create private protected areas include conservation easements, land trusts, private reserves, and incentives. These protected areas are found in all 50 states of the

United States. Most protected areas are conserved through planning processes undertaken by TNC. TNC has developed a toolkit called Conservation by Design (CbD) (which includes Ecoregional planning and Conservation Action Planning (CAP)) which aims to include lands of high conservation value priority into its protected areas system. As an international NGO, TNC has developed a Private Lands Program to promote an international private reserve model. As a result, TNC holds private protected areas in Africa, Australia, Canada, Mesoamerica and Caribbean South America.

**Table 1.13 Lands Protected by The Nature Conservancy in the United State (as of June 2010)<sup>1</sup>**

Protection Tools	Acres Protected	Note
Assists	2,499,094	For repetitive activities on the same tract, the Grant Total figure only counts it for one time.
Ownership Acquired	7,908,026	
Conservation Easements	6,221,558	
Leases	5,492,870	
Management Agreements	1,451,522	
Registered Acres	521,833	
Public Land Designations	2,016,525	
Other Protection Tools	1,079,021	
Grand Total	23,860,103	

#### **1.2.4.3 AMERICAN PRAIRIE FOUNDATION (APF)**

The American Prairie Foundation (APF) is a younger member of conservation NGOs in the United States. As a non-profit, Montana-based organization, APF was established in 2001 as a registered land trust to provide sufficient habitats for wildlife by connecting public protected areas through purchasing or holding titles to manage private lands. By the end of 2009, APF had deeded and

<sup>1</sup> Data source: [http://home.tnc/cim/files/acres\\_saved\\_q4fy10.pdf](http://home.tnc/cim/files/acres_saved_q4fy10.pdf)

leased 121 million acres of public land. The established American Prairie Preserve helps to protect the least protected grassland in the world by maintaining its ecological integrity and ecosystem services.

## **1.3 OTHER LAND CONSERVATION TOOLS**

Acquiring ownership of any private land or water for conservation is not always easy to achieve in many countries. It usually takes several years to decades in the United States to acquire a parcel of private land or water and to establish it as a conserved land. To prevent development on ecologically sensitive private lands, many creative conservation tools for private land protection are created, such as conservation easements, land trusts, fee-simple purchases, leases, and tax incentives.

Federal, state, and local land use laws and zoning ordinances also serve to protect sensitive lands. These tools have been used since the late 1960s in the U.S. when public agencies and nonprofit NGOs began working cooperatively to protect private lands from development (Mortimer *et al.*, 2007). These conservation tools help to build conservation networks beyond protected areas. These incentive-based conservation tools deserve recognition. In this guidebook, we will introduce some useful conservation tools suitable for government agencies and/or NGOs.

### **1.3.1 FEE-SIMPLE PURCHASE**

Fee-simple purchase is a way for a conservator to purchase land from a land owner who might develop lands in a manner inappropriate to the underlying sensitivity of the ecosystem need of the area for financial gain (James *et al.*, 1999). Fee-simple purchase is comparatively costly due to the difficulty of estimating revenue generation possible from other types of development or uses. However, fee-simple purchase is the easiest tool to use. Standard transfer of real estate ownership will ensure that the lands are

preserved from incompatible land uses. Conservators can manage the lands according to conservation objectives. This conservation tool can be applied by governmental and non-governmental agencies, and even by private individuals. In China, all lands are state-owned in theory. Therefore, the application of this conservation tool in China is next to impossible.

### **1.3.2 CONSERVATION EASEMENTS**

As a contractual agreement between a land owner and a conservator, conservation easements have been increasingly preferred by private landowners, government agencies, and NGOs seeking compatibility between conservation and development. Easements usually refer to “partial interests” in land, that is, the conservator only holds the right to enforce the terms of the easements, which generally deal with uses and level of development allowed on the land (James *et al.*, 1999). Conservation easements can be donated, sold, or willed to a conservator, who can be a conservation organization or a government agency. Conservation easements, in most cases, run with the title to the land. Therefore, all future owners of the land are bound by the original agreement. Many land trusts will only accept perpetual easements to ensure that lands will be protected permanently, although the duration of a conservation easement can vary, due to specific needs of landowners and some benefits, e.g., tax benefits. Due to tax incentives in the United States, most conservation easements are donated. Compared with fee-simple acquisition, easements are relatively complex institutionally, but provide advantages to the owner that a sale of the land does not. Well-established legal mechanisms and templates make the process easier.

Conservation easements are applicable to diverse properties, including forests, wetlands, coastlines, grasslands, watersheds/water supply areas, scenic areas, wildlife habitats, farmland ranches, historic areas and buildings, as well as areas to be restored for conservation purposes. Management restrictions differ broadly from prohibiting clear-cutting and salvage logging to preventing the use of chemicals, the construction of roads, and so on (Mortimer *et al.*, 2007). Through

annual inspections, conservators are responsible for the enforcement of easement restrictions. However, a difficulty in conservation easements can be the enforcement and monitoring of easement restrictions. (James *et al.*, 1999). It is hard to identify whether some changes are caused by natural processes or prohibited land management practices, potential ownership change, or the change of conservator goals due to the change of organizations. In addition, NPS reported difficulties in acquiring easements due to misunderstandings with landowners, administrative problems, enforcement, and associated high costs (Gaddis, 1999).

Conservation easements are popular as a conservation tool for several reasons: (1) land is privately owned but conservation objectives are achieved; (2) custom-tailored agreement meets both land owner's and conservator's needs and; (3) conservation-consistent land uses are allowed. Specifically, conservation easements can bring the following benefits to land owners: (1) permanent private ownership; (2) continued pursuance of economic values through compatible land use activities; (3) tax benefits; (4) flexibility in reserved rights versus prohibited uses; and (5) engagement of conservation partners to manage lands. Similarly, for a conservator, the benefits of conservation easements include: (1) lower cost; (2) preemption of certain threats; and (3) consideration of human welfare by maintaining private ownership. Due to the reasons mentioned above, conservation easements are being used more often, in lieu of fee-simple acquisition.

Mortimer and others (2007) identified approximately 3,598 forestland easements held by 355 conservation organizations and 16 state agencies. Through comprehensive overview, Mortimer and others (2007) pointed out that for developing countries, easement use should fully consider the different needs of landowners by increasing flexibility when developing management documents. With the promotion of forest land ownership system reform, the conservation easements can be implemented by the Chinese governmental agencies together with other conservation organizations. This process could assure the achievement of conservation goals that might otherwise not be realized because of incompatible forest management practices on collective lands

within or surrounding protected areas. Relevant policies should be in place first to provide a valid guarantee for easement application in China.

### **1.3.3 TRADABLE DEVELOPMENT RIGHTS**

Tradable development rights are useful conservation tools for government agencies. To ensure that people in the conservation areas share benefits equal to those of people in the development areas, the government gives development credits to people in the conservation areas. The landowners can develop their land beyond a given development restriction after buying sufficient credits from the people in the conservation areas. Such a system is suitable for local government to implement. In addition, the market competition for development credits trading influences the value of these credits and the success of the system. Similar systems are applied for protecting pine lands in New Jersey and open space in some counties of Maryland (Schaerer, 1996).

### **1.3.4 TAX CREDITS AND PENALTIES**

Another effective tool that government agencies can use to stop unwanted development of land from development is tax credits. The government compensates land owners for the difference in value between developed and un-developed uses of a piece of land through tax credits or other subsidies. Conversely, the government can fine development with a tax tool, also. The shortfall of this tool is that it always under-rewards (Boyd *et al.*, 1999).

### **1.3.5 CONSERVATION LAND LEASE/RENT**

Due to the rising cost of land acquisition and the urgent needs to establish corridors between protected areas, popular conservation tools are likely to be shifted to direct payments for easements, land leases, and management contracts from traditional acquisition (Jenkins *et al.*, 2004). Currently, we are experiencing such shifts though the rapid increase of conservation easements internationally.

As another promising conservation tool, conservation land lease also attracts attention from government agencies, NGOs, and private land owners. Conservation land lease is defined as “*the land owner is paid to use and manage a defined piece of land for conservation purposes for a defined period of time*” (FAO, 2010). Conservation land lease can be used for at least two circumstances: (1) payments made to farmers for reforestation of conservation easement lands; and (2) management contracts signed to conserve wildlife habitats (Jenkins *et al.*, 2004), such as the Kitengela wildlife conservation land lease program in Nairobi. Generally speaking, the purpose of a land lease is to transfer a bundle of rights from a landowner to a tenant in different contractual agreements (Slangen and Polman, 2008).

## **1.4 FINANCING FOR PROTECTED AREA SYSTEMS IN THE UNITED STATES**

### **1.4.1 INTRODUCTION**

Financing is the lifeline of every protected area system. Different challenges faced by protected areas worldwide are somehow relevant to the issue of financing. Sustainable financing facilitates effective management of protected areas. Although protected areas receive funds from many channels, sources of protected area financing falls into three categories. First, protected areas generally receive funding from the domestic government budget and global international donor assistance (Emerton *et al.*, 2006). Second, private and community funds contributed by businesses, non-governmental organizations, philanthropic foundations and local communities really help protected areas to conserve biodiversity in all developed and some developing countries (Emerton *et al.*, 2006). Third, environmental funds, debt-for-nature swaps, and international assistance are common financing mechanisms for protected areas, especially in developing countries (Emerton *et al.*, 2006). Environmental funds can be structured as endowment funds spending only income while attempting to maintain

or enhance capital; sinking funds disbursing its entire assets over a specified period of time; revolving funds receiving regular income; or a combination of these. In this section, we will review financing of key protected area systems in the United States.

## **1.4.2 FINANCING FOR FEDERAL PROTECTED AREA SYSTEMS IN THE UNITED STATES**

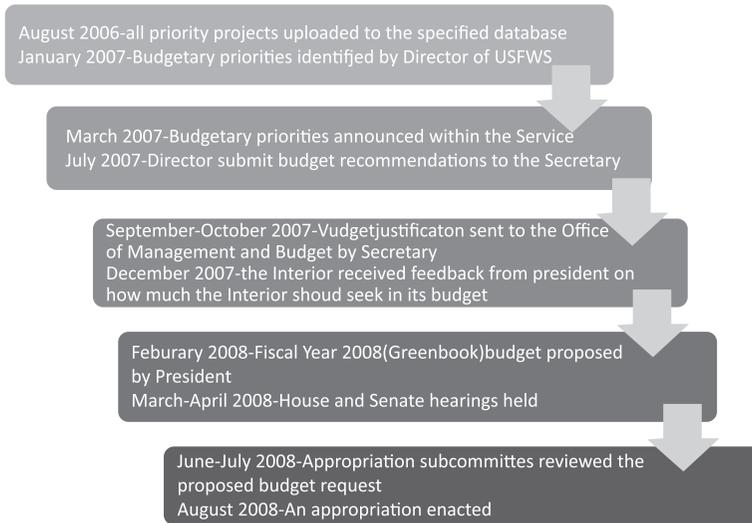
As a developed country, the United States' main sources of financing for protected areas on public lands are government appropriations and budgets and private as well as community funds. Private and community funds have long contributed to the management of protected areas in the United States.

### **1.4.2.1 GOVERNMENT BUDGET**

Funding levels for all four of the federal land management agencies are listed in the annual Department of the Interior, Environment and Related Agencies Appropriations Bill. Since 1995, USFS has been included in the Interior bill as a related agency. The four federal land management agencies receive funds from the federal government through annual appropriations consisting of both discretionary and mandatory appropriations. Although there may be a few differences among the four federal land management agencies, the whole process of formulating the government budget is similar. The process used by USFWS to formulate the fiscal year 2009 budget is illustrated in Figure 1.20.

Discretionary appropriations need the approval of Congress on an annual basis. Most mandatory appropriations are permanent, so they don't need annual appropriation by Congress (Vincent, 2004). The enacted FY2009 funds for four federal land management agencies are shown in Table 1.14. NPS received the most funds per acre compared with the others. Certainly, USFS received the largest appropriation among the four agencies, due to its significant role in wildfire management. The funds allocated to the USFS for wildland fire management amounted to 2.1 billion dollars in FY 2009.

**Figure 1.20 FY2008 Government Budget Process for USFWS<sup>1</sup>**



**Table 1.14 Enacted Funds for Four Main Federal Land Management Bureaus in FY2009**

Agency	Appropriations (US \$000s)		Total (US \$000s)	Acres (million acres)	Dollars per acre	Full Time Employee (FTE)	Acre per FTE
	Discretionary	Mandatory					
BLM <sup>2</sup>	1,021,508	253,291	1,261,757 <sup>3</sup>	256	4.93	10,650	24,038
NLCS			66,705	27	2.47		
USFWS <sup>4</sup>	1,440,451	988,867	2,429,318	96	25.31	8,898	10,789
NWRS			462,879	96	17.14		

<sup>1</sup> Information source: [http://www.fws.gov/refuges/friends/pdfs/FriendsForwardWinter\\_012907.pdf](http://www.fws.gov/refuges/friends/pdfs/FriendsForwardWinter_012907.pdf)

<sup>2</sup> Data source: BLM website: [http://www.blm.gov/pgdata/etc/medialib/blm/wo/Business\\_and\\_Fiscal\\_Resources/justification.Par.56889.File.dat/FY2010\\_BLM\\_Greenbook.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/Business_and_Fiscal_Resources/justification.Par.56889.File.dat/FY2010_BLM_Greenbook.pdf)

<sup>3</sup> The difference is due to -13,042,000 recession of balance from last fiscal year.

<sup>4</sup> Data source: USFWS website: <http://www.fws.gov/budget/2010/2010%20Greenbook/01.%20General%20Statement%202010.pdf>

Continued

Agency	Appropriations (US \$000s)		Total (US \$000s)	Acres (million acres)	Dollars per acre	Full Time Employee (FTE)	Acre per FTE
	Discre- tionary	Manda- tory					
NPS <sup>1</sup>	2,525,608	399,196	2,924,804	84	34.82	1,645	51,064
USFS <sup>2</sup>	4,758,794	956,399	5,915,193 <sup>3</sup>	193	30.65	2,314	83,405
Total	9,746,361	2,597,753	12,531,072	692		23,507	

Discretionary appropriations for different agencies cover different categories of operational and managerial activities. Mandatory appropriations refer to funds that all four agencies receive from special accounts and trust funds established in the Department of the Treasury. The four agencies hold trust funds and special accounts with different budgetary authorities. In FY2003, the appropriations for four agencies was US \$661 million dollars for USFWS, US \$305 million for BLM, US \$305 million for NPS and US \$285 million for USFWS (Vincent, 2004).

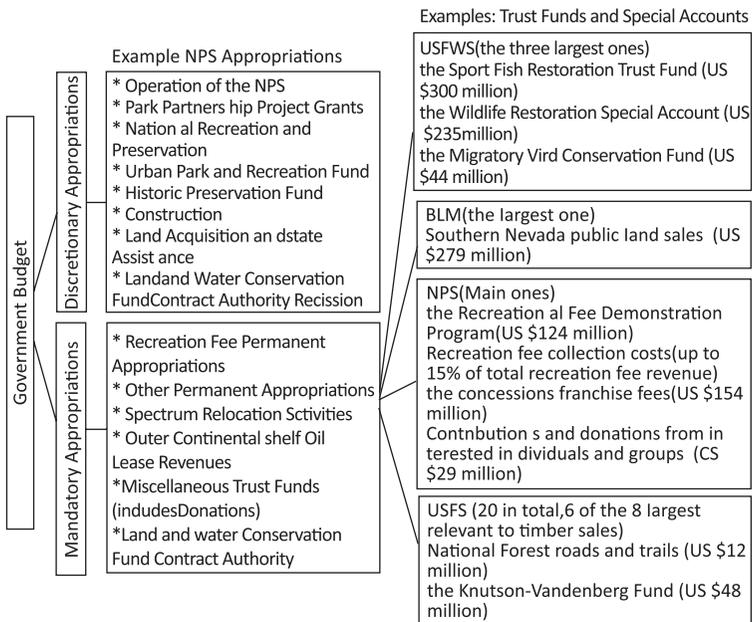
Protected areas are often allowed to keep a portion of the revenues they generate on their preserve for use on the protected area through special accounts and trust funds mentioned above. However, there is an exception for NPS—special accounts for concessioners are established in commercial banks rather than with the U.S. Treasury. These funds can only be spent with authorization of a park unit superintendent. The Land and Water Conservation Fund (LWCF), used for federal land acquisition, is relatively large and controversial. Therefore, an act of Congress is required for the four agencies to spend monies from that fund (Vincent, 2004). See Figure 1.21 for a complete picture of the government budget for land management bureaus.

1 Data source: NPS website: [http://home.nps.gov/applications/budget2/documents/NPS\\_10-YearBudgetHistory.pdf](http://home.nps.gov/applications/budget2/documents/NPS_10-YearBudgetHistory.pdf)

2 Data source: USFS website: <http://www.fs.fed.us/publications/budget-2010/overview-fy-2010-budget-request.pdf>

3 US \$200 million difference results from budget of Supplement and Emergency Funding for Fire.

**Figure 1.21 Government Budget Diagram in the United States<sup>1</sup>**



### 1.4.2.2 PRIVATE AND COMMUNITY FUNDS

Although government is the dominant funding source for protected areas, the budgets of most countries, including rich countries like the United States, cannot meet the financial needs required to fully implement identified priority conservation activities in protected areas. In the United States, all four federal land management bureaus received a lump-sum of US \$13.45 billion in FY2010, which amounted to just 0.31% (BLM: 0.03%; USFWS: 0.064%; NPS: 0.073%; USFS: 0.0144%) of the total federal budget for that year (US \$ 43,295 billion). Government budgets generally cover base operations and staffing as well as activities that are vital to the health of the conservation areas (e.g., wildland fire management and construction). To fill in financial gaps, management agencies of federal protected areas also seek funding from NGOs and the private sector. In FY2009, there were 176 NGOs, including foundations, private nonprofits, and land trusts that provided financial support to NPS.

<sup>1</sup> Data from: NPS website: [http://home.nps.gov/applications/budget2/documents/NPS\\_10-YearBudgetHistory.pdf](http://home.nps.gov/applications/budget2/documents/NPS_10-YearBudgetHistory.pdf) and Vincent, 2004.

Take Yellowstone National Park as an example: 69% of its funds came from government appropriations and 31% from other funding sources. The Yellowstone Association, Yellowstone Park Foundation, corporations and some wealthy park patrons are the main providers of other funding for Yellowstone National Park. The most generous patrons and their contributions are summarized in Table 1.15. All in all, NGOs and private sector funding supplement the government appropriations to allow more activities and programs dealing with protection to be implemented.

**Table 1.15 Main Private Financing Supporters for Yellowstone National Park<sup>1</sup>**

NGOs and Main Patron	Fund Purposes
Yellowstone's Cooperating Association	Support educational and scientific programs
Yellowstone Park Foundation	Improve resources and enrich visitors' experience
Chip Davis, president of American Gramophone and Producer of the Musical Group, Mannheim Steamroller	Support a variety of projects, e.g., backcountry trail restoration, recycling efforts, and special museum exhibition
Canon U.S.A. Inc.	Park publication printing and grizzly bears study (equipment donation)
Diversa Inc.	Establish laboratory for wolf DNA researches
The Environmental System Research Institute (ESRI)	Map resources and spatial information of park and make it available for researchers and other users
Unilever Home & Personal Care-USA	Support scientific conferences, donate recycled material for boardwalks around old Faithful Geyser and fund the establishment of a new Old Faithful Visitor Center

### 1.4.3 FINANCING FOR STATE PROTECTED AREA SYSTEMS

The federal government does not generally invest in protected areas

<sup>1</sup> Information from: <http://www.yellowstonenationalpark.com/sopparkstaffunding.htm>

on state-owned lands with the exception of some funding from special accounts and trust funds. Table 1.16 tells us the budget composition of the Department of Land and Natural Resources (DLNR) of the State of Hawaii. The total budget for DLNR amounted to US \$184 million and US \$186 million in FY 2008 and FY2009, respectively. This budget includes management of protected areas, harbors and submerged waters. For a state like Hawaii, which strongly depends on tourism, protected area systems contribute to the visitor experience and there by contribute to government revenues. In FY2008, DLNR received US \$1.9 million direct revenues from rents, use charges and harbor fees, which amounts to 1.8% of its operating budget. As an example the Department issued 12,000 camping permits statewide.

**Table 1.16 Overview of Budget for Department of Land and Natural Resources in FY2008 and FY2009<sup>1</sup>**

Funding Sources	FY2008		FY2009	
	Amount (US \$)	Percent	Amount (US \$)	Percent
Operating budget				
General Funds	34,258,380	31.84%	34,532,761	30.84%
Special Funds	59,163,502	54.99%	61,458,318	54.89%
Federal Funds	13,388,275	12.44%	15,185,826	13.56%
Revolving Funds	788,574	0.73%	788,574	0.70%
Sub-total	107,598,731	100%	111,965,479	100%
Capital Improvements Budget				
Special Funds	4,230,000	5.57%	500,000	0.68%
General Obligation Bonds	47,046,000	61.90%	46,999,000	63.67%
Reimbursable G. O. Bonds	10,000,000	13.16%	1,000,000	1.35%

<sup>1</sup> Data from: Department of Budget and Finance. Budget in Brief: FY2009 Executive Supplemental Budget. <http://www.state.hi.us/budget/memos/budget%20in%20brief/Budget%20in%20Brief/Budget%20in%20Brief%20FY%2009.pdf>

Continued

Funding Sources	FY2008		FY2009	
	Amount (US \$)	Percent	Amount (US \$)	Percent
Federal Funds	9,820,000	12.92%	13,820,000	18.72%
Private Contributions	250,000	0.33%		
County Funds	1,750,000	2.30%		
Interdepartmental Transfers	2,905,000	3.82%	11,500,000	15.58%
Sub-total	76,001,000	100.00%	73,819,000	100.00%
Grand Total	183,599,731		185,784,479	

As for New York State, all protected areas have been financed primarily through the expansion of the Environmental Protection Fund (EPF). The EPS is supported by taxes on real estate transactions throughout the state. In Fiscal Year 2010-11, the New York State Department of Environmental Conservation (NYSDEC) and the Office of Parks, Recreation and Historic Preservation (OPRHP) received US \$1,160 million and US \$230 million, respectively, from all funds, which was approximately a 12.9% and 12.5% decrease compared with Fiscal Year 2009-10, due to economic challenges. Approximately 4.9 million acres of land are protected in New York State. Consequently, the New York State Government spent around US \$300 per acre of protected area (Table 1.17).

**Table 1.17 Budget of Protected Area Management Agencies in the New York State**

Agency	Year 2009-10 (US \$)	Year 2010-11(US \$)
NYSDEC	1,333,000,000	1,160,000,000
OPRHP	263,000,000	230,000,000
Total	1,596,000,000	1,390,000,000
Protected Lands (Acre)	4,900,000	4,900,000
Dollars/per acre	326	284

In most states very little state general fund revenues are used for protected area acquisition or management. Two significant sources of protected area management and acquisition funding to states result from the Federal Aid in Wildlife Restoration Act (commonly known as the Pittman-Robertson Act, or P-R Act) and the Federal Aid in Sport Fish Restoration Act (commonly known as the Dingell-Johnson Act or DJ Act). These funds have been used to acquire significant state protected areas for wildlife and fisheries. The P-R Act imposes a 10 percent federal tax on ammunition and firearms used for sport hunting, and earmarks the proceeds to be distributed to the States for wildlife restoration. The DJ Act imposes a federal sales tax on sport fishing equipment, electric outboard motors and sonar fish-finding devices, and import duties on fishing tackle, yachts, and pleasure craft. Of the P-R funds available to the States, more than 62 percent is used to buy, develop, maintain, and operate wildlife management areas. Some 4 million acres have been purchased outright since the program began, and nearly 40 million acres are managed for wildlife under agreements with other landowners.

Since 1950, state fish and wildlife agencies have received more than US \$2.6 billion under the DJ Act. These funds have helped to build or reconstruct more than 1,200 fishing or boating access sites, purchase over 260,000 acres for boating, fishing and fish production, and fund research and inventory projects resulting in better ways to manage fish populations. In addition, funding has been used to educate children and adults about fish and their habitats. The purchase of fishing equipment and motorboat fuels by fishing and boating enthusiasts supports sport fish recreation.

#### **1.4.4 FINANCING FOR PRIVATE PROTECTED AREA SYSTEMS**

As for private protected area systems in the United State, their managers usually receive funding from the following sources: dues and contributions, private contracts, government grants, investment income, other income, and land sales and gifts. Here, we will take a close look at the financing mechanism of the non-profit NGO by analyzing The Nature Conservancy (TNC).

According to TNC's 2009 audit statement, TNC holds US \$4.6

billion of net assets, including conservation lands, investments, property and equipment, etc. (Section A of Table 1.18). Usually, TNC receives funds or support from several sources shown in Section B of Table 1.18. Among the six sources, dues and contributions make up the largest share. Notice that the investment income was down due to the economic downturn. Individuals (25%), bequests (24%), corporations (5%), foundations (43%) and other organizations (3%) are the five providers of the contributions.

**Table 1.18 Assets and Fund Sources in FY2009 and FY2010 for The Nature Conservancy<sup>1</sup>**

Item	No. (US \$000s)	No. (US \$000s)
Section A		
Asset, Liability and Net Assets Summary	As of June 2009	As of June 2008
Conservation land	2,150,214	1,768,984
Conservation easements	1,546,236	1,442,032
Investments held for conservation projects	466,277	621,735
Endowment investments	837,302	1,077,036
Planned giving investments	230,824	286,460
Property and equipment (net of depreciation)	95,970	99,714
Current assets	185,238	235,657
Other assets	125,144	117,526
Total Assets	5,637,205	5,649,144
Current Liabilities	368,291	221,016
Notes payable: long-term	216,828	352,566
Other liabilities	428,435	174,713
Total Liabilities	1,013,554	748,295
Total Net Assets	4,623,651	4,900,849

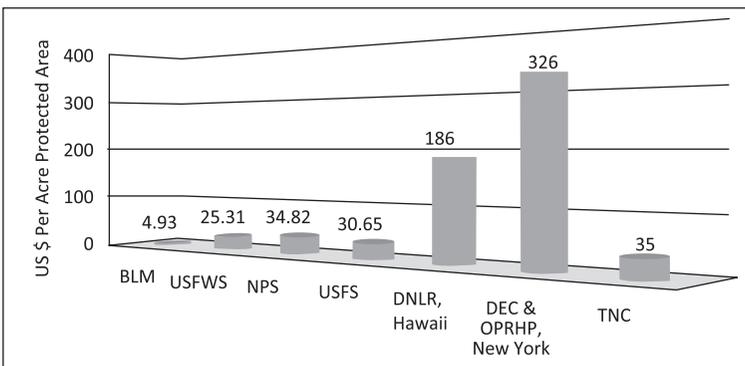
<sup>1</sup> Data from TNC 2009 annual report: <http://www.nxtbook.com/nxtbooks/natureconservancy/annualreport09/#/50>

Continued

Item	No. (US \$000s)	No. (US \$000s)
Section B		
Support and Revenue		
Dues and contributions	416,798	484,764
Private contracts	36,733	27,226
Government grants	126,915	128,558
Investment income (loss)	-320,659	-137,390
Other income (loss)	-22,158	-8,668
Land sales and gifts	309,594	621,863
Total support and Revenue	547,223	1,116,353

The total expenses for TNC in FY2008 and FY2009 were US \$933,872,000 and US \$824,421,000, respectively. The conservation effort per acre of protected areas is approximately US \$35 in FY2009. The environmental conservation efforts made by TNC and NPS are roughly the same per acre of protected area if you just look at this number and the NPS number in Figure 1.22.

**Figure 1.22 Conservation Investment Comparisons among Protected Areas Managed by Different Managers**



## 1.5 PUBLIC INVOLVEMENT

A protected area cannot be effectively conserved without public support. In the United States, public participation is an integral component of protected area management. The National Environment Policy Act of 1969 (NEPA) creates a public, interdisciplinary framework for decision-making. NEPA does not mandate the protection of the environment but merely public consultation. As a result, all land management agencies need to seek public input on environmental assessments and other documents when they plan for a protected area. In addition, relevant legislation requires all protected area management agencies to seek public input when developing their management plans. For example, in the case of USFWS, on March 25, 1996, Executive Order 12996 declared public involvement to be one of four guiding principles and required agencies to provide *“a full and open opportunity for the public to participate in decisions regarding acquisition and management of National Wildlife Refuges.”* Furthermore, the Order also stated that the *“public will be provided with appropriate opportunities to identify, prior to acquisition, existing compatible wildlife-dependent uses of new refuge lands that shall be permitted to continue on an interim basis pending completion of comprehensive planning.”* This law also encourages the public to nominate new protected areas as appropriate, including wilderness and marine protected areas in Hawaii, just to name a few. Once management plans or other plans are developed, protected area management agencies must seek public review and comments through a variety of communication mediums, e.g., television, radio, newspaper, websites, and so on. Notice of intent to prepare a plan/project and the availability of approval of the final plan/project are generally required by applicable Federal Registers. Usually, public meetings and public hearings are held to seek public contributions to a protected area management plan, which provides a forum for public involvement in the decision-making process regarding management of a protected area.

Accordingly, all protected area management agencies consider public participation to be a major component of their agendas and most provide many opportunities to enhance public participation (Table 1.19). More detailed information and cases, especially

regarding the role of volunteers, will be discussed in the fourth chapter—Visitors and Outreach—of this guidebook.

**Table 1.19 Examples of Public Involvement in the Management of Protected Areas in the United States**

Jurisdiction	Public Involvement (Examples)
NPS	<ul style="list-style-type: none"> <li>• To be a volunteer</li> <li>• To make a donation</li> <li>• To be a partner of a park</li> <li>• To join a park Friends Group</li> <li>• To participate in park planning</li> </ul>
USFWS	<ul style="list-style-type: none"> <li>• To participate in refuge acquisition</li> <li>• To participate in refuge planning</li> <li>• To be a volunteer</li> <li>• To join a Refuge Friends Group</li> </ul>
BLM	<ul style="list-style-type: none"> <li>• To be a member of Resource Advisory Councils (RACs) in the western States to recommend land use planning, recreation, noxious weeds, and wild horse and burro herd management areas</li> <li>• To get informed by visiting Learning Landscapes</li> <li>• To participate in land use planning</li> <li>• To establish partnership to receive land management assistance from BLM</li> <li>• To design “Take it Outside” program to promote and support children conduct outdoor activities on the public lands;</li> <li>• To be a volunteer</li> </ul>
USFS	<ul style="list-style-type: none"> <li>• To be a volunteer</li> <li>• To participate in the design and operation of USFS recreation programs</li> <li>• To participate in forest planning</li> </ul>

Through the active interaction between public and protected area management agencies, both sides have become better informed. The benefit of public involvement for management agencies is that they better understand the needs and desires of the public and can factor those into their decision making process regarding protected areas. The intent is to make better decisions that will reduce conflicts and lawsuits and to garner public support for the protected area. Likewise, public interest will support protected areas as a result of people being

well informed and protected areas will benefit in volunteer time and monetary support from the public. The United States has learned that appropriate public involvement is indispensable. Before the public participatory framework was well-established, some autocratic decisions made by land management agencies caused damage to natural resources on the public lands and did not allow for the public to fully enjoy the benefit of protected areas. On the other hand, public involvement processes are time-consuming and can slow down the process of decision-making. As with all complex time sensitive issues it is a question of how to balance timely and appropriate decision-making with appropriate public involvement.

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## **1.7 APPENDIX**

### **1.7.1 VISITED FEDERAL PROTECTED AREAS**

During the field studies of three-year CPALAP training (2008-2010), participants visited some typical protected areas in the United States ranging from protected areas on federal public lands to conserved lands administrated by states to protected areas owned by non-governmental organizations (Fig. 1.18). All visited sites have their own characteristics in stewardship. In this guidebook, the second, the third and the fourth chapters are structured through reviewing conservation practices of these protected areas. Therefore, it is reasonable to give a brief introduction of each visited protected area to ensure readers a better understanding of stewardship of these protected areas.



### **1.7.1.1 VISITED NATIONAL PARK UNITS**

**GREAT FALLS PARK—McLean, Virginia:** On the outskirts of Washington, D.C., the Potomac River passes through a landscape of surprising beauty and ecological significance. At Great Falls Park, the Potomac River builds up speed and force as it falls over a series of steep, jagged rocks and flows through the narrow Mather Gorge. The Patowmack Canal offers a glimpse into the early history of America. Great Falls Park has many opportunities to explore history and nature, only miles from the nation's Capital. The fifteen-mile stretch of river is one of America's most biologically diverse areas, home to more than 1,400 plant species. Scientists have identified at least thirty distinct natural vegetation communities, several of which are globally rare and imperiled. The Gorge also supports a wide variety of animal life, from invertebrates to the bald eagle and fish like the American shad. Approximately two million people visit the Gorge annually. The Nature Conservancy is working in partnership with the National Park Service, the George Washington Memorial Parkway, state agencies, and other private conservation groups to identify, protect, and restore the natural resources of the 9,700 acre Potomac Gorge area. Several factors threaten the natural resources of the Gorge. More than 250 introduced non-native species crowd out native plants. The region's large deer population harms natural areas by overeating native vegetation, altering natural habitats and preventing tree regeneration. Introduced plant diseases also take a toll on native vegetation. This oasis in the middle of an urban environment faces ongoing threats from human activity as well. Stresses include expanding residential and commercial development, road and utility construction, and increased demand for water. Within the park, high levels of visitor use create pressure to build additional infrastructure, such as parking lots. And insensitive recreational practices can destroy natural areas by trampling vegetation, fragmenting habitats, and promoting the spread of invasive species.

**YOSEMITE NATIONAL PARK—California:** Yosemite National Park embraces almost 1,200 square miles of scenic wild lands that stretch along California's eastern flank. The park ranges from 2,000 feet above sea level to more than 13,000 feet and has these major

attractions; alpine wilderness, three groves of Giant Sequoias and the glacially carved Yosemite Valley with impressive waterfalls, cliffs and unusual rock formations. Inspired by the scenic beauty of Yosemite and spurred on by the specter of private exploitation of Yosemite's natural wonders, President Abraham Lincoln signed legislation in 1864 granting Yosemite Valley and the Mariposa Grove of Giant Sequoias to the State of California as an inalienable public trust. This was the first time in history that a federal government had set aside scenic lands simply to protect them and to allow for their enjoyment by all people. The creation of Yosemite National Park was formalized in 1890, and it became first state park and first national park in the world. It has served as the model for the development of other parks and led to the birth of the U.S. National Park System as we know it today.

Recognizing that administration of the park required special, full-time attention, the United States government established the National Park Service in 1916. The purpose of the new agency was to conserve the scenery, natural and historic objects, and wildlife for the enjoyment of future generations. Shortly after the park service was created, Yosemite park managers inaugurated the educational program so familiar to park visitors today. Known as "interpretation," the program was originally limited to guided nature walks. The formative years of the National Park System reflected the realization that protection of the parks depended on a strong program of education designed to increase public awareness of the special values embodied by Yosemite and other outstanding natural areas. Therefore, the early interpretation program has since evolved to include visitor center displays, campfire programs, informal talks, multi-media presentations, and informational literature. A logical extension of the interpretive program is the Yosemite Museum.

The past seventy-five years in Yosemite has seen consistent management and burgeoning visitation. With scientific research and experience, resource policies have changed. Fire is no longer viewed as evil, wild animals are managed to be wild, and artificial attractions have been eliminated. The greatest challenge facing Yosemite today is its popularity. With visitation hovering around four million people each year, the park sometimes suffers from overcrowding, congestion, and air pollution. Effects of these conditions are often resource

degradation and a diminished experience for visitors.

With habitats ranging from thick foothill chaparral to expanses of alpine rock, Yosemite National Park supports over 250 species of vertebrates, which include fish, amphibians, reptiles, birds, and mammals. This high diversity of species is also the result of habitats in Yosemite that are largely intact, compared to areas outside the park where various human activities have resulted in habitat degradation or destruction. Despite the richness of high-quality habitats, however, three species have become extinct in the park within historical time and another 37 species currently have special status under either California or federal endangered species legislation.

The most serious current threats to Yosemite's wildlife and the ecosystems they occupy include loss of a natural fire regime, exotic species, air pollution, habitat fragmentation, and climate change. Increasing ozone pollution is causing tissue damage to the massive Giant Sequoia trees in the park. This makes them more vulnerable to insect infestation and disease. Since the cones of these trees require fire-touched soil to germinate, historic fire suppression has reduced the trees' ability to reproduce. The current policy of setting prescribed fires will hopefully help the germination issue.

Yosemite National Park has documented more than 130 non-native plant species within park boundaries. Natural and human-caused disturbances, such as wildland fires and construction activities, have contributed to a rapid increase in the spread of non-native plants, which can bring about significant changes in park ecosystems.

**MUIR WOODS NATIONAL MONUMENT**—Mill Valley, California: Muir Woods National Monument is very popular, with nearly one million visitors each year due in part to its close proximity to San Francisco. The 559 acre park includes redwood trees that are more than 260 feet high. Some are more than 1,200 years old. Muir Woods National Monument is a part of the Golden Gate National Recreation Area, one of the largest urban national parks in the world. Until the 1800's, many northern California coastal valleys were covered with coast redwood trees similar to those now found in Muir Woods National Monument. The forest along Redwood Creek in today's Muir Woods was spared from logging because it was hard to get to. By 1890 local conservationists realized how vulnerable Redwood Canyon

was to advancing civilization, and it was purchased privately in 1905 and donated to the United States Federal Government. President Theodore Roosevelt declared it a national monument in 1908. Muir Woods is celebrating its one-hundred year anniversary in 2008. The park was named for John Muir, an early and influential conservationist as well as writer and inventor. John Muir was instrumental in saving five national parks, including Yosemite. He was also the first president of the Sierra Club, America's oldest and most influential grassroots environmental organization.

THE PRESIDIO OF SAN FRANCISCO PARK—San Francisco, California: The Presidio of San Francisco, once one of the United States' oldest continuously operating military posts, is now one of its newest and most intriguing national park sites. The Presidio was designated a National Historic Landmark in 1962, and in 1994 it was transformed into a national park as part of the Golden Gate National Recreation Area. The Presidio Trust was established in 1996 to preserve the natural, scenic, cultural, and recreational resources. The Presidio Trust is a new model for managing public space. Its mandate is to fund the park's preservation and ongoing operations and maintenance without funding from the federal government. The idea of a park that will pay for itself is controversial, but it makes sense for the Presidio. The Presidio is unlike other national parklands. It has nearly six million square feet of building space including more than one thousand homes—the infrastructure of a small town—with 2,500 residents and 4,000 people who come into the park to work every day. In addition, The Presidio has a three-hundred-acre history forest. Approximately four million people visit The Presidio each year.

A management plan for the interior lands of The Presidio was adopted in 2002. This plan provides the policy framework for decision-making at the park. It was developed by the Presidio Trust with extensive community input during a two-year public process. The plan outlines a strategy for preserving and enhancing natural, cultural, scenic, and recreational resources; land use, transportation, and infrastructure; bringing people to the park; ongoing public input and participation; and funding the Presidio's operation and long-term care. The Presidio Trust collaborates closely with the National Park Service and the Golden Gate National Parks Conservancy, a non-

profit membership organization that has supported the Golden Gate National Recreation Area since 1981. The Parks Conservancy is one of the most successful park organizations in the nation. Together, these three agencies have developed programs, volunteer opportunities, and community support to preserve The Presidio's natural and cultural resources.

CRISSY FIELD, GOLDEN GATE NATIONAL RECREATION AREA—San Francisco, California: Crissy Field is a stunning park site within the Golden Gate National Recreation Area. Crissy Field's one hundred acres of wild, windswept shoreline are a favorite place for walkers, joggers, bicyclists, thousands of birds and some seals. Originally a rich salt marsh, Crissy Field was one of the nation's leading military airfields and a part of The Presidio military post. As part of the site restoration effort in 1998-2000, individuals and groups from schools, corporations and civic organizations put in more than 100,000 native plants to help restore marsh and dune lands at Crissy Field. Community volunteers continue to play an important role in sustaining the long-term stewardship of this national parkland.

HALEAKALA NATIONAL PARK—Maui, Hawaii: The significance of Haleakala National Park is one of survival, adaptation and constant change. Located on the most isolated major island group on earth, the Hawaiian Islands is 240,000 (3862 km) from the nearest continent. Across vast expanses of ocean, life eventually came to the barren volcanic islands in the form of seeds, spores, insects, spiders, birds, and small plants. They drifted on the wind, floated on the ocean currents, or hitched a ride on migrating or storm-driven birds. These original native inhabitants survived incredible odds to arrive and faced many challenges to survive in their new home. The colonizers that survived did so by adapting to the new environment and eventually evolved into entirely new species found nowhere else in the world.

Haleakala National Park was initially created in 1916 as a part of Hawaii National Park. In 1960, the U.S. Congress authorized the establishment of the park as a separate unit of the National Park System. Since then, Haleakala National Park has had several boundary expansions which enable the national park to continue its conservation work and meet its guiding mission of preservation. Today Haleakala National Park stretches from the summit of Haleakala

to the sea, and of its 30,183 acres, 24,719 acres are designated wilderness. Two million people visit Haleakala National Park each year.

The resources of Haleakala National Park range from endemic insect species to unique cultural landscapes. The park lands are home to many native species of plants and animals and for many of these species, the park is their only home. Alien plant and animal species and human impacts, are among the issues faced by the park's resource management staff. Native Hawaiians have lived with and cared for the land now part of Haleakala National Park for over 1,200 years. For Native Hawaiians working with the National Park Service, the job of resource conservation, restoration and education is more than simply a job—it is a way to keep their culture alive in the land of their ancestors.

**YELLOWSTONE NATIONAL PARK**—Wyoming, Montana and Idaho: Established in 1872, Yellowstone is the world's first and oldest national park. An international symbol of natural preservation, it is also a Biosphere Reserve, and World Heritage Site. With 96 percent in Wyoming, 3 percent in Montana, and 1 percent in Idaho, Yellowstone National Park encompasses 3,472 square miles of mountain wildland. It is the second largest national park in the continental United States. Yellowstone preserves abundant and diverse wildlife in one of the largest remaining intact wild ecosystems on Earth, supporting unparalleled biodiversity. The park protects the gray wolf, grizzly bear, bald eagle, and lynx. It is home to one of the largest concentrations of elk in the world, and is the only place in the U.S. where bison have existed in the wild since primitive times. With the restoration of the gray wolf in 1995, Yellowstone now contains all the large mammal species known to be present when European Americans arrived. The park protects one of the largest grizzly bear populations in the United States, and is home to one of the largest concentrations of elk in the world.

Within its borders, Yellowstone also embraces the world's most extraordinary collection of geysers and hot springs, containing approximately half of the world's hydrothermal features—more than 10,000, including the world's largest concentration of geysers—more than 300. It is also the site of one of the largest volcanic eruptions

and calderas in the world, the spectacular Grand Canyon of the Yellowstone, and the largest lake above 7,000 feet in North America. More than 2,400 miles of streams flow through Yellowstone, some of which provide the best and most challenging fly-fishing in the world.

The human history of the Yellowstone region goes back more than 11,000 years. Cultural and historic resources abound in Yellowstone, with more than 1,100 prehistoric and historic Native American and European American archeological sites, 230 ethnographic resources, a museum collection of more than 379,000 cultural objects and natural science specimens, 90,000 historic photographs, and thousands of irreplaceable historic documents.

Today there are five different park entrances with 466 miles of roads and more than 15 miles of boardwalks. The park has approximately 1,000 miles of backcountry trails, 92 trailheads and 301 backcountry campsites. Yellowstone has nine visitor centers, contact stations, and museums; nine hotels/lodges (2,200+ rooms/cabins), seven National Park Service campgrounds (450+ sites), five concession-operated campgrounds (1,700+ sites), 1,500+ buildings, 52 picnic areas, one marina, and thirteen self-guiding trails. Visitation to Yellowstone hit a record high in 2007, with over 3.1 million visitors. Average annual visitation over the past ten years has been approximately 2.9 million. The park employs 400 year-round National Park Service employees. During the peak summer season, an additional 800 employees are hired by the National Park Service. There are also approximately 3,500 concession employees working in the park during the summer.

**GOVERNORS ISLAND NATIONAL MONUMENT**—New York City: Governors Island, located in the heart of New York harbor, is a 172-acre former military post that was home to the U.S. Army and the Coast Guard. In 2003 the federal government sold most of the island to the people of New York for one dollar and designated the remaining acreage as a National Monument. In April of 2010 the New York State government turned over responsibility for revitalizing Governors Island to the City of New York. Under the agreement, the city will convert nearly half of the island (87 acres) into a public park. The plan includes the restoration of historical structures, a new high school and commercial ventures. To implement this plan, the city will

demolish non-historic structures and convert the space into parks and walkways for public use. Governors Island—virtually off limits to visitors until about five years ago—offers spectacular views of the harbor, the Statue of Liberty and the downtown city skylines. The Governors Island Preservation and Education Corporation manage 150 acres while the National Park Service manages the balance. They are working together to facilitate public access, create open park space for recreational activities including bicycling and jogging, renovate historic buildings and fortifications, and foster the Island's development with plans for a mix of educational, not-for profit and commercial facilities. In 2009, Governors Island received 325,840 visitors.

Since 1995, the members of the Governors Island Alliance civic coalition have worked together to return Governors Island to the people of New York by promoting the redevelopment of the island and creating a great civic space. The Alliance works with the Governors Island Preservation and Education Corporation, the National Park Service, and elected officials to ensure that the redevelopment plans set public access, park programming, and historic preservation as primary goals and that there is funding for these purposes.

**GATEWAY NATIONAL RECREATION AREA**—the Port of New York and New Jersey: Gateway National Recreation Area is a 26,607 acre (107.67 km<sup>2</sup>) National Recreation Area in the New York City metropolitan area providing recreational opportunities that are rare for a dense urban environment, including ocean swimming, bird watching, boating, hiking and camping. Gateway was created by the U.S. Congress in 1972 to preserve and protect scarce and/or unique natural, cultural, and recreational resources with relatively convenient access by a high percentage of the nation's population. It is owned by the United States government and managed by the National Park Service. Some of the places within the Gateway Recreation Area in Jamaica Bay include: (a) Floyd Bennett Field is an historic airfield on the National Register of Historic Places and includes an aircraft restoration project where volunteers preserve the park's collection of historic aircraft. Exhibits and programs on the airfield's history are available in the former control tower and terminal. The grasslands of Floyd Bennett Field are a good place for viewing falcons and kestrels.

Floyd Bennett Field also includes a concession housing recreational facilities including a sports arena and ice skating rinks in adaptively re-used hangers. (b) Fort Tilden has some of the city's most pristine and secluded ocean beaches, a maritime forest, a coastal dune system, and a freshwater pond. Between 1917 and 1974, Fort Tilden served as part of the harbor's system of defenses, and once housed Nike anti-aircraft missiles. Today an observatory deck on one of the old batteries offers spectacular views of Jamaica Bay, New York Harbor and the Manhattan skyline. Fort Tilden is one of the best places on New York Harbor to observe hawks during the fall migration. (c) Breezy Point Tip contains 200 acres of oceanfront beach, bay shoreline, dunes, marshes and coastal grasslands and is a nesting area for the threatened piping plover.

As one of a unit of Gateway National Recreation Area, Jamaica Bay National Wildlife Refuge is surrounded by urban residential, commercial, and industrial development. Its 9,155 acres are mostly open water, but include salt marsh, dunes, brackish ponds, woodland, and fields. The bay itself has been disturbed by dredging, filling, and development, including the construction of John F. Kennedy International Airport. Much of the wetlands in the bay have been filled in, mostly around its perimeter. This Jamaica Bay National Wildlife Refuge is the only national wildlife refuge managed by NPS while others managed by NFWFS.

The salt marshes of Jamaica Bay offer prime habitat for migratory birds and other wildlife. The refuge is internationally renowned as a prime birding spot where more than 330 species of water, land, and shorebirds have been recorded (nearly half of the species in the northeastern United States). While most of the waters and marshes have been protected since 1972, pollution is still a problem, and after enjoying a worldwide reputation for oysters and supporting a vigorous fishing industry. The area has been closed to shell fishing since the early 20th century. The majority of the land and water within the refuge is publicly owned by the U.S. government and the City of New York. The National Park Service administers a portion of the area; New York City has several parks within the bay complex; and portions of the wetlands and uplands are under the jurisdiction of the Port Authority of New York and New Jersey. In addition, small

areas in the upland buffer of the bay remain in private residential or commercial ownership. The New York State Natural Heritage Program, in conjunction with The Nature Conservancy, recognizes two priority sites for biodiversity within the complex, and the New York State Department of Environmental Conservation has designated several areas as significant wildlife habitats.

The Marsh Islands ecosystem is an integral part of Jamaica Bay. The New York State Department of Environmental Conservation estimates that approximately 1,400 acres of tidal salt marsh have been lost from the marsh islands since 1924, with the system-wide rate of loss rapidly increasing in recent years. Between 1994 and 1999, an estimated 220 acres of salt marsh were lost at an alarming rate of 44 acres per year. If this trend continues, all remaining salt marsh on the islands will be lost over the next three decades. A restoration plan includes restoring the existing vegetated areas and the sheltered and exposed mudflats by placing fill material up to an elevation that is suitable for low marsh growth and hand-planting 900,000 marsh grasses on two of the islands.

**HAWAII VOLCANOES NATIONAL PARK—Big Island, Hawaii:** Founded in 1916, the Park encompasses 333,000 acres (1,348 square kilometers) of land from the summit of Maunaloa to the sea. There are 150 miles of hiking trails through volcanic craters, scalded deserts and rainforests as well as a museum, petroglyphs, a walk-in lava tube and two active volcanoes: Maunaloa, which last erupted in 1984 and Kilauea which has been erupting since 1983. As of January 1994, 491 acres of new land have been created on Hawaii's Big Island. The current eruption may last another 100 years or stop tomorrow. Most visitors to Hawaii Volcanoes National Park are enchanted by its active volcano and its misty cloak of rainforest. Many never realize that its underlying treasures of native plants, animals and habitats face an ecological crisis. Species that have survived for millions of years face unabated threats from a host of invaders introduced by humans over the past 200 years, as well as declining habitat outside the Park. Feral pigs, goats, and mouflon sheep, invasive plants, feral cats and rats, mongoose, ants, wasps, and mosquitoes are all taking a tremendous toll on native plants and animals. Within the Park live 23 species of endangered vascular plants and 6 of 15 endangered

native birds. Hawaii is the leading state in the U.S. for both extinctions and federally listed endangered species. Setting aside protected natural areas is not enough to effectively address this problem. The race to control invasive species and restore native ecosystems, as well as to recover the Park's endangered plants and animals, requires an aggressive commitment of time and funds. The strategy focuses first on removal of alien ungulates such as mouflon sheep, planting of common natives in park landscapes that have been disturbed by ungulates or wildfire, control of invasive species and planting of endangered and rare plants. Four endangered species, the nene, Hawaiian petrel, hawksbill turtle, and Ka'u silversword are targeted for full recovery by the National Park Service staff and its partners, who are aggressively engaged in restoring habitat, guarding nest sites, monitoring threats and population impacts, and removing alien wildlife. Another issue facing the park is controlling wildfires that threaten native ecosystems. Invasion and colonization of alien tropical and sub-tropical grasses have caused fire frequency rates to triple. Fortunately, several decades of fire ecology research have led to pioneering rehabilitation efforts, using native plants to fire-proof vulnerable ecosystems within the park.

### **1.7.1.2 VISITED NATIONAL WILDLIFE REFUGE**

**BOWDOIN NATIONAL WILDLIFE REFUGE**—Malta, Montana: The Bowdoin National Wildlife Refuge was established in 1936 as a migratory bird refuge. It is located in the short and mixed grass prairie region of North-central Montana and encompasses 15,551 acres. The Refuge's primary purpose is to preserve and enhance resting, feeding, and breeding habitat for migratory birds and other wildlife. It attracts migrating waterfowl and shorebirds by the thousands and provides breeding and nesting habitat for ducks, geese, grassland songbirds, and colonial nesting water birds. The area is equally important to a variety of resident wildlife, including raptors, white-tailed deer, pronghorn antelope, sharp-tailed grouse, and coyotes. Threatened species include the bald eagle, piping plover and peregrine falcons. North-central Montana is made up of many depressional wetlands created by glaciers over 12,000 years ago. Major habitat types on the Refuge include saline and freshwater wetlands, native prairie, planted

dense nesting cover and shrubs. Refuge wetlands total 7,226 acres with the remaining habitat consisting of uplands. The refuge receives approximately 7,000-8,000 visitors annually, with numbers continuing to increase every year.

**CHARLES M. RUSSELL NATIONAL WILDLIFE REFUGE**—Lewistown, Montana: The Charles M. Russell National Wildlife Refuge, established in 1936, is the largest national wildlife refuge in Montana—covering 1.1 million acres—and is the second largest refuge in the lower 48 states. About 176,000 additional acres are proposed for wilderness designation. The refuge, managed by the U.S. Fish and Wildlife Service, covers expansive badlands, cottonwood river bottoms, old-growth forested coulees, sagebrush steppe and mixed grass prairies. This area is an important hunting ground for various Native American tribes and is famous for its elk population, which was reestablished in 1951 from a Yellowstone National Park herd. The refuge has an active grazing program, carefully managed to promote grassland health. In close coordination with the State of Montana, hunting is allowed to manage big game populations. Bighorn sheep, black-tailed prairie dogs, coyotes, and many species of birds also inhabit the area. Invasive species are a growing problem, and biological, chemical, and mechanical control measures are targeted at eliminating weed infestations.

Within the boundaries of the refuge is a 20,000-acre “refuge-within-a-refuge,” the *UL Bend National Wildlife Refuge*—a designated wilderness area. This highly protected, remote region is the site of an ongoing effort to rescue one of North America’s most endangered animals, the black-footed ferret. Captive-raised ferrets were reintroduced in 1993, and their numbers have been slowly building since then. Prairie dogs are the primary food source for the ferret, and prairie dog towns are abundant in this area.

In 2007, the U.S. Fish and Wildlife Service began drafting a 15-year comprehensive conservation plan for the Charles M. Russell and UL Bend National Wildlife refuges for long-range guidance and management of all of the refuge programs, including habitat conservation and wildlife-dependent recreation programs such as hunting and wildlife observation. This 4-year effort includes a broad public involvement process (meetings and workshops throughout

Montana) to encourage the exchange of ideas between the public and the government on how the refuge can ensure habitat conservation and restoration while also serving its visitors and neighboring communities.

**THE GREAT SWAMP NATIONAL WILDLIFE REFUGE**—Morris County, New Jersey: The Great Swamp National Wildlife Refuge, established in 1960, lies 26 miles west of New York City. This 7,700-acre oasis of wilderness, surrounded by urban and suburban areas, provides important habitats to a many species of fish, wildlife, and plants, including some that are threatened or endangered. It also provides nesting and feeding habitat for migratory birds. Total annual visitation at the Great Swamp in 2009 was 157,500 people. The refuge consists of swamp woodland, hardwood ridges, cattail marsh, grassland, ponds, and meandering streams. The refuge is actively involved in acquiring property from private and public landowners to restore the land to upland habitat. This includes demolishing structures and cement foundations, clearing impermeable ground covers and reseeding the land with native grasses.

The Great Swamp was established as an area to provide migration, nesting and feeding habitat for migratory birds. The western half of the Refuge is intensively managed to maintain optimum habitat for a wide variety of wildlife. Water levels are regulated; grasslands and brush are mowed periodically to maintain habitat and species diversity; nesting structures for wood ducks, bluebirds, and other birds are provided; other habitat management practices are employed; and research studies are conducted. To minimize disturbance to wildlife, public access in this area is limited. The eastern half of the Refuge was designated by the U.S. Congress as a National Wilderness Area in 1968. Generally, no permanent structures, motorized vehicles, or equipment are allowed. Even mechanized forms of transportation such as bicycles are not allowed. The U.S. Fish and Wildlife Service has worked hard to remove remaining traces of man such as roads, old house sites and garbage dumps. Drained wetlands have been restored. The wilderness area provides a more primitive outdoor experience for the general public and serves as an outdoor classroom and laboratory. Hiking on the trails or free roaming in the area are permitted. By limiting use in this

sensitive area to foot travel only, the wilderness experience can be preserved.

## **1.7.2 VISITED STATE PROTECTED AREAS**

### **1.7.2.1 MARINE NATURE RESERVE**

HANAUMA BAY NATURE PRESERVE—Honolulu, Hawaii: Hawaii residents and visitors from all over the world come to Hanauma Bay to observe hundreds of species of fish and other marine organisms in their natural environment. Believed to be 35,000 years old, the Bay recently celebrated its 40th anniversary as the State of Hawaii's first Marine Life Conservation District and underwater park. Located about ten miles from Waikiki, Hanauma Bay is also celebrating a decade-long protection and preservation effort that re-established its pristine marine ecosystem. Established in 1967, Hanauma Bay Nature Preserve was renowned as one of Hawaii's favorite beaches for snorkeling and swimming, and hosted more than one million visitors annually by 1977. By 1988 the number of visitors increased to three million annually—about ten thousand per day. Residents and tourists brought in by the busload fed the fish in the natural lagoons, and soon the number of fish increased enormously. In addition, the visitors damaged the coral by walking on it.

In 1990, in response to the large numbers of people and the impact to the coral reef ecosystem, the Honolulu City government enacted regulations that closed the bay one day each week for maintenance. An education program for visitors was established, and a community group organized to protect the Bay. Today visitor attendance is strictly regulated and limited to approximately three thousand per day to help protect the Bay's fragile ecosystems. Each visitor is required to visit a Marine Education Center at the entrance of the park to view an orientation film that explains the importance of protecting the largest standing biomass of reef fish on Oahu. They are taught to not step on the reef, take fish from the bay, smoke on the beach, drive their car to the beachfront or feed the fish. These regulations create a necessary balance between man and nature. Eighteen years after the regulations were established, reefs are

regenerating, and more than two hundred varieties of marine animals can be seen in the clear ocean waters. In addition, less than three percent of visitors stand on the reef.

### **1.7.2.2 STATE PARK**

**ADIRONDACK STATE PARK—New York State:** Over a century ago, a group of visionary New Yorkers made a landmark decision to create the largest, most unique park in the entire United States. The Adirondack State Park was created in 1892 by the State of New York—a six million-acre collection of publicly protected lands declared “forever wild,” interspersed with privately held property. The Adirondack Park was designed to be a place where people and nature could peacefully coexist. Today the park is still the largest state publicly protected area in the contiguous United States, greater in size than Yellowstone, Everglades, Glacier, and Grand Canyon National Park combined, with the best remaining examples of hardwood forests, bogs, lakes, rivers, alpine summits, and spruce-fir forests. Approximately nine million people visit the park each year. Half of the land belongs to the people of the State of New York and is constitutionally protected to remain “forever wild” forest preserve. The remaining half of the park is private land. In addition to 105 towns, villages, and farms; 2800 lakes and ponds, and 30,000 miles of rivers and streams, the park has huge wilderness regions, timber lands, businesses, homes, and camps. Lake Placid and the high peak area of the park was the site of the Winter Olympics of 1932 and 1980 and is now a winter sports training area.

The Adirondack Park has approximately 130,000 year-round residents, and millions of seasonal and short-term visitors. While the park does provide a great model for how people and wild lands can coexist, it also faces many challenges including increasing rates of residential development and recreational use, and loss of traditional industries that threaten the economic viability of many communities. These changes have exacerbated tensions between the preservationists and local residents. Large-scale threats, such as acid rain, global climate change, incompatible forestry practices, invasive species, and incompatible recreation also severely threaten the

Adirondack ecosystem and local way of life.

The Adirondack Park is collaboratively managed by New York State Adirondack State Park Agency and New York State Department of Environmental Conservation.

The Adirondack Park Agency was created in 1971 by the New York State Legislature. The Park Agency is a governmental agency with an eleven-member board and a sixty-person staff. The board meets monthly to act on park policy issues and permit applications. The meetings are open to the public. The Park Agency is responsible for maintaining the protection of the Adirondack Forest Preserve, and overseeing the development proposals of the privately owned lands. The Agency prepared the State Land Master Plan, signed into law in 1972, followed by the Adirondack Park Land Use and Development Plan in 1973. Both plans are periodically revised to reflect the changes and current trends and conditions of the Park.

The mission of the New York State Department of Environmental Conservation is to conserve, improve, and protect New York's natural resources and environment. The department and its programs are authorized and governed by state Environmental Conservation Law, with some programs also governed by federal law. The Department is headed by a Commissioner, who is assisted by Executive Managers. Program divisions are led by Division Directors and organized into bureaus that carry out the functions established by state law. Working from regional offices across the state and a central office in Albany, some 3,500 staff pursues scientific assessment and vigorous action to protect and enhance New York's environment and natural resources. Each regional office serves communities within its boundaries. Citizens sometimes help by working without compensation, either as participants in advisory groups, or as volunteers on important projects, such as environmental education.

**CENTRAL PARK (National Historic Landmark )—NEW YORK CITY:** Central Park was open to the public in the mid-1800s. Unfortunately, it quickly slipped into decline and little maintenance was done. One of the major reasons for this was lack of political support. Around the beginning of the 1900s, the park faced several new challenges. Cars had been invented and they created pollution. People began to use park for active sports as well as for walks and picnics. For several

decades the park was not properly cared for, and became a place for litter, vandalism, and dead trees. This changed in 1934 when a new Mayor of the City of New York was elected who wanted to bring the park back to its original beauty. Within one year, the park was cleaned up, lawns and flowers replanted, and new park facilities were built, including playgrounds and ball fields. In the 1960s, cultural activities began to be offered in the park with a new theatre for Shakespeare plays and a stage for open air symphony and opera performances. By the mid-1970s, however, there was little money available for the city to continue to management the park effectively, and the park again deteriorated. Several citizen groups formed to raise funds and organize volunteer initiatives. One of these groups, the Central Park Community Fund, commissioned a study of the park's management that called for the establishment of a single position within the city's Parks Department responsible for overseeing the planning and management of Central Park and for a citizen board responsible for oversight.

The Central Park Conservancy is a private, not-for-profit organization founded in 1980 that manages Central Park under a contract with the New York City Department of Parks and Recreation. The Conservancy obtains its funding from individuals, corporations, foundations, and the City of New York and has invested more than \$500 million to date into the Park, making it a model for urban parks worldwide. The Conservancy provides 85 percent of Central Park's \$27 million annual operating budget and is responsible for all basic care of the Park. To manage the park, Conservancy staff aerate and seed lawns, rake leaves, prune and fertilize trees, and plant shrubs and flowers; maintain ball fields and playgrounds, remove graffiti, conserve monuments, bridges, and buildings; and care for water bodies and woodlands, controlling erosion, maintaining the drainage system, and protecting over 150 acres of lakes and streams from pollution, siltation, and algae. Notable achievements have been the development of several innovative Park management and preservation practices, which have set the standard for park management nationwide. The zone management system, for example, divides Central Park into 49 zones, each with a dedicated gardener who provides a uniformed presence and is held accountable

for his or her zone. This system is directly responsible for cleanliness and productivity improvements throughout the Park. In addition, the Conservancy developed and implemented a program to train and mentor New York City Parks Department gardeners. They are trained by Conservancy staff in Central Park in horticulture, maintenance, and management.

### **1.7.3 VISITED PRIVATE PROTECTED AREAS**

#### **1.7.3.1 PRIVATE PROTECTED BY THE NATURE CONSERVANCY**

The Nature Conservancy Adirondack Chapter: The mission of The Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. The Nature Conservancy addresses threats to conservation involving climate change, fire, fresh water, forests, invasive species, and marine ecosystems. The Adirondack Chapter of The Nature Conservancy has been working locally in the Adirondacks for thirty-six years. In 2007 it purchased 161,000 acres of land in the Adirondacks to preserve the property's biological diversity while maintaining working forests and enhancing public recreational opportunities. The property stands out among the Adirondacks' large private landholdings because of its size, location, condition, relation to major rivers, and biological and scenic richness, including ninety mountains and seventy lakes and ponds. The acquisition of this property represents a giant step forward for the Adirondack region—a means to protect lands of immense biological, ecological and economic importance—and the completion of a century-old vision. The Nature Conservancy works with communities, recreational leaseholders, and other stakeholders to chart the course toward achieving critical conservation objectives in ways that are compatible with sustainable forestry and responsible recreational uses.

COSUMNES RIVER PRESERVE—Galt, California: Consumnes River country holds a very special place among California landscapes. The Cosumnes is a small river, a mere eighty miles long. Its headwaters rise at only 8,000 feet above sea level. From mostly rain, but also

snow melt, the river's water meanders from the Sierra Nevada Mountains to the Central Valley, just south of Sacramento. It is the only remaining unregulated river on the western slope of the Sierra Nevada. In its lower reaches, the river flows through one of the more biologically rich regions in California's Central Valley. The free-flowing river allows frequent and regular winter and spring overbank flooding that fosters the growth of native vegetation and the wildlife dependent upon those habitats, which includes more than 250 bird species, more than forty fish species, and some 230 plant species.

The Cosumnes River Preserve, established in 1987, consists of approximately 46,323 acres of wildlife habitat and agricultural land managed by six partner organizations including The Nature Conservancy, U.S. Bureau of Land Management, California Department of Fish and Game, Sacramento County, California State Department of Water Resource, and Ducks Unlimited. The Preserve, centered along the Cosumnes River, is one of the few protected wetland habitats in California and is buffered by a variety of agricultural operations. The Preserve provides numerous social, economic, and recreational benefits to local communities and to people residing in the larger Sacramento and San Joaquin areas. Approximately 60,000 people visit the Preserve each year.

A new management plan for the Cosumnes Preserve was drafted in 2007. This plan describes how the Preserve will be managed in the future, especially how the partners will use stewardship and compatible ranching and farming activities as methods to sustain native plant and wildlife communities including safeguarding and restoring the finest remaining examples of California's valley oak woodland ecosystem; restoring and creating freshwater wetlands to increase the Pacific Flyway's populations of migratory waterfowl; and demonstrating the compatibility of human uses with the natural environment.

WAIKAMOI PRESERVE—East Maui, Hawaii: The Nature Conservancy of Hawaii's Waikamoi Preserve is located on the northeast slope of Haleakala—a 10,000 foot dormant volcano—on Maui. The preserve, established in 1983 in cooperation with the Haleakala Ranch Company, protects vital habitat for thirteen native

Hawaiian birds, seven of which are endangered species, and 63 species of rare plants. The 5,230-acre Preserve is located in the heart of the 100,000 acre East Maui watershed which provides sixty billion gallons of clean water annually to Maui residents, businesses, and agricultural communities. The Preserve also borders Haleakala National Park and large tracts of state and private lands that contain hundreds of plants and animals found nowhere else in the world. Vegetation types range from dense rain forests, to open shrub and grasslands, to introduced pine tree plantations. The area is remote and very rugged with many steep gulches. The Nature Conservancy, in partnership with the Hawaii State Department of Land and Natural Resources, protects the native species by managing the invasive weeds and animals threatening their survival. Access to the Preserve is limited. The National Park Service leads hikes to the Preserve on a reservation-basis only. Scientific researchers interested in Waikamoi Preserve must complete a research application at least two months in advance of any planned fieldwork.

**KA'U PRESERVE—Hawaii:** The Island of Hawaii is the largest and most topographically diverse island in the State of Hawaii. The ecosystems provide habitat for a wide variety of birds, invertebrates and plants found nowhere else in the world. These ecosystems have been adversely impacted by introduced hooved animals, including cattle, pigs, sheep and goats. There are also a host of non-native plants that have invaded even the most remote native forest. Wildfire also poses a serious threat to native ecosystems. The Nature Conservancy manages the 3,548 acre Ka'u Preserve, established in 2002 to protect biologically rich and intact native forest. The preserve features mountainous ridgelines with narrow plateaus and steep valleys. Closed-canopy trees such as koa and ohia shelter lush native plants and tree ferns. Rare plants still survive, along with rare and endangered forest birds like the Hawaiian hawk. The region consists mostly of state-owned forest reserve lands.

The Nature Conservancy's primary management goals are to prevent degradation of the forest by reducing damage by pigs and sheep, limiting the spread of habitat-modifying weeds and preventing the introduction of other invasive species. A portion of the preserve has been fenced and all pigs removed. Invasive plant surveys have

been conducted and aggressive control of kahili ginger and night-blooming jasmine is underway. Field surveys have identified several small populations of rare plants and seed have been collected for propagation. In addition, Nature Conservancy staff work closely with other preserve landowners to identify critically important forest bird habitat. They are also actively promoting conservation awareness and community pride among the residents of the Ka'u District. Programs include environmental education, internships, volunteering and guided trips.

### **1.7.3.2 PROTECTED AREAS MANAGED BY AMERICAN PRAIRIE FOUNDATION**

AMERICAN PRAIRIE RESERVE—Montana: Working within a small-but-clear window of opportunity, American Prairie Foundation (APF) is assembling a wildlife reserve amidst the majestic prairie landscape of Montana. APF is doing so by acquiring private land to interconnect with large, publicly-owned islands of protected wildlife habitat. A mere one-percent of the planet's grasslands are under any form of protection. Leading scientists from organizations such as World Wildlife Fund and The Nature Conservancy have pinpointed American Prairie Reserve in northeastern Montana and its immediate surroundings as one of the earth's most critical sites for safeguarding biodiversity.

American Prairie Foundation was formed in 2001 solely to acquire land and soundly manage the proposed reserve. Thousands of elk, pronghorn, deer, and bighorn sheep inhabit the region alongside various predators including mountain lions and bobcats. It's also home to many smaller species, such as the burrowing owl, swift fox and black-footed ferret, one of the world's most endangered mammals, and it supports the largest number of endemic species of prairie birds in North America.

Although there are well-established islands of conservation in the area, such as the Charles M. Russell National Wildlife Refuge and the Upper Missouri River Breaks National Monument, these areas include little prairie habitat and are too disconnected for large-scale wildlife conservation. Restoration of adjacent prairie lands will connect these islands, creating an approximately three-million acre complex—the

size recommended by biologists for a self-sufficient, fully functioning ecosystem.

Thanks to the stewardship of local landowners, more than ninety percent of the prairie in this area has never been plowed. Developers and other amenity buyers have “discovered” this area. APF therefore has a narrow window of opportunity to purchase these ranches and manage the land for the wildlife and the benefit of the public, rather than the enjoyment of the few.

When complete, APF envisions a wildlife complex one and a half times the size of Yellowstone National Park, or roughly the same size as the African Serengeti. This is the right place and the right time to reassemble a complete prairie ecosystem and create a national treasure that will be enjoyed for generations.

## 1.8 ACRONYMS

<b>BIA</b>	Bureau of Indian Affairs
<b>BLM</b>	Bureau of Land Management
<b>BLNR</b>	Board of Land and Natural Resources
<b>CA</b>	Coordination Areas
<b>CAP</b>	Conservation Action Planning
<b>CbD</b>	Conservation by Design
<b>CBD</b>	Convention on Biological Diversity
<b>CPALAP</b>	China Protected Areas Leadership Alliance Project
<b>DAR</b>	Division of Aquatic Resources
<b>DLNR</b>	Department of Land and Natural Resources
<b>DOA</b>	Department of Agriculture
<b>DOD</b>	Department of Defense
<b>DOE</b>	Department of Energy
<b>FLPMA</b>	Federal Land Policy and Management Act

<b>FMA</b> s	Fishery Management Areas
<b>IUCN</b>	International Union for the Conservation of Nature
<b>LWCF</b>	Land and Water Conservation Fund
<b>LUC</b>	State Land Use Commission
<b>LWCF</b>	Land and Water Conservation Fund
<b>MBCC</b>	Migratory Bird Conservation Commission
<b>MBCF</b>	Migratory Bird Conservation Fund
<b>MBHCSA</b>	Migratory Bird Hunting and Conservation Stamp Act
<b>MBTA</b>	Migratory Bird Treaty Act
<b>MLCDs</b>	Marine Life Conservation Districts
<b>NASPD</b>	National Association of State Park Directors
<b>NEPA</b>	National Environment Policy Act
<b>NBII</b>	National Biological Information Infrastructure
<b>NFH</b>	National Fish Hatcheries
<b>NFS</b>	National Forest System
<b>NLCS</b>	National Landscape Conservation System
<b>NLTA</b>	National Land Trust Alliance
<b>NWPS</b>	National Wilderness Preservation System
<b>NWRS</b>	National Wildlife Refuge System
<b>NWRSAA</b>	National Wildlife Refuge System Administration Act
<b>NWRSIA</b>	National Wildlife Refuge System Improvement Act (NWRSIA)
<b>NYS</b>	New York State
<b>NYSDEC</b>	New York State Department of Environmental Conservation
<b>NYSAPA</b>	New York State Adirondack Park Agency
<b>OPRHP</b>	(New York State) Office of Parks, Recreation and Historic Preservation

<b>SFA</b>	State Forestry Administration
<b>TNC</b>	The Nature Conservancy
<b>TVA</b>	Tennessee Valley Authority
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	U.S. Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>WA</b>	Wilderness Areas
<b>WCPA</b>	World Commission on Protected Areas
<b>WPA</b>	Waterfowl Production Area
<b>WSA</b>	Wilderness Study Areas

# 2

## CONSERVATION THREATS AND STRATEGIES

The current era is portrayed as the sixth extinction episode of species because the extinction rate is several hundred times higher than the natural rate of any historic record or paleontological estimation (Alonso et al., 2001). Specifically, two-thirds of all native vertebrates and more than 90 percent of all land bird species are extinct in Hawaii due to human activities (Alonso et al., 2001). In addition, land conversion and ecosystem loss are prevalent worldwide. Two million acres of farms, forests and open spaces are replaced annually by shopping malls, subdivisions, and highways. In addition, 100,000 square acres of wetlands have been destroyed or degraded in the United States alone (Aldrich and Wyerman, 2005). WWF summarized the status of community or ecosystem loss in the United States as follows: more than 95 percent of original primary forest has been lost; 90-98 percent of wild or scenic rivers have been degraded and 50 percent of original wetlands have been drained and filled (WWF, 1999).

In the United States, protected areas are depicted as a modern “Noah’s Ark,” providing the last safe home for biodiversity (Stein et al., 2008). The foregoing analysis has effectively proven that

protected areas are not free from internal or external threats, such as exotic species and climate change. Protected areas need appropriate management to provide effective havens for varied biodiversity. To be considered Category 1 in the IUCN (Strict Nature Preserves with Management), an area must have management so areas in this classification already meet the test of effective management to protect biodiversity. To conserve protected areas effectively, the first step is to identify the threats to the area accurately (Knight and White, 2009). In this chapter, we will provide an overview of the threats impacting land conservation and biodiversity survival in the United States and will illustrate how managers of some specific protected areas fight against threats with conservation strategies.

## **2.1 THREATS TO BIODIVERSITY IN THE UNITED STATES**

### **2.1.1 INTRODUCTION**

Threats to biodiversity ultimately result from an expanding human population and increasing non-compatible demands of human society on natural resources (Alonso *et al.*, 2001). Some threats are unique to many developing countries, e.g., poaching, incompatible non-timber forest production collection, and deforestation. Other threats are found in both developing countries and in the United States, e.g., residential development, alien species, pollution, and climate change. Although everyone can prioritize threats based on their own assessment methods, it is difficult to rank threats according to their contribution to biodiversity loss, degradation and so on, no matter how fine or coarse a scale is used because of geographic (Richter *et al.*, 1997) and taxon differences (Schemske *et al.*, 1994; Collar *et al.*, 1994). In the 1990s, Wilcove and others (1998) qualified threats to imperiled species in the United States, including habitat loss, destruction and degradation, alien species, pollution, overexploitation, and diseases, in a descending contributing order to biodiversity loss. Flather *et al.* (1998) reached a similar conclusion that habitat destruction by humans and the invasion of exotic

species are the most prevalent causes of biodiversity endangerment. Threats must be constantly assessed as they change over time. On one hand, some historically primary threats, e.g., pesticide pollution and over exploitation are not the primary threats to biodiversity in the United States today (Wilcove *et al.*, 1998; Wilcove, 1999). On the other hand, some minor-influencing threats in the past have now grown to be the primary threats, as predicted by some scientists, e.g., climate change, habitat loss, and fragmentation caused by population growth in the United States (Wilcove *et al.*, 1998).

Today there is little up to date recapitulative information on threats to biodiversity in the United States. We summarize the main contemporary threats recognized by three federal management bureaus that supervise protected areas without considering their severity (Table 2.1). Generally speaking, the most serious threats to biodiversity on federal lands in the United States are habitat loss and fragmentation, invasive species, incompatible public uses, pollution (air or water), climate change, and fire and fuels. Compared with the findings given by Wilcove and others in 1998, climate change and fire and fuels have currently risen as key threats that are seriously damaging biodiversity.

**Table 2.1 Top Threats Identified by Management Agencies Overseeing Protected Area Systems in the United States**

Threats	NPS <sup>1</sup>	USFWS <sup>2</sup>	USFS <sup>3</sup>
Habitat Loss and Fragmentation	√	√	√
Invasive Species	√	√	√
Climate Change	√	√	
Pollution (Air or Water)	√	√	
Disruptive/Unmanaged Public Activities/Recreation		√	√
Fire and Fuels			√

1 Data from website of National Parks Conservation Association: [http://www.npca.org/wildlife\\_protection/threats/](http://www.npca.org/wildlife_protection/threats/)

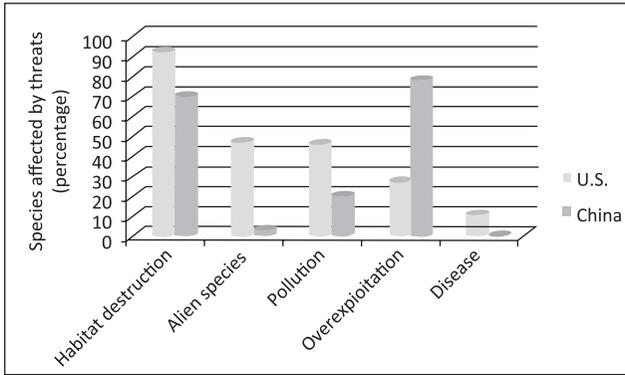
2 Data from USFWS website: <http://www.refugenet.org/new-general-info/refuge%20system.html#toc02>

3 Data from USFS website: <http://www.fs.fed.us/projects/four-threats/index.shtml#space>

### **2.1.2 THREATS COMPARISON BETWEEN THE UNITED STATES AND CHINA**

China shares a lot of similarities with the United States in terms of size, climatic zones and location in the hemisphere and thus is vulnerable to the same threats as the United States. It is valuable for Chinese managers and practitioners of protected areas to understand the main threats to biodiversity in China by learning how their counterparts in the United States are dealing with these threats. Interestingly, in 2005, research was conducted by Li and Wilcove to compare threats to vertebrates in both countries. Through systematic analysis, Li and Wilcove (2005) concluded that the primary threats to vertebrate biodiversity are significantly different in the two countries (Fig. 2.1). In the United States, the dominant threat is habitat destruction, while in China it is overexploitation probably resulting from a large, poor, rural population and a long tradition of using vertebrates as medicines (Li and Wilcove, 2005). However, the differences in threats such as alien species might be caused by limited data due to non-availability of data on these issues in China (Li and Wilcove, 2005). Although the weight of each threat to biodiversity in the two countries is disparate, the main threats are the same in both countries. Therefore, it is reasonable to learn from the experiences of the United States to avoid making the same mistakes. The current situation in China of continued population growth, rapid economic development, and collective forest ownership system reform could collectively trigger a situation where habitat destruction becomes a major threat rather than just exploitation as it is now. China may avoid these threats if they learn from some of the experiences of the United States in these areas.

**Figure 2.1 Percentage of Vertebrate Species Threatened by Different Threats in the United States and China<sup>1</sup>**



## 2.2 THREATS ANALYSIS OF VISITED PROTECTED AREAS

Each protected area has its own site-specific threats. We compiled and sorted out the threats influencing biodiversity in every protected area that we visited during the three-year CPALAP trainings (Fig. 2.2). A total of 20 protected areas have been analyzed, and information regarding their threats was derived from research articles, websites, and CPALAP training materials provided by the protected areas. The cumulative result is surprisingly consistent with the synthetic results shown in Table 2.1. That is to say that the most widespread threats among the 20 visited protected areas are residential and commercial development (14/20), alien species (11/20), disease (8/20), climate change (5/20), fire (5/20), and pollution (5/20). The last three threats have the same values. These threats are further analyzed below to let readers better understand the extent of their influence and available strategies for abating or eliminating them in the visited protected areas.

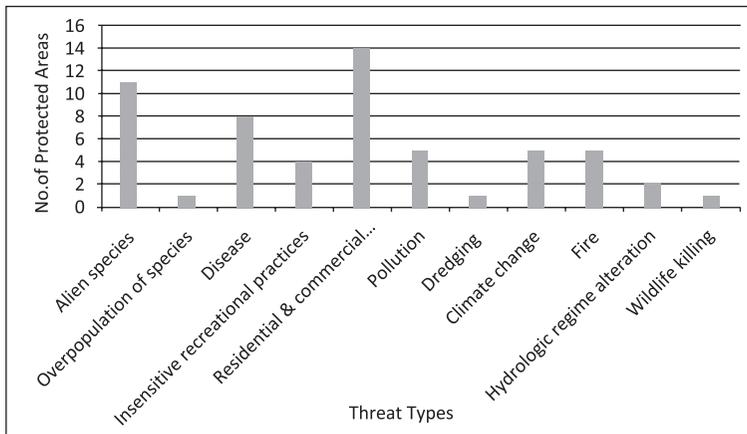
<sup>1</sup> Data about China from Li and Wilcove (2005) and Data about U.S. from Wilcove *et al.*, (1998)

## 2.2.1 HABITAT LOSS AND FRAGMENTATION

### 2.2.1.1 INTRODUCTION

In the United States, around 14 percent of lands are reserved for development as parks, wilderness, and other protected areas. The continuing health of these areas is important to protect the species depending on them. Protected areas can be effective only when they stop internal habitat loss and are connected by way of stepping stones (corridors) with other protected areas or wild areas to enhance and allow for migratory species protection. However, many human activities lead to habitat loss and fragmentation. Wilcove and others (1998) categorized 14 different factors contributing to habitat destruction and found that agriculture, commercial development, and water development are the three main causes of habitat destruction in the United States.

**Figure 2.2 Threats Jeopardizing Biodiversity in Visited Protected Areas during CPALAP Trainings (FY2008-2010)**



A strong legal guarantee for conservation effectively helps to avoid internal habitat loss in the United States. However, increasing surrounding land conversion due to rural sprawl may gradually isolate protected areas nationwide (Redloff *et al.*, 2010). Residential development resulting from population growth is encroaching upon protected areas at an unprecedented pace (Wade and Theobald, 2009; Radeloff *et al.*, 2010). The current population in the United

States has doubled from that of a century ago and will double again after another century. During the 1990s, the Rocky Mountains and the mountains west of them were the fastest growing areas, with a population growth rate of 25.4 percent during the 1990s (Hansen *et al.*, 2002). Recent research conducted by Redloff *et al.* (2010) and Wade and Theobald (2009) successively found that housing growth is isolating protected areas by shrinking their natural buffers and further altering the ecosystem within those protected areas. Their research and projections indicate that even the most strictly conserved protected areas—wildernesses—are facing such encroachment, as well as other protected areas, e.g., national parks and national forests.

What's worse, housing development on private inholdings within national forests has caused not only habitat loss but also habitat fragmentation, which may greatly influence biodiversity (Redloff *et al.*, 2010). Consequently, effects resulting from residential development, e.g., road construction, building more houses to promote economic growth in areas with attractive viewing, the spread of exotic species, and wildland fire suppression, will further threaten biodiversity of protected areas through cumulative impacts (Theobald *et al.*, 1997; Radeloff *et al.*, 2005; Haight *et al.*, 2004).

### **2.2.1.2 CONSERVATION STRATEGIES**

Redeloff and others (2010) implied that to minimize and mitigate the habitat loss and fragmentation resulting from development, social solutions, including policies, land use plans, zoning ordinance, and consumer choices should be implemented. Importantly, the cooperation among relevant stakeholders, including individual landowners, local and regional government, land trusts, conservation organizations, and the federal government, will ensure the success of fighting effectively against the threat (Wade and Theobald, 2009; Radeloff *et al.*, 2010 ). Finally, engaging and educating private landowners surrounding or within protected areas can also help to weaken biological consequences caused by this threat.

### **CASE STUDY: ADIRONDACK PARK PRIVATE LAND USE AND DEVELOPMENT PLAN**

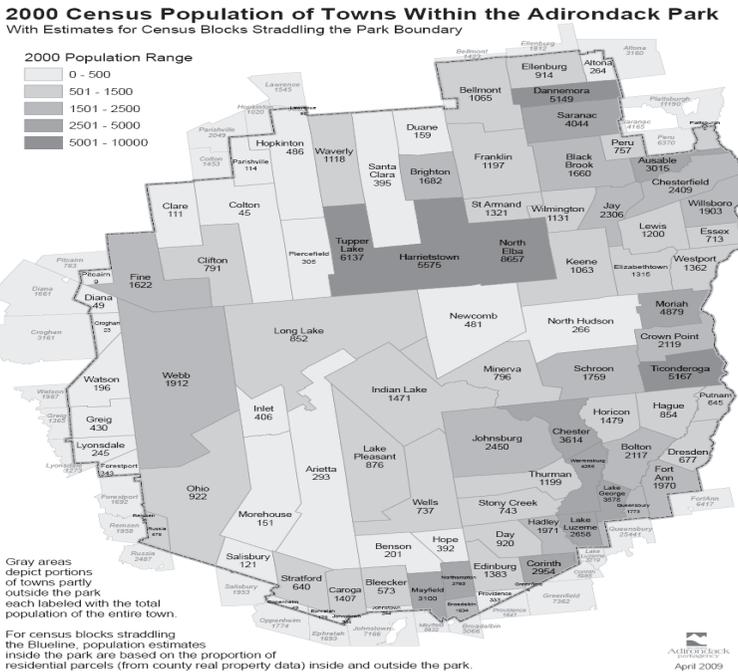
The Adirondack Park is a protected area containing a complex mix of

public and private lands (50.9 percent). The Park has areas covered with dense deciduous, evergreen and mixed forests with many rivers, streams, lakes, and ponds. The Park is the only park in the United States where a section of the park is set aside and designated as “forever wild” in the State Constitution. At the same time, 105 towns and villages are spread across the Adirondacks with a year-round population of 128,902 according to the 2000 census. Most of these towns and villages were in existence prior to the Park designation. The population distribution is shown in Figure 2.3. Population density is about 2.2 persons/100 acres in the Park. The legislation that created the Adirondack Park Agency (APA) and the land use and development plan serves as a world-class paradigm of coexistence between nature and people. The lands within the Park are attractive for development due to clean air, clean water, beautiful landscapes, and other advantages. As with all private property within the US owners are allowed to develop and sell their property as long as it conforms to the Adirondack Park Agency Act requirements. Therefore, increasing rates of residential development and recreational use could threaten biodiversity conservation in the Adirondacks to some extent. The adopted private land use and development plan in conjunction with local building codes work to minimize the impacts of development on the ecosystem.

As mentioned, the Adirondacks is managed through a detailed land use plan and zoning regimen to control residential and commercial development on private lands in the region. The Adirondack Park State Land Master Plan and Adirondack Private Land Use and Development Plan define and regulate the use of public lands and private lands (Table 2.2). Land use planning is dynamic and updates are continually made to meet the conservation and management requirements within the Park. The process is time-consuming with requirements for public input etc. but has proven to be an effective tool for continuing preservation of the area. Ten land classifications are defined for public lands and six land classifications are defined for private lands in the Adirondack Park (Table 2.3). To assist local communities in understanding these classifications, different land use areas are highlighted with different colors and have different requirements. Except for the administrative lands,

no structures are allowed to be built on public lands. To balance conservation and development, overall intensity guidelines for private lands are regulated to channel development into appropriate areas and to control overall density of development within the Adirondack Park (Table 2.3). Economic development conducted in an environmental-friendly manner is a priority for communities in the Adirondacks. For instance, in the Town of Keene located in the Adirondacks, the local landowners are required to get permits from both the Keene Town and the Adirondack Park Agency (APA) to build a new house. Zoning ordinances coupled with appropriate land use planning has systematically considered the conservation and development of this region at an eco-regional level, which helps to direct the sustainable development of the local economy in a way that benefits the maintenance of conservation values for the protected area.

**Figure 2.3 Population Census in the NYS Adirondack Park in 2000<sup>1</sup>**



<sup>1</sup> Map extracted from Adirondack Park Agency website: <http://www.apa.state.ny.us/gis/index.html>

**Table 2.2 Land Classifications in the NYS Adirondack Park<sup>1</sup>**

Classification	Percentage	Definition
State Land		
Wilderness	43.40%	A wilderness area, in contrast with those areas where man and his own works dominate the landscape, is an area where the earth and its community of life are untrammelled by man--where man himself is a visitor who does not remain. A wilderness area is further defined to mean an area of state land or water having a primeval character, without significant improvement or permanent human habitation, which is protected and managed so as to preserve, enhance and restore, where necessary, its natural conditions, and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least ten thousand acres of contiguous land and water or is of sufficient size and character as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic or historical value.
Canoe Area	0.70%	A canoe area is an area where the watercourses or the number and proximity of lakes and ponds make possible a remote and unconfined type of water-oriented recreation in an essentially wilderness setting.
Primitive Area	2.60%	A primitive area is an area of land or water that is either: 1. Essentially wilderness in character but, (a) contains structures, improvements, or uses that are inconsistent with wilderness, as defined, and whose removal, though a long term objective, cannot be provided for by a fixed deadline, and/or, (b) contains, or is contiguous to, private lands that are of a size and influence to prevent wilderness designation; or, 2. Of a size and character not meeting wilderness standards, but where the fragility of the resource or other factors requires wilderness management.

<sup>1</sup> Data and information extracted from websites of Adirondack Park Agency: <http://www.apa.state.ny.us/gis/index.html>, [http://www.apa.state.ny.us/Property\\_Owners/LandUse.html](http://www.apa.state.ny.us/Property_Owners/LandUse.html)

Continued

Classification	Percentage	Definition
State Land		
Wild Forest	51.00%	A wild forest area is an area where the resources permit a somewhat higher degree of human use than in wilderness, primitive or canoe areas, while retaining an essentially wild character. A wild forest area is further defined as an area that frequently lacks the sense of remoteness of wilderness, primitive or canoe areas and that permits a wide variety of outdoor recreation.
Intensive Use	0.80%	An intensive use area is an area where the state provides facilities for intensive forms of outdoor recreation by the public. Two types of intensive use areas are defined by the plan: campground and day use areas.
Historic	0.02%	Historic areas are locations of buildings, structures or sites owned by the state (other than the Adirondack Forest Preserve itself) that are significant in the history, architecture, archeology or culture of the Adirondack Park, the state or the nation; that fall into one of the following categories; -- state historic sites; -- properties listed on the National Register of Historic Places; -- properties recommended for nomination by the Committee on Registers of the New York State Board For Historic Preservation; and that are of a scale, character and location appropriate for designation as an historic area under this master plan and the state has committed resources to manage such areas primarily for historic objectives.
State Administrative	0.10%	State administrative areas are areas where the state provides facilities for a variety of specific state purposes that are not primarily designed to accommodate visitors to the Park.
Travel Corridors	n/a	A travel corridor is that strip of land constituting the roadbed and right-of-way for state and interstate highways in the Adirondack Park, the Remsen to Lake Placid railroad right-of-way, and those state lands immediately adjacent to and visible from these facilities.

Continued

Classification	Percentage	Definition
State Land		
Wild, Scenic and Recreational Rivers	n/a	<p>A wild river is a river or section of river that is free of diversions and impoundments, inaccessible to the general public except by water, foot or horse trail, and with a river area primitive in nature and free of any man-made development except foot bridges.</p> <p>A scenic river is a river or section of river that is free of diversions or impoundments except for log dams, with limited road access and with a river area largely primitive and undeveloped, or that is partially or predominantly used for agriculture, forest management and other dispersed human activities that do not substantially interfere with public use and enjoyment of the river and its shore.</p> <p>A recreational river is a river or section of river that is readily accessible by road or railroad, that may have development in the river area and that may have undergone some diversion or impoundment in the past.</p>
Pending Classification	1.40%	
Total	100.00%	
Private Land		
Hamlet	1.80%	Development encouraged and very limited permit requirements except building/structure higher than 40 feet, projects involving more than 100 lots, sites or units, projects involving wetlands, airports, watershed management, and specific expansions of buildings and uses
Moderate Intensity	3.40%	Most uses permitted, relatively concentrated residential development
Low Intensity	9.10%	Most uses permitted, residential development density lower than hamlet and moderate intensity
Rural Use	34.10%	Most uses permitted, reduced intensity development and residential uses

Continued

Classification	Percentage	Definition
Private Land		
Resource Management	51.30%	Most development activities require permit from APA, compatible uses allowed, including residential uses, agriculture, and forestry
Industrial Use	0.40%	Current and future Industrial uses, industrial and commercial uses allowed in other land use area classifications
Total	100.00%	

**Table 2.3 Development Intensity Criteria for Different Private Land Categories in Adirondack**

Land Use Area	Color on Map	Avg. # Principal Bldgs. (per sq. mile)	Avg. Lot Size (acres)
Hamlet	brown	no limit	none
Moderate Intensity Use	red	500	1.3
Low Intensity Use	orange	200	3.2
Rural Use	yellow	75	8.5
Resource Management	green	15	42.7
Industrial Use	purple	no limit	none

**CASE STUDY: TNC ADIRONDACK TIMBERLAND CONSERVATION**

Logging is the biggest contributor to habitat loss and fragmentation worldwide (McGarigal *et al.*, 2005). In the past two decades, forest industry acreage declined by 20 percent in the northeastern United States. Due to its uniqueness in size and land ownership patterns, the Adirondack Park embraces many commercial forest tracts that have been held by timber and paper companies for several decades

or longer. The Open Space Conservation Plan of New York State lists the top 14 high priority lands at risk in the Adirondack Park. One of the tracts is the Hudson River Gorge and watershed owned by Finch, Pruyn and Co. Lands, which is surrounded by strictly protected Adirondack Forest Preserve. To ensure that the land is preserved, The Nature Conservancy (TNC) spent US \$100 million to acquire the 161,000-acre working forest with an 18-year historic Working Forest Agreement entered into in June 2007, which will help to restore the integrity of the forest canopy and hydrologic regimes on the tract. After the acquisition, TNC worked together with partners and local communities to develop a land management plan that guarantees 92,000 acres of the acquired lands is to continue as working commercial forests while being protected by a conservation easement. 65,000 acres will be transferred to the New York State as new public lands, and 1,170 acres will be set aside for community purposes. The disposition of the remaining 3,500 acres is still under negotiation. Based on the land use plan, in 2009, TNC sold 92,000 acres of 161,000 acres of acquired lands to a timber investment management organization (TIMO) encumbered by a conservation easement sold to the New York State Department of Environmental Conservation for permanent management. Through these actions habitat loss and fragmentation may be permanently eliminated for this tract.

## **2.2.2 INVASIVE SPECIES**

### **2.2.2.1 INTRODUCTION**

Alien species has been ranked as the second widespread threat in the United States (Wilcove *et al.*, 1998). NPS, USFWS and USFS unanimously list alien species as one of their top four dominant threats to biodiversity. The threat of invasive species and their influences on ecology, economy, and society have attracted the attention of the whole United States. In 1999, President Clinton proclaimed Executive Order 13112, in which an alien species is defined as “*with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological materials capable*

*of propagating that species, that is not native to that ecosystem”* and an invasive species is pinpointed as *“an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.”* In fact, not all alien species are harmful to animals, plants, or human health. On the contrary, most alien species are important sources of food, fiber, or recreation in the United States (NISC, 2005). The real harm is from approximately 10 percent of alien species that are invasive in their new territory and cause damage to native ecosystems like a catastrophic wildfire in slow motion.

Invasive species cause not only ecosystem damage (including biodiversity loss) but also economic loss and even loss of human lives (Williamson and Fitter, 1996). Wilcove *et al.* (1998) found that 57 percent of imperiled plants and 39 percent of imperiled animals identified as threatened or endangered species under the Endangered Species Act (ESA) are endangered by alien invasive species. In addition, invasive species spread and increase steadily. For the entire United States, the associated cost of invasive species control is estimated as US \$137 billion annually (Pimentel *et al.*, 2000). The control cost invested by USFWS has increased from US \$13 million to US \$120 million in 2000 and upwards to US \$150 million now. The cumulative damage caused by invasive species cost was US \$97 billion during 1906-1991 (U.S. Congress, 1993). More than 1/5 of the known arboviruses are associated with human disease (Roehrig, 2002) and 4,156 reported human cases were infected by West Nile Virus (WNV) by the end of 2002 in the United States (Gubler *et al.*, 2003).

Alien species get introduced to a new ecosystem via intended or unintended activities of people through marine, terrestrial, and airborne pathways. Once established, invasive species spread widely and rapidly. In the United States, invasive species cover an estimated 100 million acres and are increasing by three million acres annually (Alonso *et al.*, 2001).

Invasive species are geography-specific. An invasive species may cause enormous damage on one site but not another. Importantly, both ecosystems and native species in Hawaii are more susceptible to invasive species than those on the continental mainland. This is because many native species in Hawaii had no natural predators during their evolution. As a result they never developed natural

defense mechanisms such as thorns or venom. As a result higher proportions of Hawaiian birds and plants are jeopardized by alien species than those in the continental US (Wilcove *et al.*, 1998).

Accurate information on invasive species contributes to identifying, preventing and controlling invasive species as early as possible, which would minimize their influences on ecology, society and economy. The Office of Technology Assessment (OTA) estimated that there were 4,500 alien species in the United States in 1993. In 2005, the National Invasive Species Information Center (NISIC) was established to manage invasive species information nationally. Invasive species control in the United States is proving to be as challenging as had been expected.

#### **2.2.2.2 CONSERVATION STRATEGIES**

It is difficult to control or eliminate invasive species since most strategies or methods are not species-specific and may harm adjacent native species. This partially explains why invasive species management is a time- and cost-consuming task. Invasive species spread without considering geographical boundaries. Therefore, a national mobilization to combat invasive species management in the United States is under implementation. Federal governmental agencies, state and local governments, and NGOs work collaboratively to effectively fight against invasive species. The State of Hawaii spent approximately US \$8.5 million in FY2009 to control invasive species with a 1:1 federal and state match (HISC, 2009). Therefore, the primary guiding principle of fighting invasive species should be partnership and cooperation among federal, state, and local governments, and private organizations (NISC, 2005). NISC, co-chaired by the Secretaries of the Interior, Commerce, and Agriculture, was established in 1999 as a high-level, interdepartmental organization to facilitate invasive species management nationwide. Members of NISC are the Secretaries and Administrators of 13 departments and agencies in the United States. NISC receives advice from ISAC (Invasive Species Advisory Committee) which is populated by nonfederal representatives and stakeholders. The National Invasive Species Management Plan (2008-2012) developed a detailed roadmap for the 13 federal governmental agencies to collaborate with partners in

managing invasive species. A national database—the National Invasive Species Information Center—was created in 2005 to provide accurate information for informative decision-making and management practices on site.

The national conservation strategies dealing with invasive species consist of four subcomponents: (1) Prevention—to keep the invasive species out; (2) Early detection and rapid response—to detect and eradicate invasive species to stop their spreading; (3) Control and management—to eliminate or control the problem of invasive species; and (4) Restoration—to heal, minimize, or reverse the harmful effects from invasive species (NISC, 2008). Prevention, early detection and rapid response are especially critical to invasive species control. Once an invasive species has spread widely and has seriously damaged ecosystems, it is difficult or impossible to control its damage and restore ecosystems to their previous state. Beyond that, education and public awareness are fundamental to invasive species management. Otherwise, people without basic information may inadvertently facilitate the invasion. On Maui, when we visited the Waikamoi Preserve, we were taught to clean the soles of our shoes with a brush to avoid bringing any seeds of invasive species into the protected areas. Reliable research contributing to informative decision-making is vitally needed to win the war against invasive species. During our three-year CPALAP training, we learned specific invasive species management actions that should be introduced in China to encourage similar activities.

Although the threat of invasive species has not been identified as a key threat in China's protected area systems, invasive species management needs to receive the attention it deserves with regard to biodiversity conservation. The agricultural sectors in China have taken actions to cope with invasive species to minimize the potential of enormous economic loss. The Ministry of Agriculture in China is enacting Invasive Species Management Regulation. It is well known that invasive species do not just ruin agricultural ecosystems, but natural ones as well. Therefore, it is urgent for relevant Chinese governmental agencies supervising protected areas to assess the impacts of invasive species and develop appropriate management plans based on assessment results to prevent and control invasive

species proactively as early as possible.

## **CASE STUDY: INVASIVE MAMMALS AND BIRDS IN HALEAKALA NATIONAL PARK**

### **Haleakala National Park (HNP)—Invasive Mammal Species**

Unlike other taxonomic species, it is rare that mammals become an invasive species on the continental US. However, islands are subject to mammal invasive species due to their unique evolutionary process. Hawaii is one of such islands where only two native species of mammals—the Hawaiian hoary bat and Hawaiian monk seal. Wildlife in Hawaii is sensitive to forage or predation by mammal species whether the mammal is a rodent or a goat. Located on the Island of Maui in Hawaii, Haleakala National Park (HNP) is suffering from invasive species, especially exotic invasive mammals. HNP, which encompasses 6 percent of the island of Maui, provides a safe home for diverse endemic species (Loope and Reeser, 2001). Approximately 90 percent of plants and invertebrate species in HNP are endemic to Hawaii and 20 percent are endemic only to the island of Maui. Introduced mammals, e.g., goats, pigs, deer and cows, are now threatening these endemic species and vulnerable ecosystems in the Park.

Goats are the pests with the most destructive power in HNP by directly destroying plants thus indirectly destroying bird habitat. This animal also causes erosion problems within the Park (Luna, 2003a). The rare endemic plant, Haleakala Silver Sword started to gain in numbers once goats were completely removed from the Park in 1989 (Rodrigues, 2002).

Pigs became prevalent in the Park with the expansion of the Park in 1969 (Luna, 2003a). Pigs devastated the tree ferns within the Park by feeding on them. These ferns provided suitable habitats for many other species that were adversely impacted. Although they were difficult to eradicate, pigs were successfully removed from the Park by the mid-1990s (Luna, 2003a).

Five axis deer were brought to Maui in September of 1959 by a mandate from the Hawaii State Legislature to promote wild game hunting. It is estimated that by 1995, the population on one ranch was more than 500 individuals. As a result, the axis deer have spread

too much of Maui. Although Haleakala is not a suitable habitat for axis deer due to high elevations, some herds inadvertently got into the Park and did pose a threat to vulnerable vegetation until eradicated there.

Other invasive mammal species, e.g., rats (100 individuals removed within 10 months), cats and mongooses were live trapped to conserve nestlings of endangered Hawaiian Dark-rumped Petrels (Loope and Reeser, 2001; Luna, 2003a).

Through continuous efforts of the Park and by collaborating with partners, all pigs, goats and virtually all axis deer have been eradicated in the Park today. To maintain the conservation efforts and permanently prevent invasive mammal species from entering the Park, the entire Park parameter is being fenced. With the removal of feral animals, the ecosystem is gradually being restored to its natural state (Luna, 2003a). Some endemic sedge (*Mariscus hillebrandii*), *Bidens micrantha subsp. Kaledalaha*, *Plantago pachyphylla*, Haleakala silversword (*Argyroxiphium sandwicense subsp. macrocephalum*) have recovered after removing these exotic species from the Park (Loope and Medeiros, 1994).

For HNP, the strategies for managing invasive mammal species is to eradicate their populations within the Park and then to erect fencing to keep them from returning. The fence must be routinely patrolled by rangers to fix holes and gaps in the fences.

#### **Haleakala National Park—Exotic Bird Species**

Compared with invasive mammal species, limited updated information about exotic bird species is available. Conant and Kjargarrd (1984) recorded that 53 percent of the birds (17 species) found in HNP were exotic species. Unfortunately, people have much less understanding of exotic birds and the impact of exotic bird species on native ecosystems, including avifauna. Altered structure and plant species composition in HNP facilitates the settlement of many exotic birds. In many cases these exotic birds are better adapted to the ecosystem and bring diseases that detrimentally impact the native bird species. Thus, exotic bird species might influence native birds by competing for food or as disease reservoirs. Since exotic bird species have not been considered invasive species until recently, little action has been taken to manage them.

## **CASE STUDY: INVASIVE FISH SPECIES IN YELLOWSTONE NATIONAL PARK (YNP)**

As the most famous protected area in the world, Yellowstone National Park (YNP) has rich water resources. Rivers and lakes cover 5 percent of land areas in YNP with the largest water body—Yellowstone Lake encompassing 87,040 acres. There are many non-native fish occupying the freshwater systems in YNP that are the consequence of early Park fisheries management philosophy.

This early philosophy held that fish resources provided food and recreational opportunities for people living in and visiting the area. To supplement fish consumption by human and “wildlife”, YNP initiated fish planting programs in 1881. Although the United States Fish Commission since 1907 prohibited the introduction of non-native fish, non-native species planting at YNP did not stop until 1955 due to a lack of other alternative fish species. Non-native fish were banned from introduction in 1936 although cutthroats and other native fish continued to be introduced. As a result, the planting program stocked more than 310 million native and non-native fish in YNP between 1881 and 1955. It was David Madsen acting as the supervisor of fish resources that first noticed the ecological consequence of non-native fish introduction, especially the degradation of a native species caused by cross breeding of non-native fish with native fish.

Today, eighteen fish species or subspecies are recorded in YNP. Thirteen of them are native and five are non-native. The settlement of non-native fish has resulted in serious ecological consequences, including population decline and/or extinction of native fish species, loss of the fishery’s genetic integrity, and indirect influences on their natural predators in the Park. The largest high altitude lake—Yellowstone Lake is an example of the ecological disaster this policy caused.

The Yellowstone Lake is the largest high altitude lake in North America. A species of trout, the lake trout was probably introduced in the lake in the 1980s was not found until 1994 (Kaeding *et al.*, 1996; Munro *et al.*, 2005). However, the source, date and mechanism of the introduction of lake trout to YNP are unknown (Shaw *et al.*, 2008). One lake trout replaces 41 native cutthroat trout yearly, which predicts the demise of cutthroat trout in the future (Rizycki *et al.*,

2003). Furthermore, the decrease of population size of cutthroat trout will negatively impact animals higher in the trophic chain, e.g., grizzly bear and osprey (Haroldson *et al.*, 2005; Martinez *et al.*, 2009). Because the lake trout and cutthroat trout occupy different ecological niches, those animals dependent on the cutthroat for food will not be able to prey on the lake trout. Unlike the cutthroat, the lake trout lives in deepwater all year round and never comes to shallow water for spawning where they become prey for other animals (Schullery and Varley, 1995; Stapp and Hayward, 2002).

The need to maintain the cutthroat and where possible restore the lake to pre-Euro-American conditions is the primary goal of YNP. As a result of the imminent need to address this issue, YNP developed strategies to control lake trout by consulting experts (McIntyre, 1995). YNP has implemented intensive programs to combat the lake trout, including implementing regulations requiring the “killing of all lake trout caught in YNP” (Koel *et al.*, 2005), gill netting lake trout and electronic fishing over mature lake trout after identifying their spawning habitat with GIS and LIDAR (Bigelow *et al.*, 2003; Bigelow, 2009). YNP has also experimented and had success with the use of biodegradable polymers which deter egg deposition or suffocate deposited eggs, ultrasound, microwaves, or pesticides (WTU, 2008). However, due to the serious influences of lake trout, YNP has decided to contract commercial fishery consultants to hasten reduction of lake trout soon (Gresswell, 2009). All in all, the invasive fish management in Yellowstone Lake still has a long way to go. It seems that to introduce non-native species into a protected area is not a smart decision although sometimes it was a reluctant option after balancing protection of pristine natural systems and provision for use and enjoyment for human society.

### **CASE STUDY: INVASIVE PLANT SPECIES IN HAWAII VOLCANOES NATIONAL PARK (HVNP)**

Alien plant species cause more conservation concern nationwide in the United States due to their detrimental impacts on species biodiversity, habitats and ecosystems. In the Hawaii Volcanoes National Park (HVNP), records of the Natural Resource Conservation

Service of the United States Department of Agriculture show that nearly 200 non-native plant species are established in the Park. Although not all non-native species endanger native ecosystems in HVNP, several are aggressive and are altering native communities and the wildlife that depend on these communities.

Many invasive plant species entered the Park through natural means such as animal dispersal and human activities. Nearly all native species in HVNP are fire intolerant, including the dominant shrub. Therefore, in HVNP where fire disturbance happens frequently, fire-tolerant invasive species are easily reestablished and replace native species that are not fire-tolerant. Take Molasses grass as an example, this invasive plant creates a fire resistant mat and replaces adjacent native grass rapidly after a fire. At the same time, the thick mat increases fuel load that might increase the risk of fire, which creates a greater threat for the survival of remaining fire-intolerant natives. Several other invasive plants, such as, Florida blackberry, banana poka, and strawberry guava, spread by frugivorous birds are causing vegetation to be altered in HVNP by outcompeting native plants with their dense canopies.

Eradication of invasive plants is complicated and expensive. In the 1940s, HVNP failed to eliminate firetree (*Morella Faya*) Myricaceae from the Park. To control expansion of invasive species, manual or mechanical removal methods, e.g., hand-pulling plants and removing roots and stumps, are commonly used although such methods are time-, cost- and labor-consuming. Some herbicides have been tested and proved effective at the lowest concentrations without any known effects on the endemic species. Biological methods are playing increasing roles in controlling invasive plants in the United States.

## **2.2.3 CLIMATE CHANGE**

### **2.2.3.1 INTRODUCTION**

Few threats to natural systems can wield worldwide influence as climate change does. Some climate change scenarios predict global extinction to reach approximately a quarter of mammal species (IPCC, 2002) and nearly one fifth of bird species (IPCC, 2007). Beyond this,

climate change will generate other stresses to speed up the extinction process, such as habitat loss, disease outbreaks, and altered fire regimes. Under such circumstances, protected areas become more significant than ever for the survival of wildlife as well as human beings in terms of relatively protected ecosystems which sustain them (Mansourian *et al.*, 2009; Dudley *et al.*, 2010).

In the United States, the average temperature has risen more than 2°F over the past half century and is projected to increase by 4-11°F in terms of different carbon dioxide emission scenarios by the end of this century. Precipitation has increased by five percent over the past 50 years (Thomas *et al.*, 2009). Alaska has unsurprisingly gotten hotter at twice the rate of the rest of the United States and will continue to, as projected by modeling (Thomas *et al.*, 2009). Climate change has imposed pressures on both the natural and managed ecosystems of the southwest in the United States (Moritz *et al.*, 2008; Thomas, 2009). Substantial impacts in the future are likely to endanger protected areas at a landscape level in the United States (Thomas *et al.*, 2009). Mansourian *et al.* (2009) indicate that climate change probably affects protected areas in a number of ways, for instance, species moving in or out of protected areas because of temperature and precipitation change, pest outbreaks, invasive species expansion, and higher fire incidence.

Preliminary studies have been conducted to systematically identify how climate change influences protected areas in the United States, and conservation strategies have been proposed accordingly (Saunders *et al.* 2009; Griffith *et al.*, 2009). Saunders *et al.* (2009) found that 11 categories of risks caused by climate change greatly imperil 25 national parks in the United States, including loss of ice and snow, loss of water, higher seas and stronger coastal storms, more downpours and flooding, loss of plant communities, loss of wildlife, loss of historical and cultural resources, intolerable heat, overcrowding, loss of fishing, and more air pollution. These risks will not appear in each national park evenly, given the differences in natural resources, landscape, and management effectiveness (Saunders *et al.*, 2009) (Table

2.4). In addition, as a protected area system focusing on species protection, species and populations in the NWRS (National Wildlife Refuge System) are likely to survive on the edges of their geographical, biological, or geophysical ranges (Griffith *et al.*, 2009). In conclusion, climate change is an unequivocal threat for biodiversity and other resources in protected areas and is rapidly imperiling the entire planet.

### **2.2.3.2 CONSERVATION STRATEGIES**

The threat posed by climate change is so definite that it is imperative that human beings act immediately by building on available knowledge, further research, and decisive management practices on site. Experts believe that specific effects induced by climate change can be illustrated at the site level, but the strategic response must be developed at a system-wide level (Griffith *et al.*, 2009). Far-sighted experts have proposed possible solutions for combating the effects of climate change on some protected area systems in the United States.

In terms of the National Park System, actions to mitigate and adapt to climate change include creating new and expanding existing national parks, working together with neighboring landowners to manage surrounding lands as migratory corridors, strengthening stress (e.g., altered fire, insect pest and disease) management that might combine with climate change, reducing emissions, and mobilizing other resources to combat climate change (Saunders *et al.*, 2009).

Similarly, to adapt to climate change, Griffith *et al.* (2009) recommended that the NWRS reform their planning by identifying clear conservation goals and by conducting gap analysis of the adequacy of existing systems in achieving these goals under the combination of climate change and non-climate stressors.

Similar to the National Park System, it is important for NWRS to work together with adjacent landowners to create ecological corridors for protected species and also to educate the public in order to mitigate emissions to the atmosphere.

**Table 2.4 National Parks at Greatest Risks Caused by Climate Change in the United States<sup>1</sup>**

Name	State	Loss of Ice Snow	Loss of Water	Higher Seas & Stronger Storms	More Downpours & Floods	Loss of Plant Communities	Loss of Wildlife	Loss of Cultural Resources	In-tolerable Heat	More Over-crowding	Loss of Fishing	More Air Pollution
Acadia NP	ME	*		*	*	*	*	*		*	*	*
Assateague Island NS	MD/VA			*	*	*	*			*	*	*
Bandelier NM	NM	*	*		*	*	*	*				
Biscayne NP	FL			*	*	*	*	*	*	*	*	
Cape Hatteras NS	NC			*	*	*	*	*		*	*	
Colonial NHP	VA			*	*			*				
Denali NP&P	AK	*	*		*	*	*					
Dry Tortugas NP	FL			*	*	*	*	*			*	
Ellis Island NM	NY/NJ			*	*			*				*
Everglades NP	FL			*	*	*	*		*		*	
Glacier NP	MT	*	*		*	*	*				*	
Great Smoky Mts NP	TN/NC	*			*	*	*			*	*	*

<sup>1</sup> Data extracted from Saunders et al., 2009.

Continued

Name	State	Loss of Ice Snow	Loss of Water	Higher Seas & Stronger Storms	More Downpours & Floods	Loss of Plant Communities	Loss of Wildlife	Loss of Cultural Resources	In-tolerable Heat	More Over-crowding	Loss of Fishing	More Air Pollution
Indiana Dunes NL	IN	*	*		*	*	*			*	*	*
Joshua Tree NP	CA				*	*	*	*	*			*
Lake Mead NRA	NV/AZ		*		*	*			*			*
Mesa Verde NP	CO	*	*		*	*	*	*				
Mount Rainier NP	WA	*	*		*	*	*			*	*	
Padre Island NS	TX			*	*	*	*			*	*	*
Rocky Mountain NP	CO	*	*		*	*	*			*	*	*
Saguaro NP	AZ		*		*	*	*		*			*
Theodore Roosevelt NP	ND				*	*	*					
Virgin Islands NP/Virgin Islands Coral Reef NM, VI	VI			*	*		*				*	
Yellowstone NP	WY/MT/ID	*	*		*	*	*			*	*	
Yosemite NP	CA	*	*		*	*	*			*	*	*
Zion NP	UT	*	*		*	*	*	*	*		*	*

NP=National Park; NM=National Monument; NS=National Seashore; NHP=National Historical Park; NP&P = National Park and Preserve; NL=National Lakeshore; NRA = National Recreation Area

In terms of the National Park System, actions to mitigate and adapt to climate change include creating new and expanding existing national parks, working together with neighboring landowners to manage surrounding lands as migratory corridors, strengthening stress (e.g., altered fire, insect pest and disease) management that might combine with climate change, reducing emissions, and mobilizing other resources to combat climate change (Saunders *et al.*, 2009).

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Similar to the National Park System, it is important for NWRS to work together with adjacent landowners to create ecological corridors for protected species and also to educate the public in order to mitigate emissions to the atmosphere.

### **CASE STUDY: RESPONSES OF TERRESTRIAL LANDSAPCE TO CLIMATE CHANGE IN YELLOWTONE NATIONAL PARK**

Although science projects climate changes will have an impact on biodiversity, environment and social society at a macro level, there is usually very little information about how a disrupted climate may act on a specific protected area (Saunders *et al.*, 2009). As a model park for the whole world, Yellowstone National Park (YNP) has spearheaded the research in coping with climate change.

Higher temperatures and changes in precipitation patterns can alter ecosystems in YNP (Saunders *et al.*, 2009). Climate change is predicted to influence YNP in two different climate regimes. In the north of YNP, the projected climate regime is wetter in summer and drier in winter, while in the rest of the Park, it is the opposite. Scientists predict that vegetation will recede to higher altitudes along with the disappearance of some important species, e.g., white bark pine. Water levels of wetlands and underground aquifers will further decrease too. However, a few species have benefited from climate change in YNP, e.g., willows. Large animals, such as grizzly bears, Canada lynx and wolverines, might face food shortage and decreased habitat size.

Due to its ecological, biological, geological traits, obvious changes will not be observed in YNP in the next few decades. Even so, YNP has taken actions to slow climate change down. First and foremost, YNP resource managers and scientists are working on developing site-specific conservation strategies through better understanding influences resulting from climate changes by working with other counterparts in the United States. At the same time, employees of YNP are reducing emission contributions through recycling efforts and using clean energy for vehicles (biodiesel and ethanol).

### **CASE STUDY: RESPONSES OF MARINE WETLANDS TO CLIMATE CHANGE IN JAMACIA BAY NATIONAL WILDLIFE REFUGE, UNIT OF GATEWAY NATIONAL RECREATION AREA**

The salt marshes in Jamaica Bay National Wildlife Refuge have been conserved since 1972 as a unit of Gateway National Recreation Area. However, Jamaica Bay has suffered habitat loss and fragmentation due to climate change and decreased sediment supply for a long period. Comparison of aerial photographs of Jamaica Bay over time revealed that the loss rate of marsh lands had increased rapidly over time from 0.4 percent per year during 1924-1974 to 1.4 percent annually during 1974-1994 and to 3.0 percent yearly during 1994-1999 (Hartig *et al.*, 2002). Initially, marsh loss mainly occurred along exterior marsh boundaries. Interior habit losses have become common since 1974. These losses have rapidly made large proportions of marsh lands disappear to be replaced by mudflats. During this process the underlying peat substratum disintegrates which further exacerbates vegetation loss on the marsh lands. This further influences the fate of wildlife depending on the vegetation to live. Researchers discovered that an average 38 percent of low marsh vegetation has disappeared since 1974 overall for the main island with smaller islands losing up to 78 percent of their vegetation cover (Hartig *et al.*, 2002).

The bad news is that the sea level rise is 2.8mm/yr in Jamaica Bay (Hartig and Gornitz, 2001), which is higher than the global average sea level rise rate of 1.5mm/yr (IPCC, 2001). The updated research indicated that the marshlands loss was quicker. Thirty percent of the marshlands remaining in 2003 was lost by 2005 (JBWPPAC, 2007). JBWPPAC (2007) concluded that the marsh islands would disappear

by 2012 rather than by 2024 if the 2003-2005 observed habitat loss rate continued.

To save the marshlands in Jamaica Bay, the New York City Department of Environmental Protection (NYCDEP) (2006) drafted the Jamaica Bay Watershed Protection Plan (Draft Plan) to provide an overarching conservation conceptual plan for Jamaica Bay. Employees of the Jamaica Bay National Wildlife Refuge are promoting climate change education by making their Park as an example.

## **2.2.4 ALTERED FIRE REGIME**

### **2.2.4.1 INTRODUCTION**

Fire is an integral component of natural ecosystems. Native Americans and early European settlers used fire as a tool to manage forests and grasslands in order to make a living. Later, fire was considered destructive rather than beneficial, and fire suppression became the norm, partially because of changing patterns of population and economic growth (Walkingstick and Liechty). By the 1910s, USFS strictly implemented a policy of “extinguish all fires”. To educate the public, USFS promoted Smokey the Bear as the icon for a fire prevention campaign in 1944. This icon is still implanted in people’s minds today. However, decades of successful fire prevention and suppression in some fire-prone ecosystems have led to increases of fuel loads in and composition of forests that cause more serious fires that are harder to control and extinguish once they start (National Commission on Wildfire Disasters, 1995; USDA Forest Service, 2000). This is the result of misunderstanding the role of fire in natural ecosystems (Myers, 2006). Research results also indicate that the expansion of residential housing surrounding protected areas greatly contributes to increased fire incidence (Hammer and Helmers, 2010). Excessive accumulation of fuels caused by dead and dying trees, and dense stands of small trees which exist due to excluding fire artificially, serve to increase fuel loads and make an ecosystem more vulnerable to fire (Myers, 2006).

To extricate themselves from this predicament, governmental agencies and scientists reconsidered the role of fire in ecosystems

and recognized that fire has two faces—one beneficial and the other detrimental (Myers, 2006). For ecosystems in which fire plays an evolutionary role, fire is essential to the health of those ecosystems and their associated species. Altered fire regimes created by fire suppression policies are now regarded as threats to fire-adapted ecosystems in the United States. Currently the governmental agencies responsible for fire management (e.g., BLM and USFS) and non-governmental conservation organizations (e.g., TNC) have been developing methods to decrease the threat caused by altered fire regimes, e.g., allowing wildfires to burn in some protected areas, introducing prescribed burning, reducing fuels, and other treatments.

#### **2.2.4.2 CONSERVATION STRATEGIES**

In the United States, BLM and USFS receive large budget allocations for wildfire management, focusing on improving fire prevention and suppression, reducing fuels, restoring fire-adapted ecosystems, and promoting community assistance (Vincent, 2004). Similar to many other countries, aerial and ground methods are combined to control wildfire in the United States. USFS aviation supports fire management from the sky. Since the 1990s, the USFS has focused more on ecosystem management, forest restoration and fire management through thinning of underbrush to reduce fire hazards. Prescribed burning, thinning, and salvaging dead and dying trees are common ways to decrease fire incidence. Certainly, fire prevention and suppression is also a priority for forest protection, especially for forests that are not adapted to fire. A prominent feature of fire management in the United States is to use prescribed burning to deal with altered fire regime. During the training, we learned that Yosemite National Park and Yellowstone National Park use controlled burning to manage forest health.

#### **CASE STUDY: PRESCRIBED BURNING CONSERVATION PRACTICES IN YOSEMITE NATIONAL PARK**

The vegetative cover is distributed vertically in Yosemite National Park. Yosemite contains five ecosystems over a wide range of elevation from 700 meters to 4,400 meters, which respond to water

availability influenced by topography and climate. From 700-2,000 meters, the dominant vegetation has thick leaves that are influenced by fire. From 1,000 to 2,300 meters, oak trees, pine trees and wet meadows are dominant communities. In this vegetation zone, fire also has an important influence as well as root diseases. From 2,200 to 3,300 meters, fire is a very important factor. Subalpine ecosystems from 2,800 to 3,300 meters are strongly influenced by fire also. Therefore, Yosemite National Park depends on fire as an ecosystem management tool. Natural fire is necessary for the health of the Park and the Park management depends on the natural role of fire in its active management plan.

Unfortunately, 100 years ago fire suppression was the norm in national parks. This resulted in the buildup of fuel for fires, which meant that when fires happened, they were very large, intense fires. When the policy changed and the Park allowed fires to happen naturally, the fires were very small and beneficial to the ecosystem. When suppression was the norm in the 1960s and 70s, Park management noticed that there was no new growth and sequoias only, pine and other non-natives were growing in the understory. As a result of a major fire in 1976, Park management noticed that after the fire cleared out the pines in the understory the young sequoia started to grow. They determined that this was because the sequoia seed is very small, needs to touch the ground, and the fire acted as a catalyst to assist in the germination of the seed that was not previously getting through the understory. It was the same with oaks. The understory of pines was preventing the seed from getting to the ground. As the Park explored the cultural background for the area, the Park found that the Native Americans in the area used to set small fires every fall before they left for the winter. The lesson learned by YNP management was that fire is essential to this ecosystem and if you keep fire from a fire-dependent ecosystem, the ecosystem is changed.

Yosemite National Park adopted a plan of yearly controlled burns throughout the Park in different areas. These plans are hampered by weather and complaints about the smoke from residents outside the Park resulting in less acreage than the park would like being burned every year. For instance, in 2007, the park planned to burn 1900 acres and only burnt 1,600 acres. Therefore, the Park continues to fall

behind instead of catching up natural fire regime. Currently, there are only a few areas in the Park where if a fire starts, the Park will put it out. These areas are confined to areas where the fire would endanger people or buildings. Every year, the Park burns piles of underbrush cleared along the roads and stacked. In 2005, the underbrush was so thick that if a fire had started the entire forest in the area would have burned. The Park hired private contractors to clear the brush and burn the piles under the Park's management. The Park always informs the community about what their burns and when they are happening. However, a controlled burn can only be set under the right temperature, wind and moisture conditions. Otherwise, the Park has to wait. There have been times when parks have lost control of the prescribed burn. In New Mexico, homes were lost as a result of a control burn that got away from the park management. In general, people don't like parks burning trees and they don't like the smoke. Therefore, to educate the public for the need for fires to balance the health of the forest and to manage the smoke in the least intrusive way possible is a constant balancing act for park managers.

The Park has developed a fire management plan involving input from the public, experts and park staff, which specifies how much to burn a year to catch up for all the years that the Park did not allow fires. The designated Fire Manager and Superintendent work together yearly to decide what areas to burn and to set the schedule, and then it is dependent on the appropriate weather conditions to implement the burns. Usually, in Yosemite National Park, burns can happen in the spring and fall. Burning in the spring is preferred primarily because the rain can be counted on to help put the burn out rather than snow which is less predictable. However, with the climate change, there is less snow and more rain, and the Park may consider a new formula to burn. To ensure endangered and rare species are protected, surveys must be conducted to ensure that the planned burn areas have no rare or endangered species. Most burns in the fall occur after the breeding season is over. If important tree species are present in the area, the burn will be controlled in such a manner that they do not burn. Unlike wildfires, the heat, direction, and size of a controlled burn is managed. The Park prefers to clear underbrush and use burn piles rather than burn an entire area as large burns on

the ground are harder to control. Botanists also record the changes in biodiversity before and after a burn. In addition, based on records, park employees rarely if ever find dead animals after a burn and for fire-dependent ecosystems, native species have adapted to fire cycles while invasive species have not in many instances. Therefore, prescribed burning helps to control invasive species effectively.

The Park has used prescribed burning for more than 20 years. Rich experience on prescribed burning in parks tells us that burning is best suited for use in fire-dependent ecosystems and that a comprehensive fire management plan needs to be in place. Sufficient research and preparation are critical before setting a prescribed burn. Post burn surveys are also useful to improve prescribed burning and to plan future burns. Finally, although prescribed burns are relatively controllable, careful management is required to assure that the burn stays under control and does not cause property damage.

### **CASE STUDY: WILD FIRE AND PRESCRIBED BURNING IN YELLOWSTONE NATIONAL PARK**

Generally speaking, ecosystems in Yellowstone National Park are fire-dependent. The natural fire return interval for shrub and grasslands, is 20-25 years in the Northern Range (Huston, 1973). For lodgepole pine forests on the central plateau and subalpine white bark pine stands, it is 300 years or more (Romme, 1982; Romme and Despain, 1989). That is to say, many of Yellowstone's plant species are fire-adapted. The cones produced by some of the lodgepole pines (*Pinus contorta*) which makes up nearly 80 percent of the Park's extensive forests, are serotinous, meaning that the seeds inside can be released only through the intense heat of a fire (Nyland, 1998).

Wallace (2004) summarized many scientists' findings about plants and wildlife after the fire of 1988 where there were more than 50 fires. The 1988 fires burned approximate 35 percent of the Park. The fire killed many lodgepole pines and other trees (e.g., 24 percent whitebark trees), it did not kill most other plants where the damage was confined to only the tops with roots remaining alive to regenerate due to varied burning intensities, e.g., as ground fires or as crown fires. Fires may stimulate regeneration of sagebrush, aspen, and willows in the Park too. Though aboveground parts of grasses

and forbs were consumed by flames, the below-ground root systems typically remained unharmed. Prairies tended to bounce right back after fire. Forests renewed themselves a bit slower. Generally speaking, there was higher biomass and increased nutritional value in vegetation in the first three years after a burn. Most areas returned to pre-fire levels within five years. More nutrition and biomass post-fire was available because of all the minerals released into the ground. Elk returned and ate all the burnt bark and peeled off the bark to eat the mineral layer underneath (very high sugar and easy access in winter). Most ungulate species and grizzly bears were affected by 1988 fire because of the loss of habitat for forage. Rodents were probably the biggest victim in terms of becoming easy prey for predators or due to suffocation in burrows. Birds and aquatic species experienced less direct harm from 1988 fire.

The fire management plan was reviewed after the 1988 fire and finally re-issued in 1989 and updated again in 1992. Yellowstone National Park again had a wildland fire management plan, but with stricter guidelines under which naturally occurring fires may be allowed to burn. In addition, policies are changing to allow human-caused fires to burn if no structures are in the way. This new policy saves money and doesn't risk fire fighters lives.

After a prescribed burn, the resultant young forests are more resistant to natural fires and harder to burn due to lack of fuel for any fire. It will still burn, but won't travel quickly and simply doesn't create the kind of enormous, dangerous forest fire. The bigger animals use forests more when the forest is young (Romme *et al.*, 2005). Similar to the Yosemite National Park, the Yellowstone National Park sent crews out looking for dead animals post-fire for purposes of research and to assess the impact on wildlife. For example, in one area, there were 30,000 elks one summer. Of this herd, they found only 230 dead because they became trapped in a box canyon and suffocated to death. Research shows that animals move out if there is a fire, then within 30 minutes of the fire moving on move back into the previously burnt section of the forest. Finally, in the Yellowstone National Park, fire helps to rid the forest of many diseases and insects. The exception found at YNP was a beetle that thrives on fire-injured trees; their population rose for 6 years but now has leveled out in the Park.

## **2.2.5 OVERUSE BY VISITORS**

### **2.2.5.1 INTRODUCTION**

In addition to providing conservation opportunities, protected areas in the United States also provide opportunities for the public to enjoy nature or benefit from the opportunity for certain kinds of resource extraction. For example, wildlife-dependent activities, including hunting, fishing, wildlife observation, photography, and environmental education and interpretation are in national wildlife refuges. However, some kinds of recreational activities, e.g., off-road vehicles and personal watercraft, are not allowed in national wildlife refuges. The allowed uses are dependent on their compatibility with the resource. When managing protected areas in the U.S., the resource comes first. As for the National Park System, outdoor recreation and scientific research are permitted while harvesting and removal the resources within units of the national park system is generally prohibited. Limits are set through permits when any activity becomes detrimental to the resource. As stated above, protection of the resource is first and activities that are not compatible with that goal are prohibited or managed through a permit system. Generally, visitors on foot are allowed in areas of all levels of protection in the U.S. system.

Visitor use impacts include the quality of the recreational experience and the environmental consequence of the experience. Carrying capacity management of a protected area is considered by many protected areas when designing recreational activities/programs and zoning recreational areas. Every year, flocks of visitors swarm to some popular protected areas, e.g., Yosemite National Park where annual visitors number approximately 3.9 million. This number peaked in 1996 with about 4.2 million. Visitor numbers have fluctuated around 3 million annually since the 1990s in Yellowstone National Park. Some measures have been taken to limit visitors in some protected areas, e.g., pricing through costs of permits, quotas, limits on types of activities, and alternative site promotion, to name a few. Resource damage is another result of overuse, and can occur even in situations of only moderate or minimal use (Thorsell and Lascuráin, 1992). Common problems resulting in resource degradation

arise from the construction of tourist facilities, including hotels, restaurants and souvenir stands. However, these problems are not quite as serious in the United States as they are in some developing countries. Of course, other activities conducted by visitors, such as hunting or fishing might also damage resources in a protected area.

#### **2.2.5.2 CONSERVATION STRATEGIES**

To mitigate negative impacts resulting from use by visitors, first of all, protected areas conduct varied promotion and education programs and activities to build visitors' understanding on how to behave appropriately in a protected area. Many negative tourism impacts result from the activities of inexperienced or unknowledgeable visitors (Thorsell and Lascuráin, 1992). Many protected areas provide flyers, brochures, and booklets to help visitors to become partners in the protection of the resource and how they can help. Secondly, some protected areas implement a visitor limit policy. Such is the case at Yosemite National Park. Thirdly, protected areas use permit/license management to limit visitors or resource extraction. As a useful conservation tool, permits provide a means to balance preservation and conservation-consistent resource uses. For example, Yosemite National Park issued 18,777 permits for visitors to explore wilderness areas inside the park.

The type of permit or license system used in a specific area is tailored to the needs of the area. The general system of permits and licenses and how it is operated and run is similar across the system.

Not all activities conducted in protected areas require permits or licenses, but many do. In national parks, certain types of activities need permits, e.g., gathering, distributing printed materials and other public expressions of opinion. Generally, commercial (film, photography, sound recording) and non-commercial activities (including fishing, backcountry, boating, research, and weddings) require permits to be conducted in a national park. Most parks have an admission fee and camping permits are also charged for, however activities such as hiking and biking when allowed are free. Most protected areas regardless of the government entity that manages them are open to the public in some form for some activities. Examples of recreational activities that may need a permit or have

charges attached are off highway vehicle area/trail, river, wilderness, rifle range, camping, and groomed cross-country ski trails. All systems that allow special uses, like group activities and recreation events require permits in advance. For national wildlife refuges, visitors interested in research or monitoring, commercial filming, hunting, fishing, canoeing, kayaking, and special events services apply for permits to USFWS. The use of permits and fees depends on the resource being protected and the use involved.

Another strategy used in protected areas to accommodate visitors while protecting a fragile ecosystem is a system of boardwalks that lead the visitor through an independent guided hike while assuring that the visitor does not impact the ecosystem by stepping on plants and nesting areas critical to the protection of the area.

Lastly, but importantly, protected areas conduct programs to monitor uses by visitors in order to better manage resources, and improve the visitor experience. Yosemite National Park, for example, constantly assesses the needs of visitors and their impacts on resources so as to improve their management, which is based on informative monitoring results.

### **CASE STUDY: HUNTING AND FISHING PERMIT/LICENSE MANAGEMENT IN NEW YORK STATE**

The Department of Environmental Conservation (DEC) is responsible for issuing permits or licenses for hunting, fishing and trapping on all lands in the State. Every year, they announce regulations about hunting, fishing, and trapping. Regulations describe where to hunt, who can hunt, what to hunt, and when to hunt as well as how much game can be harvested by an individual. Not all species that occur within the State are allowed to be hunted. Every year, the DEC posts updated information on these regulations. Usually, only those game species with sufficient population size are allowed to be hunted. For example, big game, including black bear and white-tailed deer, small game, including squirrels, raccoon and turkey, migratory game birds and furbearers can be hunted or trapped according to State promulgated regulations. Regulations address hunting and fishing limits not only by the numbers of animals, but also the gender and age.

In the State, to hunt or trap a person must hold a license or

permit. Licenses and permits can be purchased at one of DEC’s 1,500 license sales outlets statewide, e.g., New York Office of Conservation, hunting stores, and most town halls. Permits or licenses are diverse with different privileges and prices ranging from no fee to US \$96 (Table 2.5). Some licenses are permanent but some are seasonal which are valid only for current hunting seasons (Table 2.6). Most long arms, such as rifles and shotguns, and bows used for hunting do not require a license to possess. All pistols require a possession permit.

**Table 2.5 Seasonal Hunting Permits/Licenses Examples in the New York States<sup>1</sup>**

Type	Qualification	Privileges	Age	Fee (US \$)
Conservation Legacy	Hunter Education Certificate (HEC) or previous hunting license PLUS acceptable Bowhunter Education Certificate (BEC), or Bow Stamp Issued 1980 or later, or NYS Jr. Bowhunting License Issued 1980 or later	All the privileges that apply to a Super Sportsman License plus a habitat and Access Stamp and subscription to the Conservationist magazine	19-69 Yrs	96
Super Sportsman	same as Conservation Legacy	All the privileges that apply to fishing, small game, big game, bowhunting, muzzleloading licenses and turkey permit	19-69 Yrs	88
Trapper Super Sportsman	Hunter & Trapper Education Certificates or proof of previous hunting and trapping licenses	All the privileges that apply to small game, big game, muzzleloading, fishing and trapping licenses and turkey permits	19-69 Yrs	88

<sup>1</sup> Information extracted from Department of Environmental Conservation, New York State: [http://www.dec.ny.gov/docs/wildlife\\_pdf/2010guideregs.pdf](http://www.dec.ny.gov/docs/wildlife_pdf/2010guideregs.pdf)

Continued

Type	Qualification	Privileges	Age	Fee (US \$)
Sportsman	Hunter Education Certificate Or previous hunting license	All the privileges that apply to fishing, small game and big game hunting	19-69 Yrs	47
Senior Sportsman	Hunter Education Certificate Or previous hunting license	All the privileges that apply to fishing, small game and big game hunting	70+ Yrs	10
Small and Big Game	Hunter Education Certificate OR previous hunting license	Hunting small game species with gun or bow during appropriate seasons. Hunt deer and bear with guan, muzzleloader or bow during the regular season or hunt with shotgun or muzzleloader with the January firearms (permit required) deer season in Suffolk County	19-69 Yrs	29

The NYS DEC is responsible for identifying overall limits to game animals annually according to their existing populations. To keep hunting or fishing sustainable, hunters are requested to report what they kill, which helps the DEC to understand the resource status beyond doing field surveys through tracking and releasing. However, not everyone obeys hunting. Some hunt out of season or take more than permitted, so the state has a system of penalties for people who do not obey the rules, e.g. fines. Armed Environmental Conservation and Forest Rangers patrol in the field and enforce game laws. To try to minimize the enforcement burden, the State also offers and encourages hunter education so that hunters understand the need for and the importance of the regulations.

**Table 2.6 Permanent Hunting Licenses/Permit Examples in the New York State**

Type	Fee (US \$)
<b><i>Lifetime Resident Sportsman License (combined small game, big game and fishing privileges, also includes turkey permits):</i></b>	
For a person age 0–4	380
For a person age 5–11	535
For a person age 12–69	765
For a person age 70 or older	65
<b><i>Other Lifetime Resident Licenses</i></b>	
Small and Big Game Hunting License	535
Fishing License (age 0–69)	460
Fishing License (age 70 and older)	65
Trapping License	395
Bowhunting License	235
Muzzleloading License	235
Recreational Marine License	150
Combo Fishing & Recreational Marine Fishing License	450

Finally, some permits or licenses are sold in the form of stamp or donation (Table 2.7). Revenues from stamp sales or donations by hunters will go to special accounts which are set aside to protect wildlife specifically. For example, all the revenues from the sale of the Federal Duck Stamp go into the Migratory Bird Conservation Fund set for USFWS for the acquisition lands to protect migratory birds. In 2004, the Migratory Bird Conservation Fund received US \$44 million through selling duck stamps to hunters, refuge visitors, and stamp collectors just to name a few (Vincent, 2004).

**Table 2.7 Hunting Stamps Examples in the New York State<sup>1</sup>**

Type	Age	Fee (US \$)
Habitat and Access Stamp	Any	5
Venison Donation (help feed the hungry by supporting NY's venison donation program)	Any	1 or more
Conservation Patron (includes Habitat Access Stamp and Conservationist subscription)	Any	12
Federal Duck Stamp (available at most Post Offices and some sporting goods stores)	16+ Yrs.	15
<p>Qualifications: Validated by holder's signature on the face of the stamp, AND NYS Conservation Legacy, Trapper Super Sportsman, Super Sportsman, Sportsman, Senior Sportsman, Small and Big Game, or Small Game license.</p> <p>Privileges: Hunt migratory waterfowl. It is not needed for gallinules, coot, crows, rails, woodcock or snipe. All migratory game bird hunters, including Junior Hunters must register with the Harvest Information Program by calling toll free 1-888-427-5447 or register online at: <a href="http://www.ny-hip.com">www.ny-hip.com</a></p>		

**CASE STUDY: VISITATION LIMIT MANAGEMENT IN HANAUMA BAY NATURE PRESERVE**

Hanauma Bay Nature Preserve is a 101-acre site with rich biodiversity and is famous for its outdoor recreational opportunities. Average daily use of Hanauma Bay skyrocketed from 1,370 users in 1975 to 6,808 users in 1999 (Vieth and Cox, 2001). In the late 1980s, Hanauma Bay was almost being “visited to death” with 13,000 visitors a day at peak times (Beukering and Cesar, 2004). Users dropped trash in the water, fed the fish and littered on the beach. In addition this intensity of use threatened the ecosystem and biodiversity of the bay by stirring up sediment, disturbing and trampling coral and algae (Beukering and Cesar, 2004). What’s worse, some near-shore coral reefs were disappearing (Vieth and Cox, 2001). In 1990, the City and County of Honolulu’s Department of Parks and Recreation issued the Hanauma Bay General Plan (HBGP) after voluntary use reduction did

<sup>1</sup> Information extracted from Department of Environmental Conservation, New York State: [http://www.dec.ny.gov/docs/wildlife\\_pdf/2010guideregs.pdf](http://www.dec.ny.gov/docs/wildlife_pdf/2010guideregs.pdf)

not achieve the desired management goals. HBGP aims to reduce over-use through several methods. The Park limits the entry of cars to the parking lots, closes the preserve on Tuesdays and holidays, and charges non-resident visitors an admission fee and requires the viewing of an environmental education piece on the Park prior to access to the bay.

The preserve reduces visitors through limiting cars. The preserve charges US \$1 parking fee per car and HBGP enforces that the "... public lot shall be limited to non-commercial and U-Drive passenger vehicles and authorized permittees; parking shall be limited to the number of parking stalls...; vehicles shall be denied entry to the parking lot when full." At the same time, commercial vehicles are allowed to stay in the commercial lot for 15 minutes for sightseeing and picture taking activities. These rules manage to control the visitor numbers effectively. Non-Hawaii resident visitors over the age of 13 are charged a US \$5 entry fee. Once visitors enter into the preserve, they watch an mandatory video in the visitor center opened in August 2002 to understand the ecological sensitivity of Hanauma Bay and activities that are not-allowed in the preserve, e.g., feeding fish, trampling coral reefs and so on. Both residents and non-resident visitors are required to watch the environmental video. Frequent visitors must watch the video at least twice annually. A computer-based recording system helps to track visitors who have watched the video. On the beach, local NGOs help to manage visitors by providing volunteer services ranging from educating people on the appropriate use of the preserve to providing docent services.

Recent research conducted by Dr. Brock indicated that the preserve is recovering from the previous degradation gradually. The story in the Hanauma Bay tells us that it is smart to take proactive actions to manage the resource use strategically rather than wait until the resource is in crisis.

### **CASE STUDY: BOARDWALKS AS TOOLS FOR CONSERVATION EDUCATION AND RESOURCE PROTECTION IN NEW YORK STATE ADIRONDACK PARK**

Prior to December 31, 2010 and a severe fiscal crisis, the Adirondack Park Agency administered two Visitor Interpretive Centers. Each

center served to provide the public with a personal experience with wetland ecosystems by creating a trail system to certain wetlands and a boardwalk through them. Uncontrolled access into the wetland could have negative effects on the functions of the wetland. By constructing an elevated walkway the surface of the wetland was left undisturbed, visitors could take as much time as they like for nature observation and study in comfort, and visitors could experience a closeness to the wetland and its occupants developing an appreciation for the resource. Self-guiding brochures or periodic signage was used to allow visitors to learn important information about wetland ecosystem function and benefit.

## **2.2.6 POLLUTION**

### **2.2.6.1 INTRODUCTION**

Protected areas also play a role in providing clean air and water for our society. Unfortunately, human consumption produces waste and pollution, which adversely impacts biodiversity in protected areas, not to mention negative impacts to human health. Pollution appears in the form of oil spills, acid rain, toxic chemicals in fertilizers and pesticides, sewage runoff, etc. (Alonso *et al.*, 2001). Pollution can either damage wildlife directly or through complicated ecological processes that influence other organisms in a food web. This can happen locally, regionally, nationally, or internationally. It is reported that pesticides kill an estimated 75 million birds and billions of non-target insects on croplands every year in the United States alone (Alonso *et al.*, 2001). Health and distribution of wildlife and biodiversity in the world is increasingly and radically influenced by pollution (Bryant, 2002). Furthermore, recent research has demonstrated that air pollution can bring about decreased precipitation distribution, and can also threaten critical water resources (Rosenfeld *et al.*, 2007). Air pollution leads to water pollution through atmospheric deposition, which further jeopardizes wild plants and animals directly and indirectly.

### **2.2.6.2 CONSERVATION STRATEGIES**

In industrialized societies, it is becoming increasingly difficult to

prevent pollution from harming protected areas. Pollution generally causes fatal damage to wildlife, biodiversity, and the ecosystems they depend on. One of the saddest recent examples was the Gulf of Mexico oil spill, which had disastrous impacts on the wildlife there and potential long-term impacts that remain unknown. To avoid discharge or emission of pollutants, the Clean Air Act (CAA) and the Clear Water Act (CWA) (the Federal Water Pollution Control Act, FWPCA) were signed into law by President Richard Nixon in December, 1970 and October, 1972 respectively. These were later amended to strengthen the protection of these resources. These Acts have an overarching effect on protected areas by targeting the pollutants and polluters nationwide in the U.S. They do not avoid disasters as is evidenced by the oil spill but they provide for clean up and payment for restoration that would most likely not happen without this legislation.

Furthermore, the Clean Air Mercury Rule (CAMR) and the Clear Air Visibility Rule (CAVR) issued by the U.S. Environmental Protection Agency (EPA) further contribute to mitigating the harmful effects of pollution. For example, the Clear Air Visibility Rule asks states to identify older industrial facilities and power plants that affect visibility in specially protected areas and determine emission controls to improve visibility, air quality, and public health.

At the site level, protected areas manage their activities and the behavior of visitors in order to minimize possible pollution for biodiversity and ecosystem protection. For example, in Yellowstone National Park, they have replaced the old boardwalks, built with chemically treated wood, with less toxic plastic based products which reduce discharge of chemicals into the environment which occurred as the old wooden boardwalks deteriorated. They also promote “green” cleaning products to protect the health of visitors. Green products are made from natural ingredients that are environmentally friendly, non-toxic and biodegradable. Importantly, some protected areas, especially national parks, are selected as air quality monitoring bases in the United States. For instance, 15 national parks were members of the National Park Service Air Quality Web Cameras. In each national park, digital cameras and other equipment were installed to photograph the area and record air quality information in these protected areas. Images are updated every 15 minutes and

the air quality data are updated hourly. Such information helps to immediately monitor air quality in these parks.

### **CASE STUDY: ACIDIC DEPOSITION AND MERCURY POLLUTION IN NEW YORK STATE ADIRONDACK PARK**

As the biggest protected area in the 48 continental states of the United States, the NYS Adirondack Park has suffered from acidic deposition and mercury for many years. NYS Adirondack Park encompasses over 3,000 lakes, 30,000 miles of rivers and streams, and a mosaic of habitats covered with old growth forests. Many lakes and rivers in the Adirondacks seem clean and pristine. However, these lakes and streams have been impacted by acidic deposition. As a region particularly sensitive to acidic deposition, research shows that there were only seven lakes identified through sediment analysis as acidified in the Adirondacks before industrialization. During the 1930s, 4 percent of high-altitude lakes and ponds had a pH less than 5 when measured with old style colorimetric methods, this increased to 9 percent in 1970s (Pfeiffer and Festa, 1980). Nearly 25 percent of surveyed lakes in the Adirondacks in the 1990s were acid dead or held less aquatic life and species diversity compared with lakes with a lower acidity (Baker *et al.*, 1996). Acid deposition threatens terrestrial organisms as well as aquatic organisms. Since the 1960s, over half of the large canopy red spruce has died in the Adirondack Mountains (Driscoll *et al.*, 2001). Acidic deposition makes habitats unsuitable for amphibians and birds also. Acidification has been linked to increases of some chemicals, e.g., mercury in waters (Driscoll *et al.*, 2003). Generally, mercury enters remote lake systems with a healthy surrounding watershed through atmospheric deposition, terrestrial runoff and ground water infiltration and is in the inorganic form (Hg) (NYSERDA, 2008). Mercury is then converted to the organic form methylmercury (MeHg) in waters and lakes. The proportion of total Hg as MeHg in some Adirondack lakes amounts to 10 percent due to the abundance of wetlands in the region and MeHg could bio-accumulate along food chain (Selvendiran *et al.*, 2009). A survey found that 10 of 13 fish species in these lakes had average mercury concentrations above EPA guidelines. It is estimated that 25 percent of loons in the Adirondacks

have blood mercury levels that can cause mortality and lead to their further decline. Mercury poisoning makes fish unsuitable for human consumption resulting in fish consumption advisories.

Pollution usually comes from activities outside protected areas. As a region sensitive to acid rain, the Adirondacks have become the victim of surrounding industrial development including air pollution from “rust belt” industrial areas in the Mid-West U. S. and adjacent Canada. Since air pollution and acid rain do not respect geographic jurisdictions, mitigating or eliminating acid rain needs strong cooperation on a large geographical scale. Under the umbrella of the CAA, New York State passed an acid deposition control act in 1984 to further reduce air pollution from activities within the state. During the 1980s, the NYS Department of Environment Conservation has conducted a series of comprehensive studies to help understand and solve the problem. These studies have provided information relevant to the enactment of policy or law. Since the 1990s, the Department of Environmental Conservation has shifted to address the dynamic impacts of acid rain on biodiversity and ecosystems in the Adirondacks. Although the recovery road is long, a recent research study demonstrates that some lakes in the Adirondacks show signs of recovery although they remain far from full recovery (Nierzwicki-Bauer, 2010).

Importantly, to reduce air and water pollution many institutions, organic farms, hatcheries and other activities in the area now pursue actions to protect the fragile environment surrounding them in Adirondacks. At the Rivermede Organic Farm, solar and geothermal energy are used to reduce the emission of harmful gases. Green houses are established to plant vegetables and flowers and organic farming techniques are used, e.g., white plastic sheet to cover and protect plants, natural pesticides, composts made with manure and garden waste from one year are used the next year as fertilizers to keep vegetables and flowers free from chemical pesticides, which helps to reduce water pollution. At the Adirondack Fish Hatchery, they feed fish by hand rather than with automated feeders to decrease waste and also pump fresh oxygen into water to facilitate fish feeding. A combination of such techniques helps to decrease pollution releases from 500lbs of phosphorous per year to less than 50lbs in the past 15 years. These multi-dimensional conservation strategies will ensure

that the damaged environment flourishes again as long as these and other pollution controls continue in the Adirondacks.

### **CASE STUDY: PROMOTE GREENING PRACTICES TO MITIGATE AIR POLLUTION IN YELLOWSTONE NATIONAL PARK**

Clear air and good visibility add value to the beauty of the Yellowstone National Park. However, surrounding power plants and oil and gas drilling do contribute to air pollution in the Park. On one hand, the Park is implementing air quality monitoring programs that are instant and dynamic through the use of digital cameras to establish an early warning system. On the other hand, the Park aims to create a Greening of Yellowstone through the combination of series specific conservation activities to reduce pollution, including solid waste, air and water pollution.

The Park has replaced partial wooden walkways that release toxin chemicals with recycled plastic lumber. Biodiesel-powered trucks with less emission have been used in the park and hybrid powers, e.g., diesel with canola oil and gasoline with ethanol is promoted across the whole park. The Park also promotes green buildings with sustainable heating systems, insulation and high-efficiency lighting to decrease energy consumption. The Park also uses alternative energy to light the Park, e.g., solar energy. Since many facilities and structures are managed by concessioners, the Park works together with these concessioners to conduct sustainable resource campaigns, including using clean energy, organic food, and environmental-friendly products to protect environment from pollution. Finally, the Park has initiated a campaign for recycling and composting activities to effectively use solid wastes rather than hauling them to a landfill 150 miles away. All these activities collectively contribute to mitigate climate change also.

## **2.2.7 DISEASE & PESTS**

### **2.2.7.1 INTRODUCTION**

Unlike mixed tropical forests, natural forests in the northern hemisphere boreal and temperate zones are relatively simple ecosystems and are susceptible to threats by insects and diseases.

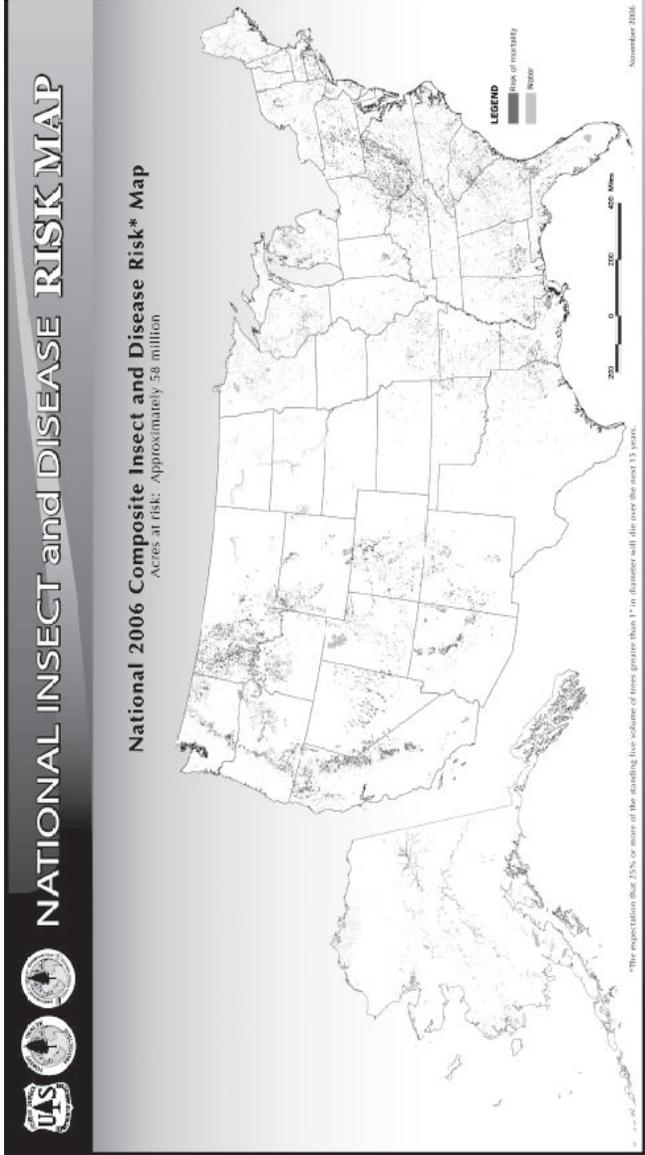
Western spruce budworm (*Choristoneura occidentalis*) and Douglas-fir tussock moth (*Orgyia pseudotsugata*) were historically recorded as damaging the natural conifer forests of western North America (Furniss and Carolin, 1977). Most dominant and major forest trees in the United States are under siege by native and exotic forest pests (Manion, 1991). In 2007, approximately 6.8 million acres of forest were dead that year, due to pests and diseases. One native beetle—the mountain pine beetle—contributed to nearly 61 percent of the mortality (USDA, 2009). USDA (2009) reported that since 1998, forest mortality caused by diseases and pests has increased radically and peaked in 2003. In addition, gypsy moths, which cause defoliation of trees, are prevalent in the eastern United States (USDA, 2009). Climate change may impact on the spread of these pests to other areas in the future which could lead to an increase in forest fire fuel due to increased dead trees putting forests at further risk. While many look at these threats as separate and independent they are indeed inter-related.

#### **2.2.7.2 CONSERVATION STRATEGIES**

Similar to pollution and climate change, pests and diseases spread without consideration of any geographic boundaries. In the United States, the job of detecting and reporting pests and diseases is carried out by State and Forest Service program specialists on a regular basis. They form a main component of the Forest Health Protection Program (FHPP), created by USFS of the Department of Agriculture (DOA). FHPP aims to ensure that forest lands managed by USFS, the Department of Defense and the Department of the Interior, remain healthy, viable and intact. To achieve this they collaborate with Native American and state partners to implement a series of conservation practices, including thinning, insect monitoring and reporting, fire prevention, and suppression, etc.

Private forest landowners can obtain appropriate assistance through state foresters and other state agencies. Nationally standardized aerial and ground surveys are implemented to evaluate the status of and changes to the condition of forest ecosystems. FHPP has been conducting risk mapping for major insects and diseases for the entire country since 1995 (Fig. 2.4).

Figure 2.4 Insect and Disease Risk Map in 2006 of the United States<sup>1</sup>



1 Map extracted from USFS, available at : [http://fhm.fs.fed.us/fact/pdf\\_files/fhm\\_nidrm\\_2009.pdf](http://fhm.fs.fed.us/fact/pdf_files/fhm_nidrm_2009.pdf)

The second basic strategy to control diseases and pests is to improve public awareness and education so as to avoid unconsciously facilitating their expansion. As for specific insects and diseases, well-developed management and treatment actions are available from USFS through the reports they produce. For instance, in order to prevent and suppress the mountain pine beetle, removing infested trees, thinning pine stands, and creating age-class diversity by regeneration are effective measures to reduce further loss of the forest (USDA, 2009). In addition, applying registered pesticide to uninfested trees, e.g., verbenone, (an anti-aggregation pheromone), is a promising management tool to prevent this insect from attacking forests (USDA, 2009).

### **CASE STUDY: EXOTIC INSECTS IN NEW YORK STATE ADIRONDACK PARK**

Today, the fastest growing threat to forests in the Adirondack are insect pests, including emerald ash borer (*Agrilus planipennis*), hemlock woolly adelgid (*Adelges tsugae*), siren woodwasp (*Sirex noctilio*) and the Asian long-horned beetle (*Anoplophora glabripennis*). In some ways these insect invaders have been added to the traditional threats of a century ago in Adirondacks, e.g., land clearing, logging, and agriculture encroachment. Pests and disease outbreaks can fundamentally alter forests in a negative manner. Factors such as higher temperatures, longer growing seasons and precipitation shifts associated with can trigger or exacerbate forest pest outbreaks. Chronic but minimal negative impacts of existing forest pest populations can quickly escalate when these triggering factors occur. There is no real way of stopping these types of threats other than developing biological controls due to the scale of the infestations, population numbers, unsuitable chemical controls and expense.

Although there are many exotic forest pests in NYS, there are three that have recently been identified that pose the threat of or have produced substantial forest damage. They are the emerald ash borer, the Asian long-horned beetle from China and the hemlock woolly adelgid. The Asian long-horned beetle prefers sugar maples (*Acer saccharum*) that are a major component of the Adirondack

forest and the northeastern hardwood forest and one of the most ecologically and economically valuable forest trees in the northeast US. The beetle is found in New York City and on long Island. Emerald ash borers kill ash trees which account for approximately 8 percent of forest trees in the state of New York. The Emerald ash borers are relatively small insects and can disperse long distances very quickly. It is suspected that they are also moved on firewood. The borer has been identified in 7 NY counties. The hemlock woolly adelgid attacks eastern hemlock (*Tsuga Canadensis*) in NYS and has caused severe hemlock mortality in much of the lower Hudson River valley and in scattered locations in the Finger Lake region. Due to the inadequacy of native predators for these insects, the insects are hard to eradicate and scientists have not yet completely identified the suite of species that can be used as biocontrol agents. Now, when an emerald ash borer or Asian long-horned beetle finds a tree, forest managers have relied on cutting down and chipping the tree to avoid their further expansion. However, because of the constitutional mandate of “Forever Wild” and the general prohibition for cutting and removal of trees on Forest Preserve lands, forest managers have a difficult decision to make and limited options for controlling these species. Does the presence of these species require cutting of trees in areas (Forest Preserve) where cutting is generally forbidden? Science must guide the management decisions. To limit this risk, NYS DEC enacted regulations forbidding importation of untreated firewood into the state and the long-distance transportation of untreated firewood within the state in March of 2009. The State’s Governor proclaimed August 2010 as Forest Pest Awareness Month in New York State to build public awareness about these insects. Some politicians also called for Congress to increase funding to hamper further expansion of these insects, especially research to keep them from invading protected areas. The people in the New York State are actively pursuing means to combat these insects to protect their forests.

### **CASE STUDY: MONITORING DAMAGES RESULTING FROM INSECTS AND DISEASES IN YELLOWSTONE NATIONAL PARK**

Yellowstone National Park is one of the areas most influenced by the white bark blister disease (WBBD) in the United States. WBBD is

an exotic disease introduced inadvertently from British Columbia in 1910. WBBB is a fungal disease which kills whitebark pine. Whitebark pine is a key stone tree species in promoting biodiversity (Ellison, 2005). The Yellowstone National Park monitors WBBB which has been present in Yellowstone for 50 years, but which has resulted in very low tree mortality. The Park does not try to control it anymore as the cure is worse than the problem. Yellowstone doesn't have exotic insects that cause (environmental) damage yet. If it happens, it's unclear what they would do because there is no effective measure to control them at this time.

In addition, native small beetles, like Douglas-fir beetle, attack dominant trees in the Park. Douglas-fir beetles generally break out after forest fires and drought and peaked in 2005, which resulted in 670,000 acres forest across the West in the United States being affected (USDA, 2009), including the Yellowstone National Park.

Animal disease is another issue that is of concern to the Yellowstone Park especially as it might impact its symbol animal, the wild bison. Wild bison having brucellosis could result in the abortion of their first calf. Brucellosis was first detected in the wild bison in Yellowstone National Park in 1917. As one of the only two states holding brucellosis free tags in the United States, the State of Montana hazes wild bison back into the Park to prevent potential brucellosis transmission from wild bison to cattle beyond the Park's boundary. For Montana, if cattle were infected the state would incur a huge economic loss as they would lose their standing as a Brucellosis free state. However, for the wild bison as their population increases need more habitat area so they will continue to stray outside the Park boundary. As a result, every year, when the population size exceeds an arbitrary population "cap" as stated in the bison management plan, bison will be sent to slaughter in an effort to control herd size to be sustainable within the Park boundary. One hundred and 200 bison respectively were sent to slaughter in 2002 and 2003. Such a program is not optimal for the real recovery of wild bison from the perspective of biodiversity conservation so the Park is looking for other means of control. To gain more territory for bison, the Park even wants to use "remote vaccinate" to stem brucellosis. Even if such strategy were successful, it would not end the story of brucellosis in the Park since

this disease also acts on elk and transmission for elk to livestock has also been documented.

## **2.2.8 OVERGRAZING**

### **2.2.8.1 INTRODUCTION**

Despite the importance biodiversity conservation in some protected areas in the United States, grazing is permitted on wilderness areas under the Wilderness Act. Many grazing leases and permits were entered into prior to the legal designation of the Wilderness Area. Leases still exist and some are being renewed due to political influences of the land owner and continued limited awareness about protected areas on the part of the public and the political system. Conservation movements have also not adequately addressed this concern (Strassmann, 1987; Kerr and Salve, 2000). By 2000, 32 units of the national park system were permitting livestock grazing (Kerr and Salve, 2000). The Strassmann survey in 1987 reported that 123 national wildlife refuges were used by private ranchers and farmers for cattle grazing and hay harvest, and 374,849 animal unit months (AUM) of cattle were grazing in these refuges. This is 41 percent more than the statistics reported by USFWS that fiscal year.

According to GAO's report to Congress, 4.5 percent of land areas among 31 units (1,580,000 acres) of the national park system and 26.9 percent of land areas among 94 units (740,000 acres) of the national wildlife refuge system in the 48 continental states were approved for grazing by the end of fiscal year 2004. Approximately 2.7 million acres of lands managed by NPS and about 795,000 acres of lands administered by USFWS received 17,000 AUMs and 12,000 AUMs respectively which were approved for grazing in fiscal year 2004 (GAO, 2005). In addition, 9.2 percent and 9.8 percent of federal lands managed by BLM and USFS permitted grazing on them by fiscal year 2004 in the United States (GAO, 2005). Increasing evidence has demonstrated that grazing is generally an incompatible use of protected areas (Braun *et al.*, 1978; Gao, 1981, 1989; Dew, 1992).

### **2.2.8.2 CONSERVATION STRATEGIES**

Today, an increasing number of people consider grazing (overgrazing) in protected areas as a threat to the conservation of biodiversity and ecosystems. For example, cattle may have negative effects on wetlands by grazing on nesting habitats for waterfowl, adding suspended solids and bacteria to the water, and increasing the water temperature. A voluntary grazing permit buyout program is being promoted across the country to help solve conflicts between grazing and conservation goals in protected areas. Through the program, non-governmental conservation organizations can buy grazing leases at a competitive market price from private ranchers. The key to successful application of this strategy requires the relevant federal protected areas' management authorities (e.g., USFS, BLM) agree to end grazing on that specific allotment. At the same time, for some specific protected areas, e.g., wilderness, Congress has agree to contribute to improving the grazing policy by permanently retiring grazing permits through property acquisition or by setting a time-certain end to grazing permits in some national park units.

#### **CASE STUDY: CHARLES M. RUSSELL NATIONAL WILDLIFE REFUGE—GRAZING PERMIT**

Located in the middle of Montana, the amazing landscape of the Charles M. Russell National Wildlife Refuge encompasses 1.1 million acres interspersed with native prairies, forested areas and river bottoms. It was not until 1976 that the USFWS received the full jurisdiction for the refuge, which terminated the previous dual management between USFWS and BLM. In the refuge, wildlife and grazing conflicts have existed since its inception in 1936 due to the grandfathering of existing grazing uses. Politics in favor of allowing grazing on public lands are intense even now. In the past 25 years, the refuge has been sued in federal court four times by private ranchers due to their policy of prohibiting grazing in some areas.

Grazing permits are issued annually to a permittee by the refuge and can be transferred to members of that immediate family. In the fiscal year of 2004, 21,500 AUMs on 450,000 acres of the refuges were approved for grazing. This resulted in the refuge being recognized

as having the largest amount of public lands used for grazing in the national wildlife refuge system in the lower 48 states (GAO, 2005). That is to say, about 41 percent of the land area was permitted for grazing in the refuge. In 2007, about 18,000 AUMs were grazed at the refuge. Large-scale grazing reduces cover for ground-nesting birds and eliminates berry-producing shrubs that many wildlife feed on. Over-grazing also destroys critical habitats used by birds and fish and cause soil erosion. A USFWS study showed that many areas on the refuge were not suitable for wildlife due to overgrazing. Employees of the refuge spend much of their time on cattle grazing issues that frequently are detrimental in their impact on native wildlife.

Currently, the refuge is comprehensively evaluating grazing impacts on the refuge as they develop a comprehensive conservation plan that will guide conservation activities in the refuge for the next 15 years. In the management plan developed in 1976, reducing grazing activities by one third was one of their conservation objectives. The refuge has set up fencing around controlled monitoring samples to monitor the impacts of grazing on grasses in the refuge yearly. Some non-governmental organization, e.g., American Prairie Foundation have taken an active role in purchasing grazing leases from permittees and retiring them to help reduce grazing within the refuge. As a management tool, some areas in the refuge are implementing prescriptive grazing to keep the prairie healthy. Accordingly, monitoring programs are established to ensure prescriptive grazing positively influences grass in the refuge.

## **2.3 RARE, THREATENED, ENDANGERED AND NATIVE SPECIES RESTORATION**

### **2.3.1 INTRODUCTION**

As the most fragile components of biodiversity within protected areas, rare, threatened and endangered (RTE) species are probably the first group of victims of the myriad threats we have discussed. As the precious gems of biodiversity, RTE species are protected

as the top priority of any protected area. The Congress issued the Endangered Species Act (ESA) in 1973 to protect critically imperiled species from extinction and to recover and maintain the species populations by removing or lessening threats to their survival. The Act is managed by both USFWS (focusing species except marine ones) and NOAA (focusing on marine species). US States also typically identify, study and protect rare, threatened and endangered species under a variety of state statutes.

A species meeting one of the following five criteria can be listed as an endangered species by USFWS or NOAA via an assessment process or under nomination by any individual or organization: (a) habitat or range is or is undergoing destruction, modification, or curtailment, (b) overutilization for commercial, recreational, scientific, or educational purposes, (c) population declining due to disease or predation, (d) inadequacy of existing regulatory mechanisms, and (e) existence of other natural or mandate factors affecting its viability. During the process of listing a species, public notice, comments, and judicial review are required. One of the tasks for USFWS and NOAA is to prepare a recovery plan for an endangered species in which they describe the goals, budget, and estimated timeline to recover the endangered species. According to ESA, once threats are eliminated or controlled, the population size increases, and habitat quality and quantity is stabilized, an endangered species can be delisted. Occasionally, few species are delisted due to unreliable information used when listing them.

During the training, we witnessed several endangered species restoration programs (including some native species restoration examples) discussed below.

### **CASE STUDY: ATLANTIC SALMON RECOVERY IN ADIRONDACK FISH CULTURE STATION**

Adirondack Fish Culture Station (AFCS), situated in the Adirondack Park rears landlocked Atlantic salmon (*Salmo salar*) for stocking throughout New York State. Historical documents show that the fresh water systems in the Adirondacks were abundant with native Northern American Atlantic salmon at one time. As anadromous fish, Atlantic salmon typically spend 2-3 years in freshwater when

they are juveniles and then migrate to the ocean for a 2-3-year stay, finally returning to their natal river to spawn. In the early 1900s, many dams were established in the region, which contributed significantly to the severe population decline of this migratory fish. As a consequence, by the late 1900s, native Atlantic salmon disappeared from their traditional spawning grounds due to the pressures of dam construction and over-fishing. Significant declines in the Atlantic salmon population in the U.S. prompted an endangered listing of the species under the Endangered Species Act in 2000.

As the second oldest of the twelve hatcheries in New York State, AFCS has focused on hatching Atlantic salmon since 1985. To restore the species, wild eggs of Atlantic salmon are first collected from the State of Maine and Sweden, where Atlantic salmon are naturally distributed. To avoid genetic pollution, wild Atlantic salmon and captive human-reproduced Atlantic salmon are raised separately. Every year, AFCS stocks approximately 650,000 fish in more than 50 public waters throughout New York. Of the total salmon stocked by each year, about 325,000 are fry or newly hatched young, 25,000 are fingerlings 3 to 5 the Adirondack Fish Culture Station inches long, and approximately 300,000 are yearlings. AFCS also provides educational opportunities for students in the region. Due to its location in Adirondack Park, environmental-friendly hatchery management criteria are followed by AFCS, e.g., hand feeding, feeding low-phosphorous fish food, and state-of-the-art wastewater treatment.

### **CASE STUDY: REINTRODUCTION OF GRAY WOLF BACK TO YELLOWSTONE NATIONAL PARK**

The gray wolf (*Ganis lupus*) was listed as an endangered species in 1974 due to diverse methods of predator control by ranchers and others, including poisoning. According to the Endangered Species Act, it is mandatory to recover an endangered species so long as appropriate conditions are available. NPS policy states that a native species should be restored as long as they meet the following criteria: (1) sufficient habitat available, (2) external threats can be prevented, (3) the restored subspecies most nearly resembles the extirpated subspecies, and (4) local extinction has been caused by human activities.

Following these criteria, Yellowstone National Park started plans to restore the gray wolf to the park in 1975. As one of the two jurisdiction agencies of the Endangered Species Act, USFWS proposed the Northern Rocky Mountain Wolf Recovery Plan in 1987 to experimentally reintroduce wolves into Yellowstone. Many scientists predicted dire ecological consequences for wildlife (e.g., coyotes, grizzly bears, cougars, mule deer, and so on) as a result of reintroducing gray wolves into their environment. In 1991, USFWS received funds from Congress to develop an environmental impact statement (EIS), in cooperation with NPS and USFS, concerning the restoration of gray wolves to Yellowstone. During the period of EIS preparation from 1991 to 1994, more than 160,000 pro and con statements on the restoration of wolves were received from agencies and the public. It was not until 1994 that the EIS was finally approved by the Secretary of the Interior and the reintroduction of gray wolves into Yellowstone and central Idaho was initiated.

From 1994-1995, staff from Yellowstone, USFWS, and participating states prepared release sites for the reintroduction of gray wolves. One acre release site was enclosed with 9-gauge chain-link fence in 10X10 foot panels. A two-foot overhang and a four-foot skirt at the bottom of the fencing were designed to discourage climbing over or digging under the enclosure. In addition, a small holding area was attached to each pen to prepare for separating a wolf from the group, and plywood boxes were provided to isolate wolves if necessary. At the same time, USFWS finished preparing special regulations on how to manage the experimental population.

Once the preparation work was done, USFWS and Canadian wildlife biologists captured wolves in Canada where the wolves were similar to those that had been in Yellowstone and Idaho before. Thirty-one wolves, with breeding adults and juveniles ranging from 72 to 130 pounds, were introduced into Yellowstone in three groups (14 wolves in 1995, 11 in 1996, and 7 in 1996) and temporarily penned in the enclosure. All reintroduced wolves wore radio-collars for tracking purposes.

Before being released into the wild, the penned wolves were kept away from human contact as much as possible. Scientists monitored them with telemetry or visual observation when placing food, like

dead elk, deer, moose, or bison collected in and around the Park. During the process of reintroduction, several lawsuits objecting to restoration of wolves were filed and consolidated. In 1997, a judge made a ruling based on the suit to “remove introduced wolves and their offspring from Yellowstone and central Idaho.” The Justice Department appealed the case in 2001, and restoration resumed. The available data demonstrates that wolves contribute to a healthier biodiversity in Yellowstone and the Greater Yellowstone Ecoregion (GYE). They prey on elk and bison primarily in Yellowstone and have not become the threat to livestock that ranchers anticipated.

Since 1995, wolf population has ranged between 21-174 wolves in 3-16 packs in Yellowstone. In 2007, there were 171 wolves. In 2008, there were 124 wolves in 12 packs with a decrease of 27 percent, compared with 2007 mainly due to disease, intra-specific wolf, wolf killing, and mange. In addition, the Park is concerned about outbreaks of canine distemper among the wolf population in Yellowstone. With the population increase in the GYE, USFWS delisted the gray wolf from the Endangered Species List for Idaho, Montana, Wyoming, Yellowstone, and Grand Teton National Park in March, 2008 but relisted it in July that same year.

Every year, average economic revenues contributed by visitors flocking to Yellowstone to see the gray wolf are approximately US \$3,500,000. Many corporate and business activities related to gray wolves have grown greatly in Yellowstone. These, in turn, benefit local economic development.

### **CASE STUDY: NATIVE SPECIES RESTORATION IN AMERICAN PRAIRIE PRESERVE**

In Montana, American Prairie Foundation is working together with partners, including World Wildlife Fund (WWF), to restore the American Prairie Reserve (APR). APF has been implementing a series of native species restoration projects in APR since its inception, including American bison, prairie dog, black-footed ferret, and swift fox.

The American bison is the symbol of prairies in America. In the Great Plains, the number of bison has radically decreased from 20-60 million to 500,000 bison wandering in North America today. Less than

4 percent of these bison live in conservation herds. No herds on the Great Plains are free ranging without non-hybridization with domestic cattle. It is estimated that fewer than 7,000 bison of the remaining 500,000 remain non-hybridized genetically with domestic cattle.

In 2005, APF, in cooperation with WWF, introduced 16 pure bison back to the APR next to the Charles M. Russell National Wildlife Refuge in Montana. In 2006, 16 bison gave birth to five offspring in the APR. The bison population now numbers 76 with subsequent reintroductions in 2006 and 2007 and calves born in 2007 and 2008. The bison were introduced from the Wind Cave National Park in South Dakota. To contribute to nationwide bison restoration, one bull with a successful breeding record and a favorable genetic profile in APR will be sent to the Fort Niobrara National Wildlife Refuge in Nebraska. Similar to the gray wolf restoration project in Yellowstone, a comprehensive restoration plan was developed by including advice and comments from renowned scientists and neighboring communities.

To ensure the health and sustainability of the new herd in APR, APF and WWF will continue to translocate bison to APR in the next few years. At the same time, to mitigate the threat to bison from fencing, APF and WWF will continue to remove old barbed wire fence and construct new fences specifically designed to manage bison and to allow for free movement. Radio-collared bison will be monitored to study their behavior in the reserve.

#### **CASE STUDY: NATIVE AND ENDANGERED PLANTS RECOVERY IN HALEAKALA NATIONAL PARK**

The Hawaiian Islands are abundant with rare and endemic species susceptible to extinction. Many plant species are rare and threatened and merit listing. Seven plant taxa formerly native to the Park are known to be extinct, and 15 others have been extirpated from the Park in this century (Loope and Medeiros, 1994). Through an intensive rare plant management program, Haleakala National Park aims to increase the population size of rare species in order to minimize local extinction. From the 1920s to the mid-1970s, native species were grown at the Park. In 1996 the Park started nurseries to propagate some targeted native plants. Luna (2003b) says that there are three

nursery greenhouses in the Park. We visited the research center, rare plant greenhouse consisting of 7 small green houses, a hoophouse, and outdoor nursery benches that are used for hardening plants prior to outplanting. All plants before outplanting are sanitized and tagged.

Cutting and seeds for the nursery are taken mostly from plants within the Park and rarely are special permits issued that allow others to take plants or seeds for collections in adjacent reserves (Luna, 2003b). By 2002, over 60 species, including 11 threatened and endangered species were cultivated at the nurseries in the Park (Tunison, 2002).

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## 2.5 ACRONYMS

<b>AFCS</b>	Adirondack Fish Culture Station
<b>APF</b>	American Prairie Foundation
<b>APR</b>	American Prairie Reserve
<b>APA</b>	Adirondack Park Agency
<b>CAA</b>	Clean Air Act
<b>CAMR</b>	Clean Air Mercury Rule
<b>CAVR</b>	Clear Air Visibility Rule
<b>CWA</b>	Clear Water Act
<b>DEC</b>	Department of Environmental Conservation
<b>DOA</b>	Department of Agriculture
<b>EIA</b>	Environmental Impact Assessment
<b>EPA</b>	Environmental Protection Agency
<b>ESA</b>	Endangered Species Act
<b>FHPP</b>	Forest Health Protection Program
<b>FWPCA</b>	Federal Water Pollution Control Act
<b>GYE</b>	Great Yellowstone Ecoregion
<b>HNP</b>	Haleakala National Park
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>ISAC</b>	Invasive Species Advisory Committee
<b>JBWPPAC</b>	Jamaica Bay Watershed Protection Plan Advisory Committee
<b>NISC</b>	National Invasive Species Council
<b>NISIC</b>	National Invasive Species Information Center
<b>NWRS</b>	National Wildlife Refuge System

<b>OTA</b>	Office of Technology Assessment
<b>HVNP</b>	Hawaii Volcanoes National Park
<b>WBBD</b>	White Bark Blister Disease
<b>WNV</b>	West Nile Virus
<b>WWF</b>	World Wildlife Fund
<b>YNP</b>	Yellowstone National Park

# 3

## **WETLANDS CONSERVATION AND MANAGEMENT**

### **3.1 HISTORY AND TENDENCY**

The value of wetlands has gradually earned global recognition since the 1800s. As important as key global ecosystems, wetlands have been described as the kidneys of our planet, due to the natural cleansing function that they perform. In fact, wetlands are more than just a natural filter. They are also home to diverse wetland-dependent organisms, transition zones between upland and truly aquatic systems, and storage areas for flood flow.

In the past, wetlands were often considered useless because they bred diseases, restricted overland travel, and impeded the production of food and fiber (Dahl and Allord, 1994). Consequently, wetlands have been dramatically and systematically converted or modified for other purposes worldwide, including in the United States. Dahl and Allord (1994) reviewed the history of wetland resources in the United

States (as shown in Table 3.1) and concluded that the contiguous United States lost approximately 119 million acres of wetlands from the early 1600s to the mid-1980s. With the enactment of the Migratory Bird Hunting Stamp Act, the process of acquiring and restoring America’s wetlands was initiated (Dahl and Allord, 1994). It was not until the 1970s that the US citizens started to recognize the value of wetlands, especially their environmental functions. With the increase of wetland awareness on the part of the public and the implementation of policies beneficial to wetland protection in the United States, the rate of wetland loss slowed. Updated statistics on America’s wetland resources during the period from 1998 to 2004 indicate that wetland areas have ceased to decline and have actually begun to increase (Dahl, 2006). The trends of wetlands differ by wetland types in the United States (Fig. 3.1).

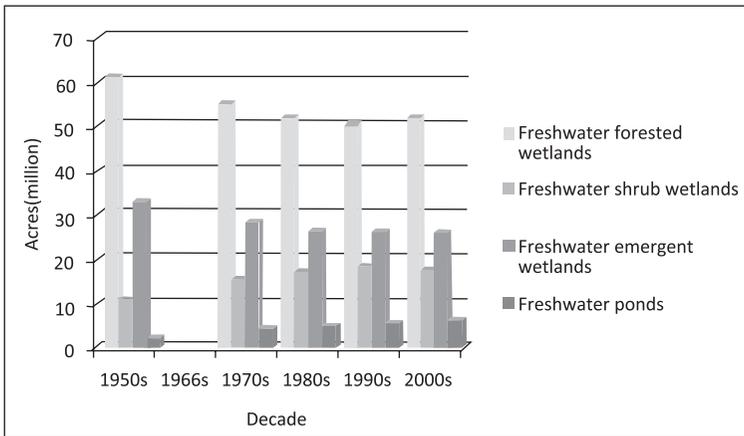
**Table 3.1 History of Wetland Resources in the Conterminous United States during 1600s-1990s**

Period	Main Changes
1600s-1800s	Wetlands regarded as obstacles to development, eliminated or reclaimed for other purposes, started to drain wetlands, pursuing land productivity, wetlands converted to farmland
1800s-1860	Population expansion westward, large-scale wetlands converted to farmland and modified in other ways, e.g., dams
1861-1900	Agriculture moved west and wetlands reclamation prevalent
1901-1950	Technology changes sped up wetland loss, e.g., agricultural drainage, large-scale flood control, diversion dams, water-control structures, urban expansion
1951-present	Values of society on wetland changed, wetland protection and restoration emphasized, wetlands gained, compared with mid-1980s-mid-1990s

Currently, wetland systems are still threatened by dredging, draining, and filling due to urban and agricultural expansion,

contamination, increasing pressure from tourism, water supply and diversion, and influx of exotic plants into the United State (Dahl and Allord, 1994; Johnson, 1994; Gibbs, 2000; Dahl, 2006). In 1989, the “No net loss” wetlands policy was set by President George Bush as the overall goal of wetlands conservation in the United States. Wetland areas have since stabilized at around 134 million acres since then. Conserving and restoring the remaining wetlands as well as creating wetlands has been widely applied to achieve the wetlands conservation goal. In 2004, the Federal Government promulgated a new national wetlands conservation goal focusing on increasing wetlands, enhancing wetland quality, and seeking to advance at least 3 million acres of wetlands across the United States to be restored, enhanced and protected by 2009 (Dahl, 2006).

**Figure 3.1 Acreage of Wetlands in the Lower 48 States of America, 1950s-2000s<sup>1</sup>**



### 3.2 WETLAND DEFINITION AND CLASSIFICATION

Although there is no standardized definition of wetlands in the United States (FECWD, 1989), federal and state agencies generally agree on the factors that must be present to determine a wetland. As the

<sup>1</sup> Data from Dahl, 2006.

principal federal agency inventorying wetland resources in the United States, USFWS adopted the definition and classification scheme developed by Cowardin and others in 1979. Cowardin and others (1979) defined wetlands as *“lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water”*. For purposes of this classification wetlands must have one or more of the following three features: *“(1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non soil and is saturated with water or covered by shallow water at some time during the growing season of each year.”* This definition includes both vegetated and non-vegetated wetlands (e.g., mud flats, sand flats, rocky shores, gravel beaches, and sand bars) (FICWD, 1989). This standard is also used by the Federal Geographic Data Committee as a national standard for wetland mapping, monitoring, and data reporting in the United States.

According to this definition, some habitats associated with water bodies, e.g., ephemeral waters, some farmed wetlands, and deepwater habitats (riverine and lacustrine systems) are not classified as wetlands in the United States, while in some countries, they are. Definitions of wetlands used by the Army Corps of Engineers (ACOE), Environmental Protection Agency (EPA) and National Resources Conservation Service (NRCS) merely include vegetated wetlands although ACOE and EPA regulate the “waters of the United States” which includes unvegetated areas.

### **3.3 WETLAND IDENTIFICATION**

Wetlands are identified in the field for federal regulatory purposes by using the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987). Except where noted in the manual, the approach requires positive evidence of hydrophytic vegetation, hydric soils, and wetland hydrology for a determination that an area is a wetland. Some States utilize the federal manual, while others, like New York State, have developed their own delineation manuals.

Most, if not all, require direct or indirect evidence that the three factors of hydrophytic vegetation, hydric soils, and wetland hydrology are present. In the NYS Adirondack Park, Adirondack Park Agency staff demonstrated to Chinese nature reserve staff the use of these factors to identify the boundary of a wetland. Careful delineation of wetlands is important because it affects the planning practices of a protected area, e.g., permits are required for onsite wastewater treatment systems within 100 feet of any wetland in the Adirondack Park. Accurate and consistent wetland boundary delineations are critical to protect the resource and reduce controversy.

### 3.4 WETLAND REGULATIONS

In the United States, the federal government safeguards wetlands mainly through regulations that go beyond other mechanisms, e.g., acquisition, planning, disincentives for conversion of wetlands to other uses, technical assistance, education, and research (Todd and Muir, 1999). In the United States, the EPA, ACOE, USFWS, NRCS, and the National Oceanic and Atmospheric Administration (NOAA) jointly manage wetlands with their own focused missions (Table 3.2).

**Table 3.2 Jurisdictional Agencies on Wetlands in the Federal Government of the United States**

Organization	Main Responsibility
EPA	Protect wetlands chemically, physically, and biologically due to their link with the nation’s water supply
ACOE	Navigation and water supply
USFWS	Manage fish and wildlife-game species and threatened and endangered species
NRCS	Oversee wetlands affected by agricultural activities
NOAA	Manage the nation’s coastal resources

The Clear Water Act (CWA) is the most far-reaching regulation for wetlands protection in the United States. Section 404 of the CWA protects wetlands through the use of controls on non-point source pollution that impacts off site discharges that could detrimentally impact the wetlands health.

Some other regulations and programs provide supplementary protection, e.g., the Swamp Buster Program (to suspend agricultural subsidies for farmers who convert wetlands to agriculture), the National Wildlife Refuge System Administration Act of 1966, and the Fish and Wildlife Coordination Act of 1965. The Coastal Zone Management Act (CZM) of 1972 and the Coastal Barriers Resources Act of 1982 protect coastal wetlands. The CZM encourages states to develop coastal zone management plans with technical and financial assistance (Todd and Muir, 1999). As a consequence, states play key roles in both coastal and inland wetland regulations in the United States.

Many states have issued their own wetland regulations to strengthen wetland conservation and protection, especially coastal wetlands. Some states regulate activities in freshwater wetlands for sensitive or critical areas through special statutes. For example, New York State promulgated in 1975 the NYS Freshwater Wetland Act that protects the wetlands of the State. Because the Adirondack Park Agency (APA) already protected wetlands under the APA Act, separate jurisdiction over wetlands in the Park was given to the Agency. Special jurisdictional thresholds and protection criteria were given to the wetland systems of the Park. In the United States, states may adopt regulations that are more stringent than federal regulations but may not adopt regulations that are less stringent.

### **3.5 PERMIT, COMPLIANCE, AND ENFORCEMENT**

Regulations are merely words on paper if they are not strictly enforced. First of all, permits are required to conduct some activities in or near wetlands. Section 404 of the CWA authorizes the ACOE to grant permits for specific activities within wetlands and waterways.

Any project influencing wetlands in any state cannot proceed without a §404 permit issued by the ACOE. At the same time, the EPA is empowered to prohibit any activity (including a construction project) if it damages water quality or brings about any other unacceptable environmental aftermath. Generally, the ACOE reviews permit applications to see whether other practical alternatives exist for a specific project, imposes mitigation requirements on the developers, and performs a public interest review. The ACOE also advises whether other environmental laws must be addressed for a specific project. ACOE has the right to deny or condition a project that is not consistent with wetlands protection regulations and laws. Before any project can proceed, ACOE will issue a permit to an applicant as long as they receive a §401 certificate from appropriate state environmental agencies.

The ACOE grants two permits: general permits for projects with minimal impacts and individual permits for projects with major impacts. Applicants have to contact the ACOE and state environmental agencies to receive professional guidance on which type of permit they should apply for. Field visits are usually conducted before specific guidance is provided by the ACOE or state environmental agencies. Applicants can then fill in permit application forms and send them to the ACOE for review. In addition, the ACOE seeks comments from the public, special interest groups, local agencies, and relevant state and federal agencies before making a final decision. Sometimes, additional information is requested or public hearings are held before a final decision is made.

Once a permit is granted, the ACOE and EPA have shared responsibilities to enforce it. After-the-fact permit applications cannot be initiated until all juridical proceedings are finished, including payment of all fees, fines and completion of all work requested by the court.

### **CASE STUDY: WETLAND PERMITS COMPLIANCE IN THE NEW YORK STATE ADIRONDACK PARK**

The State of New York has comprehensive regulations on wetland protection statewide and a layer of more specific regulations for

wetland conservation in the Adirondack Park. The Adirondack Park has been awarded several Environment Protection Agency (EPA) grants to develop a permit compliance review process aimed at discouraging people from non-compliance with their permit. The Adirondack Park Agency has implemented the process and is checking permit compliance for contemporary as well as historical permits. They started issuing wetland permits since 2000. About 800 wetland permits have been monitored and some of the findings indicating that in some instances, permit language was vague or not enforceable. This has resulted in revisions to the permit language to increase and strengthen enforceability going forward.

APA staff is now trained in compliance in addition to using GPS applications that include the use of handheld data collection units with GPS capabilities. This allows staff members in the field to download permits and access coordinates and other resource information. Those in the field often prepare a backup paper file of the permit to use with the permittee during site visits.

The trained staff members conduct field visits to check permit data and requirements with the actual project in the field. If a permit is in compliance then the case is closed. If the permittee is not in compliance with the permit then the staff will work with the permittee to resolve onsite minor violations, or if it is a major violation, they will turn it over to the APA's Enforcement Division. Among 246 cases examined in the field using this technology, 91% were in compliance with the permit conditions.

APA staff also developed a compliance manual and forms to assist members of the public in applying for permits and complying with their permits once they were granted, as well as a compliance review guide for future staff. Landowners are given a contact person to go to if they have any questions or need clarification on their permits. This provides for continued APA involvement in the implementation of the permit rather than leaving landowners on their own which was the practice in the past. The new system also allows the APA to monitor the permit on site which aids in preventing unintentional violations. Once again the tool of educating the user is key to minimizing the expense of enforcement.

## **3.6 WETLAND CONSERVATION STRATEGIES**

### **3.6.1 INTRODUCTION**

The conversion and degradation of wetlands are two critical stresses endangering America's wetlands. Wetland conversions were mainly attributed to agriculture, silviculture, and urban and rural development (Dahl, 2000; Dahl, 2006). Agricultural uses accounted for 66 percent of total wetland losses in the United States from 1954 to 2002 (Hansen, 2006). From 1988 to 2004, an estimated 39 percent of cumulative wetlands losses were due to urban development, 22 percent to rural development, 8 percent to silviculture, and 31 percent converted to deepwater habitats such as harbors (Dahl, 2006). Degradation of wetlands usually results from pollution (Neely and Baker, 1989), extensive invasion of invasive species (Doren and Jones, 1997), fragmentation (Pinder and Witherick, 1990), and vegetation change (Watson, 2004).

Regulations and laws for wetlands are the main vehicles for wetlands conservation and protection. Improving public awareness through environmental education is also regarded as a fundamental strategy to save the wetlands (The Conservation Foundation, 1998). Wetlands degradation can be mitigated with conservation strategies described in Chapter 2 for pollution, habitat fragmentation, exotic invasive species, and so forth. The real challenge for wetland conservation is to stop wetland losses and to gain back the ecological and biological functions of converted wetlands. Therefore, wetlands restoration has been identified as an effective and priority strategy for wetlands conservation. The United States has set the goal of beyond "no net loss" for wetlands and has planned to restore wetlands to at least 3 million acres by 2009.

Wetlands are interdependent, with landscapes linked together through hydrological systems. For example, a dam upstream in a river might greatly influence wetlands downstream. A large portion of America's wetlands have been irretrievably lost due to the cumulative effects of human-induced activities, e.g., dams, land use change, or spatial changes of wetlands (Bedford, 1999). Few wetland creation

projects have yet to be successful (Bottum, 2004). That is to say, only a small percentage of converted wetlands could be restored with acceptable labor and material costs. However, conservation and restoration of relatively intact wetlands are the most efficient and economic way to protect wetlands (Stevens and Vanbianchi, 1991). Accordingly, Americans have also developed economic incentives for wetland conservation, e.g., the Swampbuster Program, wetland mitigation banking, and the Wetland Reserve Program through the acquisition of permanent and 30-year easements to restore and protect degraded wetlands.

## **3.6.2 WETLAND RESTORATION**

### **3.6.2.1 INTRODUCTION**

The aim of wetland restoration is to rehabilitate degraded wetlands or to reestablish destroyed wetlands at their former locations (Kentula, 1999). Wetland restoration has been treated as an effective way to gain wetlands on both public and private lands in the United States (Zinn and Copeland, 2002). The NPS, USFWS, USFS and BLM have restored wetlands within their land jurisdictions (Dahl, 2006). Different agencies have put forward a myriad of programs and activities to promote wetland restoration, and many NGOs have actively contributed to wetland restoration on conservation lands (Dahl, 2006). Under the efforts of all conservation entities, an estimated 420,300 acres of wetlands were restored during the period between 1998-2004 in the United States (Dahl, 2006).

To restore a wetland, a well-designed restoration plan is a key step to success. As stated above, not all destroyed wetlands can be restored. Therefore, only reversible conversion sites (e.g., former agricultural lands) should be selected as restoration sites (Bedford, 1999). Wetland restoration can involve either the complete rehabilitation of a wetland to its original condition or only partial rehabilitation. However, the goals of a restoration depend on available information regarding the targeted site (Bedford, 1999). Usually, wetland landscape profiles, including hydrogeomorphic

classes, hydrogeologic and climate settings, wetland-landscape linkages, wetland ecosystems, and their geographical analysis should be reviewed to determine restoration goals. Early land surveys, aerial photographs, botanical records, and historic impact assessments all help to re-establish the past condition of a wetland (Bedford, 1999). In addition, restoration should proceed based on a restoration template developed with existing knowledge of topography and surficial geology, hydro-geological principles, hydro-geomorphic class, and the best examples of wetlands occurring in each hydro-geologic/hydro-geomorphic setting as reference (Brinson and Rheinhardt, 1996; Cole *et al.*, 1997).

This approach is useful to restore wetland function(s). The spatial boundary of a wetland restoration should systematically consider requirements from ecological, hydrological, biogeochemical, and geographical perspectives (Bedford, 1996). Landscape diversity and profiles, including species types, numbers, relative abundances, and distribution to be restored should be considered and accounted for during the restoration planning process (Bedford, 1999). A systematic process for wetland restoration—site selection, determining boundaries in time and space, and landscape biodiversity—is time-consuming, and significant data is required. As a result, some prefer to restore wetland types with simple ecosystems and few technical requirements, such as emergent marshes and open waters (Dahl *et al.*, 1991). Wetland restoration might involve simply regaining partial functions of the wetland rather than full rehabilitation that might have occurred at an earlier time. Under most circumstances, the landscapes and watersheds have been too modified to restore a wetland completely to its previous condition.

Crissy Field encompasses more than 80,000 acres and is part of the Golden Gate Parks System in California. Much of the land was previously used by the military as an airfield. During the base closing process, the land was undertaken by the national legislature with the federal government turning the area over to California for use as open space. The area consisted of hangars and runways when it was turned over. The Golden Gate Parks Conservancy (GGPC), established in 1981, has been in charge of the development and operation of Crissy Field for 26 years. Crissy Field Restoration successfully rehabilitated the

old airfield to its original marshland state. The restored marshlands include an 18-acre tidal marsh linked to the San Francisco Bay and 16-acres of dune habitats supporting more than 105 plant species and many migratory birds.

The Crissy Field Restoration happened in four phases from 1998 to 2001. These phases included remediation, recycling, restoration, and renewal. The remediation phase included removal of the asphalt, buildings and cleaning up of toxins. The Recycling phase included recycling the materials from the remediation either onsite or offsite. Materials were recycled where appropriate to create new pathways which recycled 70 acres of asphalt. The project also recycled 2 miles of fence and 25,000 cubic yards of rubble. The restoration phase included creating an 18-acre tidal marsh, restoring 16 acres of dunes, replanting 37 acres of native grasses, replanting 120,000 native plants, restoring 800 lineal feet of beachfront and restoring the 28 acres of meadows according to contouring and planting programs designed and set up by biological staff, designers, engineers and other experts. Now, GGPC is monitoring the health of the restored wetlands. Even after the marsh was established on the former pacific flyway, no wildlife was attracted to the area due to continuing contamination. After removal of asphalt and planting native vegetation, 49 birds were recorded just in mud puddles and now with full restoration 129 active species have been recorded. The renewal phase included lots of public input regarding the uses and lasting value of open space. The final plan accommodates multiple users and provides for volunteer and donor involvement.

The key to the success of this restoration was that the community envisioned and worked toward the successful restoration of the 100-acre project. To make all this possible, a major marketing campaign was undertaken that included advertisements and mailings to tell communities that their involvement was vital to ensure the long-term success of the restoration project. Accordingly, planting and other volunteer activities were designed for local communities to ensure that all involvement efforts were visible and included all ages. In the end, over 1,500 adult volunteers and 450 youth were recruited, which resulted in broad community support for the project.

## **CASE STUDY: FIGHT WITH CLIMATE CHANGE—JAMACIA BAY NATIONAL WILDLIFE REFUGE RESTORATION PROJECT**

As a wetland next to one of the largest metropolitan areas in the world, New York City, Jamaica Bay benefits not only wildlife but also more than 20 million urban people living and working in the region. Jamaica Bay is seriously threatened by climate change and, at the current rate of loss, is projected to disappear in 2012.

In order to prevent the loss of this important area the ACOE joined NPS, NRCS, New York Department of Environmental Protection, New York Department of Environmental Conservation as well as the Port Authority of New York and New Jersey to save the marshlands through an ambitious restoration program. The Jamaica Bay Study Area Report for the Hudson-Raritan Estuary Environmental Restoration Feasibility Study was completed by the ACOE in 2004. In this report, information beneficial to designing a wetland restoration project, including study area setting, history, existing land and water usage, and natural resources conditions were analyzed. The report also clearly addressed the restoration goals in Jamaica Bay as follows: (a) restore existing wetlands, (b) prevent additional wetland loss, (c) fill borrow pits, (d) create intertidal mudflats and shallow water habitat, and (e) remove invasive species (ACOE, 2004).

The project was kicked off in the spring of 2006. Two simulated marsh islands were shaped with 250,000 cubic yards of dredged sands onto Elders Point East with an area of 43 acres and 240,000 cubic yards of dredged sands onto Elders Point West with an area of 34 acres according to contouring planning. After the invasive species, e.g., common reed and common lugworm, were removed, native plants, including salt marsh cord grass, salt hay, and spike grass were planted by hand on the marsh islands. The restoration will help to mitigate the fragmentation of marsh habitats in the Elders point areas. The total investment for this restoration exceeds \$ 30 million. A New York State protected species—Diamondback terrapins—were sited as using the restored wetland at Elders Point East in 2010, which is a biological sign of the success for wetland restoration in the Jamaica Bay.

## **CASE STUDY: ERADICATE EXOTIC SPECIES—SALT MARSH RESTORATION IN THE NEW JERSEY MEADOWLANDS**

New Jersey Meadowlands is the largest brackish water complex in the New York/New Jersey Harbor Estuary and is increasingly vital to fish and wildlife resources at the regional, national, and international levels. However, the site was converted from its original cedar swamp ecosystem to a tidal marsh with sedges and cordgrass due to extensive ditching and draining (Vermuene, 1986). Furthermore, the establishment of the Oradell Reservoir in 1922 reduced freshwater flow, which contributed to the conversion of the tidal marsh to a brackish or salt marsh. It is infeasible to restore the wetland to its original cedar swamp ecosystem due to irreversible regional disturbances at the landscape scale (Bontje *et al.*, --). According to Bontje and others, the site was seldom used by wildlife before its rehabilitation due to low quality habitats dominated by common reeds that have a negative effect on wildlife use of coastal areas. This invasive species is not only a poor food source but its tall and dense stems prevent ducks and other waterfowls from landing.

Restoring the site to an open brackish marsh was chosen through studies as the most viable alternative to the other two alternatives—a freshwater marsh and closed brackish marsh - required manipulation of the water table and maintenance of structures, e.g., dams. The 14-acre restoration project included 9-acres of intertidal areas, about 2-acres of tidal channels and 3-acres of upland berm areas. Bontje and others summarized the restoration process as follows.

Four steps were taken to restore the wetlands (Bontje *et al.*, --). First exotic plant eradication (e.g., common reeds) were eradicated through twice aerial spraying of the herbicide Rodeo in the spring (March 15-May 15) and fall (August 15-October 5) of 1989. Second, earthmoving equipment was used to excavate soil and other sediments to ensure that the final elevation of the site would fall into the intertidal range. Third, 2-4 foot deep channels 10 feet in width at the bottom and 20-30 feet wide at the top were drained to maximize tidal flushing across the new marsh. After excavation, the salt marsh cordgrass within peat pots (3-4 stems per port) was planted at three-foot centers along with nitrogen fertilizer. A few months later after

the restoration, egrets, sanderlings, gulls, ducks, and the endangered Northern harrier (*Circus cyaneus*) were found foraging and resting in the restored marsh. The success of the restoration was due to close cooperation between biologists, engineers, lawyers, planners, construction personnel, and supportive local agencies.

### **3.6.3 WETLAND MAINTENANCE**

The most important factor in wetland maintenance is water in sufficient quantity and quality at appropriate times throughout the year to allow wetlands to persist. This water or “hydrologic regime” is critical in the formation and persistence of naturally occurring wetlands and thus, is of paramount importance for any entity trying to restore or rehabilitate a converted or degraded wetland. The overwhelming majority of wetland restoration projects are designed to be self-sustaining as much as possible (Kusler and Kentula, 1990). Some projects, however, still need certain kinds of follow-up management to assist them in fulfilling their functions in protected areas, especially as habitats for wildlife.

Water regime in wetlands can be classified as intermittent, temporary, seasonal, semi-permanent or permanent ones. Water regime can determine wetland vegetation in wetlands. Natural wetlands generally experience both wet and dry cycles. However, due to landscape changes, natural flooding is often no longer occurring. Under such circumstances, the manipulation of water levels in some wetlands is adopted to mimic natural flooding in order to manage wetland vegetation. The Bowdoin National Wildlife Refuge has enhanced natural and created wetlands with this tool. The refuge installed water control structures to adjust water levels of some wetlands so as to create productive habitats for wildlife.

Some restored wetlands might be occupied by plant species that decrease the quality of the habitat. In the Bowdoin National Wildlife Refuge wetlands, for example, cattails provide good cover and nesting habitats for certain wildlife. However, when cattails develop into a monoculture over much of the wetland, the wetland may no longer be suitable for the widest variety of wildlife because of simplification of the habitat. The Bowdoin National Wildlife Refuge

has taken several measures to manage cattails in order to maintain the heterogeneity of the area, for example, water level manipulation, prescribed burning, grazing, and chemical spraying (e.g., aquatic glyphosate-based herbicide under particular conditions). The water level is usually kept 3-4 feet deep long enough to suffocate the cattails. If the cattails are burned, farming equipment usually digs up the root system afterwards. Otherwise, cattails will come back after burning because their strong root system has not been damaged.

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## **3.8 APPENDIX**

### **3.8.1 FRESHWATER REGULATIONS FOR THE NEW YORK STATE ADIRONDACK PARK**

*This is a supplement to the Citizen's Guide which provides basic information about Adirondack Park Agency regulations.*

#### **Freshwater Wetlands**

(December 17, 2008)

Agency regulations implementing The New York State Freshwater Wetlands Act requires that an Agency permit be obtained for the

following activities whether or not they occur within the wetland:

1. Any form of pollution directly in, or which drains into, the wetland, including application of pesticides or discharge of sewage effluent or other liquid waste into, or so as to drain into, the wetland;
- 2 Installation of any on-site sewage drainage field or seepage pit or any sewer outfall in, or within 100 feet of a wetland;
- 3 Any other activity which harms the wetland, including diversion of surface or subsurface drainage or natural water flows, or which substantially increases erosion of, or siltation or sedimentation into the wetland.
- 4 Subdivision involving wetlands, including creation of a lot which contains wetlands (including the parcel proposed for the subdivision road) and any proposed lot adjoining a lot containing wetlands, and all land use and development related to these lots.

If all of the lots meet the following criteria the subdivision will not be considered a regulated wetland activity:

- all proposed boundaries are located at least 200 feet from any wetland.
- all subdivision roads providing access to more than one lot will be located at least 50 feet from any wetland.
- all access roads will not cross wetlands and will not cause adverse impact to wetlands
- any lot containing a lawfully existing principal building will also contain its associated on-site water supply, wastewater treatment system, and an adequate replacement site for the on-site wastewater treatment system which is located at least 100 feet from the wetland.
- the landowner proposing the subdivision must obtain a written jurisdictional determination from the Agency to take advantage of this exemption.

An Agency permit is required for the following activities if they take place within the wetland itself:

1. Draining, dredging, filling, or depositing soil, stones, sand, gravel, mud, rubbish or fill of any kind, either directly or indirectly;

2. Erecting structures, building roads, driving pilings, or placing any other obstructions, whether or not they change the pattern or flow or elevation of the water;
3. Clearcutting more than three acres.

The Agency will determine the exact location of wetland boundaries on your property if you are contemplating a subdivision or other new land use or development. Certain activities may be eligible for approval by General Permit.

Please be aware that this flyer is only intended to provide general information regarding Agency jurisdiction. If an Agency permit is required (or if the property has previously been subject to Agency review) then other restrictions may apply.

## **WETLAND IDENTIFICATION AND IMPORTANCE**

### Deep Water Marsh

Areas of open water filled with plants that float freely or are rooted are called deep water marshes. The leaves of the rooted plants are either submerged or floating. Such plants as pondweeds, duckweeds, and wild celery are important food for waterfowl. The shallow waters of a deep water marsh and the protecting vegetation make them important areas for fish spawning and nurseries.

### Deciduous Swamp

These are wetlands where the cover type contains mostly live deciduous trees, twenty feet or more in height. The trees grow on hummocks or in seasonally or permanently flooded areas. Swamp maples and willows are evident in lowland deciduous swamps. These swamps are spotted with dead trees which are used by flying squirrels and chickadees. The swamps provide a habitat for nesting waterfowl and a great variety of birds and wildlife. Their soils are usually very fertile, promoting rapid plant growth and a wide diversity of plants and animals. Because these swamps filter great quantities of water, they play a very important role in purifying water and maintaining high water quality.

### Wet Meadows

Wet meadows are wetlands where most of the cover is composed

of sedges, rushes, and coarse grasses, most of which tend to grow in clumps. Groundwater is at or near the surface for much of the year, including significant parts of the growing season, creating saturated soils. These meadows are often found in the flood plains of lakes and rivers and in the areas once flooded by beaver dams or other impoundments. Their soils are mostly mineral in structure.

### Bog

A bog is a closed wetland from which drainage is either extremely slow or absent and where the vegetation grows on a saturated mat of peat. The mat sometimes covers the entire surface of a shallow pond; sometimes it covers only a portion, leaving open water. The peat is formed by species of sphagnum moss which die, but do not decay because of the acidity and low oxygen levels of the bog. All processes in a bog including nutrient recycling are slowed down by the stagnant acid water. This is why bogs are so sensitive. It takes centuries to recover from disturbance.

### Emergent Marsh

Emergent marshes are shallow wetlands that are flooded with standing or running water much of the year. Their cover consists of such plants as cattails, bulrushes, pickerel weed, loosestrifes, and arrowheads. Emergent marshes have the most valuable cover type and one of the highest levels of productivity and habitat diversity. Not only does the vegetation in these wetlands provide nesting habitat, food, and cover for many waterfowl and other wildlife, but it adds large quantities of nutrients to food chains. These marshes are attractive to muskrat, ducks and geese, herons, and egrets, mink and deer.

### Shrub Swamp

A shrub swamp is a wetland where woody shrubs, less than twenty feet in height, make up most of the cover type. Shrub swamps are often found in floodplains, in frost pockets and other depressions, on the edges of ponds, lakes and bogs, along meandering streams, and in hillside drainages. These areas have two things in common: fresh water flowing through them and a high level of productivity. Alders, hollies and viburnums typify these swamps and have berries which

are eaten by a wide variety of birds. The shrubs are the nesting habitat of such diverse species as the rose-breasted grosbeak and kingbirds, and game birds, including woodcock, pheasant and grouse. It is also the habitat of beaver and otter, and waters adjacent to shrub swamps are essential to spawning northern pike.

### Coniferous Swamp

A coniferous swamp is a wetland where most of the plant cover consists of live coniferous trees over twenty feet in height. The trees often grow on hummocks in deep organic deposits with pockets of water or sphagnum moss between them. Coniferous swamps are most important because they give off large quantities of water over much of the year. In summer, this process helps keep surrounding soil temperatures low. This, combined with the cooling effects of the swamps dense shade helps maintain low water temperatures critical to the survival of cold water fish in streams running through these swamps. The shelter offered by coniferous swamps creates clear wintering fields so important to the survival of deer and other animals and birds.

## 3.9 ACRONYMS

<b>ACOE</b>	Army Corps of Engineers
<b>CWA</b>	Clear Water Act
<b>CZM</b>	Coastal Zone Management
<b>EPA</b>	Environmental Protection Agency
<b>FICWD</b>	Federal Interagency Committee for Wetland Delineation
<b>GGPC</b>	Golden Gate Parks Conservancy
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NRCS</b>	National Resources Conservation Service
<b>NYSAPA</b>	New York State Adirondack Protection Agency
<b>SCS</b>	Soil Conservation Service
<b>USFWS</b>	United States Fish and Wildlife Service

# 4

## VISITORS AND OUTREACH

Public use of parks and protected areas has a long history in the United States, and it directly impacts upon important economic, social, cultural, and environmental issues (Eagles *et al.*, 2000). First, outdoor recreation in conserved areas provides major contributions to local and regional economies (Hardner and McKenney, 2006) and also financially supports protected areas management. For the National Park System, Hardner and McKenney (2006) found that the economic benefit of recreational park visitation in 2004 was US \$10.1 billion. According to the statistics of the National Association of State Park Directors, American state parks collectively have an average of US \$20 billion economic impact on communities annually. In Yosemite National Park, the entry fee of US \$20 per car generates about US \$15 million in revenues per year. Of this amount, Yosemite National Park keeps 80% of the money raised from the entry fee, using it primarily for infrastructure work, while the remaining 20% goes to other parks that are less able to generate sufficient income for their needs. All revenues created by recreational activities stay with the park system. This money is in addition to the federal money (managed in special accounts or trust funds, as mentioned in Chapter 1) received

by a specific park. Second, outdoor recreation in park/conservation areas contributes to healthier, more active lifestyles for people of all ages. Third, because of the population explosion and the popularity of outdoor recreation, there is a growing challenge to manage the environment of protected areas for recreation experiences (Monz *et al.*, 2010).

The goal of protected areas management in the United States is to ensure that the public has a large variety of opportunities to enjoy nature, while at the same time supporting its preservation. Providing recreational opportunities for the public are shared mandatory management objectives for managing agencies of protected areas at different institutional levels. Management agencies of protected areas have not only invested in visitor services and facilities to enhance the experience of visitors, but have also conducted a series of outreach programs to create opportunities for the public to enjoy nature in protected areas. For example, 127 million people participated in more than 605,000 special events and ranger programs organized by the NPS. More importantly, the management authorities of protected areas in the United States highly value every opportunity for children to understand and experience nature and wildlife. Every management agency of protected areas has its own star program that aims to bring children close to nature, e.g., the “Junior Ranger” program, created by the NPS, and “Let’s Go Outside,” promoted by the USFWS.

In this chapter, we will illustrate different aspects of recreational activities in American protected areas, including management of visitors, visitor services and facilities, and public outreach, by highlighting some typical protected areas that we visited during the three-year CPALAP training.

## **4.1 RECREATION MANAGEMENT IN PROTECTED AREAS**

Although outdoor recreation in protected areas provides many opportunities for increasing revenues and gaining public support, it also brings about management issues for protected areas because the presence and activities of visitors can cause some problems for

biodiversity conservation (Candrea and Ispas, 2009). Some national parks have almost been loved to death by flocks of visitors, e.g., Hanauma Bay Nature Preserve in Hawaii. Excessive crowds can have a huge negative impact on the quality of the visitors' outdoor recreation experience, as well as on the environment. In addition, adventures in nature are generally not free from danger. Visitors' safety is an issue that cannot be avoided by managers of protected areas when outdoor recreation is mentioned. Therefore, effective management of the behaviors of visitors helps not only to minimize negative impacts on natural resources and biodiversity, but also to increase the security of visitors.

#### **4.1.1 RECREATION AND PROTECTED AREAS**

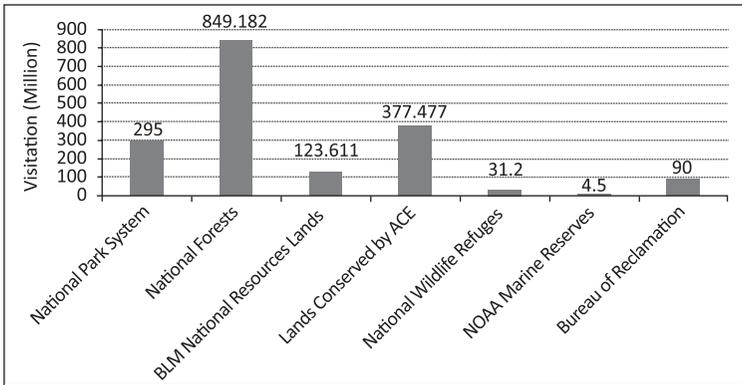
Besides preservation, providing opportunities for recreation is another principal management goal for protected areas on public lands in the United States (Vincent, 2004). For example, the Organic Act (1916) states that the fundamental purpose of the NPS *"is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."* Congress also enacted the provision to provide for public enjoyment and recreation as compatible, as a priority for the National Wildlife Refuge System managed by USFWS in 1997 (Vincent, 2004). BLM's organic act clearly addresses its function in providing recreational opportunities as follows: *"...that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use...."* Similar statements can be found in documents relevant to other protected area categories in the United States, e.g., state parks, marine management districts, and so forth.

Outdoor recreational opportunities on conserved lands have grown significantly in the United States since 1960, and include activities such as camping, hiking, biking, bird-watching, and skiing (Cordell, 2008). Figure 4.1 illustrates outdoor recreational visitation on conserved federal lands managed by different management authorities in 1996. The annual recreational visits to the National Park System amount to between 275 million and 300 million (NPS,

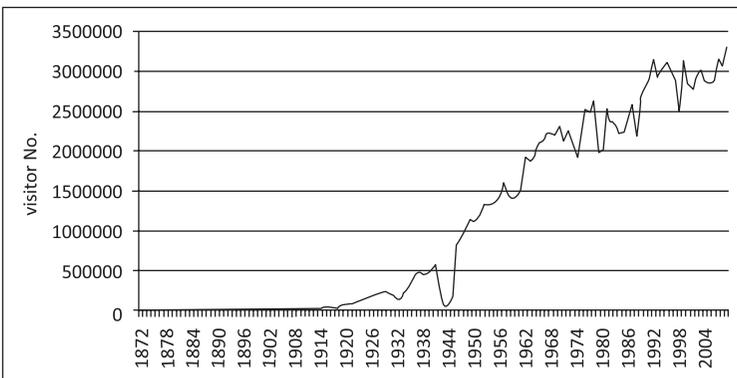
2008). The change in the number of visitors to Yellowstone National Park clearly shows the trend for increased recreational use and visitor access to protected areas in the United States (Fig. 4.2).

However, not all protected areas are as popular with visitors as others. The most popular park units in the National Park System in 2007 are listed in Table 4.1. The visitor numbers for the 15 park units listed in Table 4.1 account for 33.09 percent of the total visitor count of the National Park System in 2007, which tells us that management of recreational activities in some park units is more challenging than in others.

**Figure 4.1 Conserved Lands Visitation in the United States, 1996<sup>1</sup>**



**Figure 4.2 Visitor Statistics in Yellowstone National Park, 1872-2009<sup>2</sup>**



1 Data from Eagles *et al.*, 2000.

2 Data from <http://www.yellowstone.national-park.com/stats.htm>

**Table 4.1 15 Most-visited National Park Units of the United States, 2007<sup>1</sup>**

Nominated Name of National Park Unit	Visitor No. (million)	Percentage
National Park System	275.6	
National Parks (Top10)	36.24	13.15%
Great Smoky Mountains National Park	9.37	3.40%
Grand Canyon National Park	4.4	1.60%
Yosemite National Park	3.5	1.27%
Yellowstone National Park	3.15	1.14%
Olympic National Park	2.99	1.08%
Rocky Mountain National Park	2.89	1.05%
Zion National Park	2.66	0.97%
Grand Teton National Park	2.59	0.94%
Cuyahoga Valley National Park	2.49	0.90%
Acadia National Park	2.2	0.80%
Other National Park Units (Top 5)	54.95	19.94%
Blue Ridge Parkway	17.35	6.30%
Golden Gate National Recreation Area	14.4	5.22%
Gateway National Recreation Area	8.8	3.19%
Lake Mead National Recreation Area	7.6	2.76%
Delaware Water Gap National Recreation Area	6.8	2.47%
Subtotal	91.19	33.09%

<sup>1</sup> Data from <http://www.npsca.org/parks/visitation-2007.html>

#### 4.1.2 ECOLOGICAL IMPACTS OF OUTDOOR RECREATION

Outdoor recreational activities, including nature-based tourism (ecotourism), has been identified as contributing to ecological changes in protected areas by negatively influencing the soil, vegetation, wildlife, and water quality (Monz *et al.*, 2010).

Ecological changes of vegetation and soil have long been noticed, due to relatively visible disturbances from outdoor recreational activities and resulting mainly from trampling (e.g., Dale and Weaver, 1974; Cole and Spildie, 1998). Trampling impacts from hikers, campers, horses, and vehicles on vegetation and soil happen at campsites and on trails in direct or indirect forms (Cole and Spildie, 1998). The key impacts of trampling on vegetation and soil include reducing plant biomass, altering species composition, and eroding, as well as compacting the soil (Hammitt and Cole, 1998; Sun and Liddle, 1993; Cole, 2004).

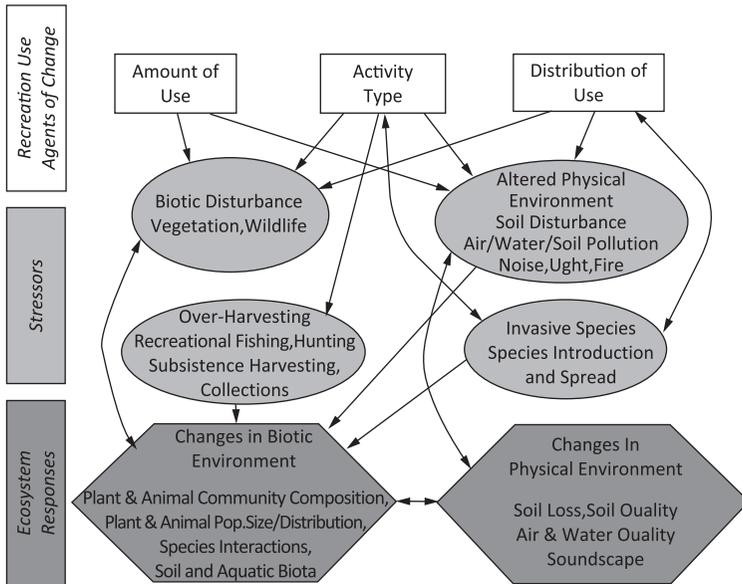
The various changes of vegetation and soil resulting from recreational uses can further influence the aquatic environment, e.g., sedimentation (Monz *et al.*, 2010). Trampling on sea grass assemblages and marine rocky shore communities produce impacts on certain marine fauna and flora (Brosnan and Crumrine, 1994; Eckrich and Holmquist, 2000). Trampling destroyed coral reefs in the Hanauma Bay Nature Preserve in Hawaii once upon a time. For marine environments, the use of motorboats and personal watercraft has proven to cause pollution, as well as damaged submerged aquatic vegetation, and disturbed marine fauna (Currey, see email site in back). This explains why the USFWS does not allow personal watercraft to be used in its national wildlife refuges. Similar phenomena have been discovered in freshwater deep waters where there is recreational power boating and water skiing. (Mosisch and Arthington, 1998). Research on marine recreational fishing in California and Hawaii has demonstrated that these activities has potentially contributed to the decline in the population size of certain fishes, resulting in the further decline of some marine animals that prey on these fish (Helvey *et al.*, 1987).

Viewing and photographing wildlife is the dominant outdoor

recreation activity form of which might cause energetic and physiological stresses for animals (Bélanger and Bedard, 1990). As traditional outdoor recreational activities, hunting and trapping have the potential of reducing reproduction rates, population size, population structure, and diversity of targeted game, in addition to scaring animals in the wild (Burger, 1995; Gutzwiller, 1995). Finally, human-wildlife interaction, including feeding animals or leaving leftovers in the open, may change the behavior of animals, resulting in having to relocate some problem animals from their original habitats (Anthony *et al.*, 1995). It goes without saying that most outdoor recreational activities, e.g., hiking, wildlife viewing, and boating, affect sensitive animals in the wilderness and other protected areas (Steidl and Anthony, 2000; Steidl and Powell, 2006).

Monz and Leung (2006) developed a conceptual model to illustrate how recreational activities in protected areas influence ecosystems (Fig. 4.3). This diagram shows that the type of recreational activity, spatial and temporal distribution of use, and usage extent collectively wield influence on biotic and physical environments and biodiversity conservation in protected areas. The development of visitor services and facilities in protected areas imposes certain negative impacts on biodiversity conservation. This is why any construction project implemented within protected areas must conduct an environmental impact assessment to assess if it should proceed as well as what mitigation should be put in place to reduce or prevent the anticipated negative impacts. Under such situations, an agency mandates a call for minimized facility development and site engineering, if possible. To reduce the negative impacts of excessive hotels and campsites in some fragile areas, actions such as those taken in Yellowstone National Park where some hotels and camp sites were removed may be considered. Plans for constructing park facilities should be well thought out and strictly followed by managers of protected areas to minimize their impacts on the natural environment and associated biodiversity. An illustrative case study relating to the New York State Adirondack Park follows Figure 4.3.

**Figure 4.3 A Conceptual Framework of the Ecological Influences of Outdoor Recreation<sup>1</sup>**



**CASE STUDY: NYS ADIRONDACK PARK—DOWNHILL SKI FACILITY DEVELOPMENT AT WHITEFACE MOUNTAIN**

The Forest Preserve lands within the Adirondack Park are large, discrete, relatively intact blocks of forest. Each large block is called a “unit”. All Forest Preserve units have a “Unit Management Plan” (UMP) that is a written plan that guides management activities within the unit. The downhill ski facilities at Whiteface Mountain are classified as an Intensive Use area. All construction activities that are to take place within the unit must be included in the UMP. In addition, proposed construction activities, such as ski trails, snowmaking facilities or ski lifts, must go through an environmental review and receive the necessary permits prior to construction. If wetlands are involved in the project, a permit from the Adirondack Park Agency is required. As managers of the state land unit, the Olympic Regional Development Authority (ORDA) must apply for the required permits and submit

<sup>1</sup> Adapted from Monz and Leung, 2006.

the proposed action for State Environmental Quality Review Act (SEQR) review. Both the Adirondack Park Agency permit and the SEQR review attempts to balance the need for economic stimulus with the protection of the unique environment for future generations. The process includes public notification to understand the public's concern regarding the proposed project. One such proposal sought to withdraw water from the AuSable River that runs through the unit in order to make artificial snow for the ski center. The SEQR allowed the public and environmental NGO's to learn about the project and provide comments on the potential impacts of this proposal. After the review, a weir (a small dam) was built in the river to provide the necessary depth from which to withdraw water. Several recommendations made during the SEQR process were incorporated into the project to protect water quality and the fish habitat. This solution seems to have met the needs for snowmaking as well as provided environmental protection. With adequate water supplies to create artificial snow, ORDA then proposed to expand the number and extent of ski trails on the mountain to remain competitive in the ski industry. Environmental analysis determined that the footprint of the proposed new ski trails fell within a nesting habitat of Bicknell's thrush (*Catharus bicknelli*). To mitigate these impacts, ORDA spent a year locating the thrush's entire nesting habitat and designed the ski trails to avoid these areas. In addition, construction of trails was done while the birds migrated to Costa Rica for the winter. However, such actions could not avoid the fact that the habitat for this kind of bird was shrinking. As part of its mitigation actions, ORDA created a partnership with environmental organizations to permanently monitor its habitat, to educate the public about the bird through displays describing this project located in several locations at Whiteface Mountain, and to help protect its wintering grounds in Haiti and the Dominican Republic.

Although some impacts from outdoor recreational activities are minor and temporary, their cumulative effects are enormous and sometimes fatal, such as trampling on fragile ecosystems of coral reefs. Outdoor recreation in protected areas is a very popular activity in the United States (Fig. 4.1). Visitation to protected areas in the United States has been on the increase. Therefore, the topic of

how to manage visitors in order to prevent recreation impacts from exceeding thresholds of tolerance has become an important issue for managers of protected areas and the general public in the United States.

### **4.1.3 STRATEGIC APPROACHES FOR VISITOR MANAGEMENT**

With increasing recreational demands for protected areas, effective management of visitors must meet two primary mandates— (1) conservation of resources, and (2) recreation provision (Candrea and Ispas, 2009). Visitor management can either focus on unrestrained visitor activities or it can create and maintain appropriate opportunities for visitors to appreciate the natural and cultural heritage with minimum impacts. Visitor management is necessary for protected areas for the following reasons: (1) visitor use can potentially have a negative influence on the natural resources and biodiversity of protected areas; (2) a high density of visitors lowers the value of the experience for visitors; (3) indirect visitor management costs less and is easily accepted by visitors (Candrea and Ispas, 2009).

Denise Antolini, Associate Professor at the University of Hawaii, School of Law, suggests that setting up rules early is a good way to prevent people from destroying the land and ecosystem. The Hanauma Bay Nature Preserve was cited as a perfect example of this principle. After many years of overuse, rules were finally promulgated which closed the preserve every Tuesday, did not allow feeding of fish, required all visitors to view an educational video before entering the park, and placed a predetermined limit on the number of people that could enter the park. All of these rules should have been done when the preserve was initially established, but the managers waited until it was almost too late.

The example tells us that if managers of protected areas establish limitations on human use early, overuse can be avoided. Eagles and others (2002) have refined four useful strategic approaches to visitor management in protected areas: (1) Supply management through providing more space or extending visiting time to create more opportunities for visitors; (2) Establish visitation demand management that is exactly opposite to supply management; (3) Enhance resource

capacity for handling use; and (4) Use impact management. Below, some useful means will be introduced to guide the management of recreational activities in protected areas.

#### **4.1.3.1 SUPPLY MANAGEMENT**

Supply management requires managers of protected areas to provide more opportunities for visitors by increasing the available space or time to enhance the capacity for use. In fact, the baseline of supply management is to guarantee that increased visitation would not impose negative impacts on the environment that exceeds the desired tolerance as noted in all applicable planning studies and documents going to the health of the ecosystem. Access control and facility capacity are also used as specific measurable limits on the use of a protected area. Some conserved lands manage visitor use by limiting the available facilities and then restricting access when these facilities are at capacity. The numbers of campsites and lodging units, parking spaces, roads, and trails are frequently used to restrict visitation in many protected areas in the United States. For example, limited parking space is utilized by Yosemite National Park and the Hanauma Bay Nature Preserve as a means of controlling the number of visitors.

However, facility limits management does not focus on the exact number of people in an area. For instance, using a limited number of parking spaces as a supply management tool, the number of visitors could be very different on a day where an average of two people per car visited versus an average of four people per car. Based on experience, some protected areas like Yosemite National Park can derive an average number per car, which helps to determine a rough estimate of the total number of visitor that might be present in a specific area based on the number of parking stalls.

In addition, the capacity of some other facilities, e.g., the utility system (infrastructure to collect and treat wastewater) can also assist in limiting visitation. For example, the largest capacity for 24 treatment facilities in Yosemite National Park per day is 24 million gallons. For Wawona Wastewater Treatment Plant, the capacity has been set at 0.105 million gallons per day, which cannot be increased by the NPS by designing or building additional facilities, according to

applicable regulations of the State of California. Yosemite National Park must meet all state and federal standards for wastewater treatment. Otherwise, if the treatment system fails, the park is closed.

#### **4.1.3.2 VISITATION DEMAND MANAGEMENT**

Compared with the other three management approaches, visitation demand management is the most common means used to administer outdoor recreation through restrictions on the length of stay, total number of visitors, or types of use (Eagles *et al.*, 2002). Usually, the following approaches are taken to manage the visitor demand:

- **Limits**—Based on a first-come, first served basis, this method sets the maximum capacity based on specific modeling or practical management experience. Yosemite National Park limits the number of visitors to protect the park’s natural and cultural heritage with comprehensive means of limits, including restrictions on group size, total numbers allowed in a specific region, and the use level seasonally or temporarily (Table 4.2). Similarly, the Hanauma Bay Nature Preserve also sets limits on vehicle parking spaces. Once the parking spaces are filled, vehicles are not allowed to enter the reserve until parking space become available again. Limits to the length of stay in specific recreational areas in American protected areas are also frequently used to manage visitors. For Yosemite National Park, as stated in the Superintendent’s Compendium of 2010, *“Camping is permitted for not more than a total of 30 days in any calendar year, provided that during the period from May 1st through September 15<sup>th</sup> inclusive, camping within Yosemite Valley and Wawona is limited to not more than a total of 7 days, and camping within all other portions of the park, during the same period, is limited to not more than a total of 14 days.”* Lastly, restrictions on the use of fire, barriers, and area closure are effective tools used by managers of protected areas in the United States to limit recreational activities.

**Table 4.2 Limits on Number of People in Yosemite National Park<sup>1</sup>**

Items	Detailed Explanation	Limit Type
Overnight visitors in wilderness areas	on trail	Group size up to 15
	off trail	Group size up to 8
Day visitors in wilderness areas	on trail	Group size up to 35
	off trail	Group size up to 8
Bicyclists	paved roads & trails	Group size up to 30
Yosemite Valley	when all day visitor parking spaces filled or back up at intersection happens	temporary access restriction
Wawona	When all day use parking spaces filled	temporary access restriction

- Quotas—The desired number is clearly defined. This is particularly suitable for some consumptive uses, like sport fishing or game hunting. In Yosemite National Park, the Yosemite Wilderness Trailhead Quota System is applied, which regulates the total number of overnight entries into wilderness areas at 1,280 visitors with a specific quota for different entry/exit trailheads. For example, the quota from Glacier Point to Little Yosemite is 10 visitors daily. Quotas can be sold, auctioned, or allocated by lottery. In the United States, some national wildlife refuges use a lottery to allocate hunting permits. For example, deer permits are drawn by lottery in the Tennessee National Wildlife Refuge.
- Pricing—Pricing is designed to reduce the number of visitors for the controlled sites. This is the case at the Hanauma Bay Nature Preserve, where there is no charge for residents of the State of Hawaii but an entrance fee for non-residents. However, in the United States, this is not a frequently-used

<sup>1</sup> Data from [http://www.nps.gov/yose/parkmgmt/upload/Chapter\\_2\\_UserCapacityManagementProgram.pdf](http://www.nps.gov/yose/parkmgmt/upload/Chapter_2_UserCapacityManagementProgram.pdf)

tool. Many protected areas are entry free. However, all NPS charge an entry fee. Even for fee protected areas, the charge is affordable.

- Alternative promotion—This strategy is to develop alternative sites for overflow, including the promotion of linear tourism. New York State has promoted a scenic byway system to disperse visitors to different destinations. The scenic byway is a kind of linear tourism which helps to spread out the impacts of visitation and to benefit more local communities along the routes. The total mileage of scenic byways presently amounts to 2,000 miles in New York State.
- Limits on specific activities—This regulates what activities can be done, as well as as where and when, e.g., rafting and bicycling. Fishing and hunting must follow other limits besides the limits on quotas, e.g., equipment used, time for fishing and hunting, the kinds of fish and animals that can be harvested, etc.

Finally, no matter which kind of approach is applied to limit recreational uses to acceptable levels in protected areas, the carrying capacity (or use capacity) of a specific protected area must be determined before limits are set. There are many different methods for estimating the carrying capacity for a protected area, including Limits of Acceptable Change (LAC) (Stankey *et al.*, 1985), Recreation Opportunity Spectrum (ROS) (Clark and Stankey, 1979), the Visitor Impact Management System (VIMS) (Farrell and Marion, 2002) and the Visitor Experience and Resource Protection (VERP) framework (NPS, 1997). No one approach is appropriate in all circumstances. Impacts from recreational uses can be influenced by other factors beyond the number of visitors, including the types of uses, the timing of use, the fragility and values of the areas of use, and the capacity of facilities that are provided (Cole *et al.*, 2005). Haas (2001) believes that user capacity should be a wisdom estimation made by managers of protected areas through systematically considering management goals of a protected area, public demands, and acceptable carrying capacity calculated with scientific prediction methods and other factors. That is to say, the carrying capacity for any protected area is more than the number of visitors.

#### **4.1.3.3 RESOURCE CAPABILITIES ENHANCEMENT**

This strategic measure refers to the increase of resource capabilities to handle use by hardening the site or specific locations, or developing facilities, and so forth (Eagles *et al.*, 2002). Usually, to meet the needs of visitors while protecting fragile vegetation and soil, the construction of facilities and location of trails and roads are common options for managers of protected areas. For example, by 2009, Yosemite National Park had paved 214 miles of roads; graded 68 miles of roads; paved 20 miles of walks and bicycle paths and 800 miles of trails, to direct the flow of visitors into areas with more resilient and robust ecosystems.

#### **4.1.3.4 USE IMPACT MANAGEMENT**

This tool aims to reduce the negative impact of uses by modifying the type of use, or by dispersing or concentrating uses (Eagles *et al.*, 2002). Zoning is a useful way to disperse or concentrate recreational uses. Dispersing is suitable for small areas with high density of use but not suitable for sensitive settings that may be negatively impacted. The other side of the coin is that concentrating allows recreational activities to be conducted at specified areas in order to confine the negative impacts to that place only. Zoning from the perspective of ecotourism should consider what type of recreational opportunities shall be provided, as well as where to conduct them, based on available tourism resources and comprehensive environmental analysis integrating geographical, geological, climatic, vegetation, wildlife, cultural, and socio-economic information of local communities. The Recreation Opportunity Spectrum (ROS) was developed in the USA in 1979 to guide zoning for recreational use in protected areas (Clark and Stankey, 1979). Use impact management methods, e.g., management zoning, provides guidance for managing user capacity by prescribing the desired types and levels of use and the areas for development within a protected area. Once zoning ordination is determined, desired types of recreational activities that are allowed are identified as well areas suitable for their placement.

#### **4.1.4 VISITOR SAFETY AND EMERGENCY MANAGEMENT**

The safety of visitors is one of the most important components of visitor management in a protected area (Eagles *et al.*, 2002). Many outdoor recreational activities have intrinsic risks. Based on the statistics of Yosemite National Park, between 230-250 search and rescue missions are launched every year. Poor management of potential risks in protected areas might cause injury accidents, and the victims could sue the protected areas. Obviously, integrating risk and emergency management into visitor management of a protected area is a smart way to prevent potential accidents, not to mention lawsuits.

##### **4.1.4.1 SAFETY OF VISITORS**

The safety of visitors is a shared responsibility among management agencies of a protected area. The visitors, themselves, as well as other stakeholders, must be willing participants. Managers of protected areas have the obligation to: (1) inform visitors about potential risks relevant to various recreational activities; (2) provide appropriate search and rescue services; (3) equip visitors with knowledge about preventing risks through educational programs in cooperation with other NGOs, concessioners, etc.; (4) provide adequate information and/or signage; (5) establish agreements with relevant recreational service providers; and (6) notify visitors and other service providers about site-specific hazards (Eagles *et al.*, 2002). For example, when visiting Yellowstone National Park, visitors are specifically reminded of the dangers of all geothermal resources and are requested to stay on the boardwalk and not touch any geothermal resources. Warning signs are easily visible, and other relevant information is available throughout the park.

#### **CASE STUDY: HUMAN-WILDLIFE CONFLICT MANAGEMENT IN YOSEMITE NATIONAL PARK AND YELLOWSTONE NATIONAL PARK**

One highlight of risk management in the United States is wildlife attack management. In Yosemite National Park, the black bear has been adopted as the symbol of the park. Black bears cause \$100,000 damage annually by going after food that is improperly stored by

visitors. Accordingly, one of the major management goals of the park is to reduce the bear-human interaction. The strategy identified to achieve this goal is to educate visitors. When black bears get used to eating human food, they become very violent and attack humans for that food. Yosemite National Park spends US \$0.5 million a year to keep people away from black bears. Everyone entering the park is educated about staying away from bears and storing their food safely. For example, every camper in the park is visited every night and informed about bear etiquette. Every car is looked into to see if there is any food in it and visitors are asked to store all food in bear proof boxes that can be rented from the park for a very low price. Every summer, 15 full time employees work on this issue. Otherwise, black bears with changed foraging behavior might have to be killed or displaced to other remote sites. Thanks to effective management, no bear has seriously injured a human in Yosemite National Park to date.

Aside from Yosemite National Park, the Yellowstone National Park takes somewhat different measures to manage such risks at different zones within the park. For instance, in the developed areas of the park, expelling dangerous and large-sized animals is the common method to prevent potential conflicts. In the wilderness areas of the park, visitors are educated and encouraged to follow relevant regulations developed by the park, e.g., not to stray or act alone, to properly store food away from animals, and to have bear spray or pepper spray on hand when travelling in the backcountry. To prevent wild animals, e.g., black bears and coyotes, from ransacking human food from rubbish bins, specially designed rubbish bins are installed in the park.

#### **4.1.4.2 EMERGENCY MANAGEMENT**

To deal with emergency incidents, e.g., natural disasters such as floods, earthquakes, avalanches, landslides, and cyclones, as well as injuries to people, emergency planning must be developed by managers of protected areas. The Hawaii Volcanoes National Park uses real-time information about volcanoes and earthquakes obtained from the Hawaii Volcano Observatory to insure the safety of both visitors and employees. A similar early-warning system has been adopted by Yellowstone National Park. For injuries to visitors, rangers on duty can provide emergency medical services, and 911 might also be called.

## **4.2 CONCESSIONS**

### **4.2.1 INTRODUCTION**

As mentioned earlier, recreation is a management goal for managers of protected areas in the United States. To enhance the visitors' experience, commercial services were long ago introduced into conservation areas as a means to build public support for conservation. The theory was, if people are not allowed to experience these areas, why would they be interested in supporting the preservation of such areas. From this early beginning, concessions have become a vital component of the management of some protected area systems, e.g., the National Park System. According to the statistics of the National Park Service Concession Program<sup>1</sup>, listed on their website for 2009, the gross receipts of all concessioners in the National Park Service was US \$1 billion, with 25 percent coming from merchandise and retail, 20 percent from lodging, 20 percent from food and beverage, and 35 percent from other services. About 575 concession contracts are currently in place between NPS and concessioners. Sixty-five major concession contracts bring in 85 percent of the total gross receipts. Seventy-five percent of the concessions are minor concessions with gross receipts of less than US \$500,000 yearly. An average of 5 percent of the gross receipts (money earned prior to taxes and overhead) is returned to the NPS with larger operations in the park heavily used by visitors contributing a higher percentage and less well visited parks contributing a lower percentage. The commercial services in national park units provide approximately 25,000 job opportunities annually.

### **4.2.2 EVOLUTION OF CONCESSION**

The Concession Policy Act of 1965 officially stipulated for the first time that the NPS had the authority to permit concession activities in order to provide quality visitor services. The legislation was

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<sup>1</sup> Data from website: [http://www.concessions.nps.gov/docs/Doing\\_Business\\_NPS.pdf](http://www.concessions.nps.gov/docs/Doing_Business_NPS.pdf)

updated by Congress through the enactment of the 1998 Concessions Management Improvement Act (1998 Act). Concessions can be granted only to those activities that are necessary and appropriate for public use and enjoyment. Importantly, the 1998 Concessions Management Improvement Act states that *“development of public accommodations, facilities, and services within such units can best be limited to locations that are consistent to the highest practicable degree with the preservation and conservation of the resources and values of the unit.”* This language again notes that even when looking for concession opportunities the preservation of the resource comes first. NPS created the National Park Service Concession Program, led by a program chief, to manage all concessions with NPS in 1999. In 2000, the concession contract language was standardized to strengthen risk management of the concession contracts. In 2004, an Environmental Management System was approved with the issuance of the Director’s Order #13A of the NPS. The NPS Management Policies 2006 provides guidance for concession management in park units.

#### **4.2.3 PROSPECTUS & SOLICITATION OF BEST PROPOSAL**

Based on general management planning, National Park Units develop their own commercial services plans to establish what is compatible with resource protection and to supervise various commercial activities. The Superintendent of a National Park Unit will work together with a concession management team to determine which services are necessary and appropriate to be operated by commercial entities. Once concession opportunities are identified, a prospectus is developed to let commercial services providers fully understand which kinds of services are needed in the specific park unit. At a minimum, the prospectus should cover the following information: (1) States the minimum franchise fee level to be met; (2) Clearly addresses any facilities, services, or capital investment that can be offered; and (3) Identifies approaches to conserve and protect valuable resources in the park unit; (4) Provides other authorized facilities or services which may be provided in proposal; (5) Provides facilities and services by the Secretary to the concessioner, if any, including public access, utilities, and buildings; (6) Estimates the amount of compensation, if any, due

an existing concessioner from a new concessioner under the terms of a prior concessions contract, (7) Provides a statement as to the weight to be given to each selection factor identified in the prospectus and the relative importance of such factors in the selection process. Ready prospectus is issued in a local or national newspaper, commercial journal or NPS Commercial Services Web Page, [www.concessions.nps.gov](http://www.concessions.nps.gov) to solicit for prospect service offers. According to the 1998 Act, all qualified commercial service providers submit their proposals to compete for the concession contract. Competitive solicitation has enhanced the efficiency of NPS concession management since 1998. Pursuant to the 1998 Act, all received proposals are scored according to a system that includes five principal factors, plus secondary selection factors and optional secondary factors (Table 4.3). To avoid conflicts of interest, concession contracts are not allowed to be awarded to NPS employees or their spouses and minor children who own, manage, or hold interest in any commercial business (NPS, 1996). If all received proposals are deemed not to meet the provisions of the prospectus then new minimum contract requirements will be created and shall reinstate the competitive selection process. According to the 1998 Act, if commercial service providers cannot provide good resource and environmental management, no matter how much franchise fee they propose, their proposal will be rejected.

**Table 4.3 Indicators used by NPS to Score Proposals Competing for Concession Contract**

Priority of Factors	Selection Factors	Scores
Principal Factors (0-24 points)	Protection of resources	0-5
	Quality of services	0-5
	Background and experience	0-5
	Financial capacity	0-5
	Franchise fee	0-4
Secondary factor	Environmental protection (e.g., energy and water conservation, recycling, sustainability)	0-3
Optional secondary factor	Specific to park unit	0-3

#### **4.2.4 AWARD CONCESSION**

When the proposal of a commercial service provider is deemed the most appropriate, that service provider is awarded the concession contract/permit. The 1998 Act shortened the duration of concession contracts from 30 years to 10 years or less. However, the Director of the NPS has the authority to award a contract with a maximum term of up to 20 years after comprehensively evaluating the warranty of a contract. Concessions can choose from three categories of concession contracts: (1) Category I: for constructing capital improvements on park lands; (2) Category II: for operating on assigned lands or in a governmental building without construction of capital improvements; or (3) Category III: for concessioners with neither assigned land nor buildings. In the concession contract, a certain franchise fee based on the value of the concession contract must be paid to the government. For any concession contract with a term of more than five years, a consideration of the franchise fee can be requested by the NPS or the concessioners, according to the 1998 Act. As mentioned above, although gaining the franchise fee is an important part of a concession contract, the NPS places first priority on concerns about resource and environmental conservation, as well as on providing quality services to the public at a reasonable price. Eighty percent of the franchise fees stay in the park where they were generated, and the fees can be used for maintaining concession operations or other visitor services, as well as other resource management and operations with high priority or urgency. The other 20 percent is deposited into a special account established in the Treasury of the United States and can be allocated to other park units for programs relevant to commercial services. As for any concession contract with estimated gross receipts exceeding US \$5,000,000, Congressional notification is required before the Director of the NPS can award the contract. All concession contracts should be developed with approved standard contract language, and any modification should be made in written documents pursuant to applicable laws, regulations, and policies.

#### **4.2.5 ADMINISTRATION CONCESSION CONTRACT**

Once a concession contract is signed, the park must have a system in

place to administer and monitor the provisions of the contract until its completion. An important component of a concession contract is the operating plan which outlines the details of how the concessioner will achieve management objectives as requested in the concession contract. The operating plan should be updated by the concessioner and reviewed by NPS on an annual basis. Since concessioners operate their businesses on preservation lands where natural, cultural, and environmental protection are of primary concern, the concessioners must submit a written environmental management program as requested by the concession contract. Concessioners must also comply with all applicable laws relevant to the protection of the environment and public health (NPS, 2006). The environmental management program should be updated at least annually and requires the approval of the Superintendent of the Park Unit. Usually, business operations in a National Park is an exclusively commercial activity. To ensure that visitors receive reasonable services, all rates charged to visitors by concessioners must be approved by the NPS, which, in turn, must take into consideration other rates and charges under similar conditions, as well as the specific operating conditions, e.g., length of season, peak loads, accessibility, number of visitors, availability and costs of labor, and other factors (NPS, 2006). The performance of concessioners is evaluated regularly, at a minimum of three times for year round operations and two times for seasonal operations. The evaluation results help the NPS determine whether to continue or terminate a concession contract and whether a concessioner earns preferential rights of renewal (NPS, 2006).

#### **4.2.6 PROTECTION INTERESTS OF CONCESSIONERS**

According to the concession contracts, all buildings belong to the US government or the NPS, even those invested in and constructed by concessioners, within the valid duration of a concession contract. Once a contract for a concessioner with a Category I contract which provides for building and construction expires or is terminated, the physical structures will be surrendered (leasehold surrender) to the government or transited to successor concessioner and compensation will be paid to the concessioner either by the government (e.g., NPS (public law 105-391 16 USC 5954 section 405) under the terms of

a prior concessions contract or the new concessioner based on the value of the capital improvement. For the latter situation, the value of the capital improvement will be the leasehold surrender interest paid to the former concessioner by the successor concessioner instead of the original construction fee that invested by the former concessioner.

### **CASE STUDY: CONCESSION MANAGEMENT IN YOSEMITE NATIONAL PARK AND YELLOWSTONE NATIONAL PARK**

Yellowstone National Park awards contracts to 95 different kinds of concessions, which brings in about US \$0.1 billion revenue to the park every year. The franchise fees for hotels reach up to US \$2,200,000 annually. Similarly, in Yosemite National Park, all gift shops, restaurants, and lodging facilities are operated by concessioners. During the formation of the national park system, it was decided to have a concession system for these types of operations in the parks, as it was felt that the private sectors would do a better job than the federal government of designing, running and maintaining these types of facilities and that the federal government should concentrate on the primary focus of preservation. Every year, 15 to 18% of what concessions earned, e.g., gross profits, is returned to the park for park use and management. Presently, in Yosemite National Park, the concessioners have staffs of 2,200 and hire an additional 800 staff during peak season.

## **4.3 INFORMATION, INTERPRETATION & EDUCATION**

### **4.3.1 INTRODUCTION**

Information and interpretation of a protected area are important tools for guiding the public to understand the nature of protected areas. The public will not truly value protected areas unless they understand their importance to the country and their mission. Information and interpretation have become important vehicles for creating a bond between protected areas and the public. The promotion of interpretation and information has a long history in the United States. Yosemite National Park created the means for interpretation in the late 1870s. NPS

has recognized that effective interpretation and education are crucial to the survival of the National Park System in the 21st century.

#### **4.3.2 INFORMATION ON PROTECTED AREAS**

Eagles and others (2002) defined information of a protected area as data, facts, and advice to visitors regarding the area's history, biology, culture, geography, geology, rules and regulations, location of facilities, hours of services, appropriate behaviors, accessible routes, and fees and charges. Management agencies of protected areas usually display information of their conserved lands to the public through classic paper promotion media (e.g., leaflets, books, journals, maps), electronic promotion media (e.g., website, radio, video, film), presentation, exhibition boards, signage, and specimens in visitor centers, at information points, and interpretive signs along walking trails, and through face-to-face interpretation programs and ranger interactions. All information must be meaningful to visitors in order to be accepted and internalized by them. All information provided by a protected area not only helps visitors to understand the protected area, but also has the potential of their valuing and further supporting the protected area.

Classic paper promotional media is the most common way to transfer information to visitors. Visitors usually can get leaflets and maps free from visitor centers or contact stations. Most leaflets and maps are foldable to make them easier for visitors to carry in the field. To encourage people to keep these promotion materials longer, some leaflets and maps also print other relevant information, e.g., a local city map. For some protected areas with international visitors, presenting information in appropriate languages is essential.

Books about protected areas usually introduce scientific information from different perspectives to visitors. Occasionally, some books not necessarily relevant to a specific protected area but regarding introductory guides to outdoor recreation and nature resources can be found in a visitor center of a protected area. Also, books are designed for both adults and children to meet their needs. Books for children are more illustrative than descriptive. This can help children acquire some basic knowledge about plants, animals, and their relationship with the surrounding physical environment. Books are usually sold in visitor centers.

If visitors can only see a small portion of a protected area due to time limitation or zoning management, some protected areas have made videos or short films to show the whole picture of a protected area, e.g., Adirondack Park and Yellowstone National Park. Videos and films make it easy to bridge the connection between a protected area and visitors by showing aesthetic plants, animals, and landscapes. Many of these videos as well as books are produced by non-profits that are “friends” of the park so that all proceeds go directly to the park. Some short films/videos have no dialogue but they do have stirring music, which mainly underscores the amazing scenery in a protected area and is suitable for all visitors. The video about the Wild Center in the Adirondack Park is a good example. Some films/videos with narration are translated into different languages. Visitors can select the appropriate language during an on-site self-guided tour by adjusting channels on a headset (e.g., Pearl Harbor National Monument) or selecting headsets that are pre-set with a targeted language (e.g., Hanauma Bay Nature Preserve). Although this information provision is costly, it is considered valuable by many people.

With the advances of Internet technology, Internet online websites have increasingly become the best way to present information to public. This mode of information is powerful and can be easily updated in a timely manner. Compared to the classic paper mode, this mode also helps tailor information according to the personalized needs of the public.

### **4.3.3 INTERPRETATION**

As far as protected areas are concerned, the goal of interpretation is to increase visitors’ appreciation with deliberately structured information (Eagles *et al.*, 2002). Interpretation can create opportunities for visitors to personally connect with a protected area. In developed countries, e.g., the United States, interpretation has become an integral component of protected area management. A recent study verifies the fact that effective interpretation will enhance the understanding of visitors for a protected area and further gain their support for the management of the protected areas into the future (Powell and Ham, 2008). Interpreters and self-guided walking guides are the two most frequently used interpretation methods.

Interpretation is an art that involves more than just transferring

information to visitors. Interpretation can make visitors aware that the interpretive information is personally relevant to them. Volumes of interpretation practices have demonstrated that well-designed primary themes and subthemes comprise half the success of interpretation. Generally, the subthemes should be kept to five or fewer, since people have difficulty grasping and maintaining more than five concepts at a time (Ham, 1992). Yellowstone National Park applies this theory well. There are eight visitor centers in Yellowstone National Park that emphasize different aspects of rich biological and cultural resources of the park (Table 4.4). Yellowstone is the exception, however, as most national parks do not have multiple visitor centers. In fact, the overwhelming majority of protected areas in the United States operate only one visitor center. Therefore, the question of how to identify the main interpretation theme is critical to attracting the appreciation and support of visitors. In addition, linking the interpretive information with something that visitors know about helps to bridge the connection between a protected area and visitors. Interpreters should avoid using too many technical terms or if used must be able to explain them clearly to the audience. They should employ their skills of pointing out similarities to common experiences and situations as much as possible. The use of metaphors is helpful whenever appropriate.

**Table 4.4 Visitor Centers/Information Stations in Yellowstone National Park, 2010<sup>1</sup>**

Name	Main Topics
Albright Visitor Center	Wildlife and History
Canyon Visitor Education Center	Super volcano and other geological phenomena
Fishing Bridge Visitor Center	Birds, other wildlife and lake geology
Grant Visitor Center	Fire in Yellowstone
Madison Information Station	Information and bookstore

<sup>1</sup> Visitor Centers/Information Stations in Yellowstone National Park, 2010

Continued

Name	Main Topics
Norris Geyser Basin Museum & Information Station	Hydrothermal features of Yellowstone
Old Faithful Visitor Education Center	Hydrothermal features
Museum of the National Park Ranger (Norris)	History of park ranger development

#### 4.3.3.1 INTERPRETERS

The majority of visitors in the United States are impressed by park rangers who are often the first line of face to face interpretation. Interpreters with professional degrees apply themselves to their work with knowledge and enthusiasm in the park system. The interpretive staff and park rangers bear the responsibility for interpretation or the development of interpretive materials and information that can be disseminated through the use of volunteers in protected areas. Other social forces from NGOs, universities, employees of concessioners, and volunteers also perform interpretation functions in protected areas. Most park use volunteers and provide interpretation training specific to the area to be interpreted before performing as volunteer interpreters. For example, in Yellowstone National Park, some employees working for the hotels at the Old Faithful Geyser assist in interpretation when they are off duty. The NPS has set national standards for interpretation with 10 benchmarks. To enhance interpreters' skills in interpretation, NPS has also developed the Interpretive Development Program. Professional and volunteer interpreters add value to protected areas through enriching the visitors' experiences there. Interpreters can effectively tailor information based on the personal needs of visitors.

#### 4.3.3.2 SELF-GUIDED INTERPRETIVE SERVICE AND MEDIA

Non-personal interpretive service and media are supplementary means to induce visitors to value a protected area. In museums, visitor centers, and wild centers of protected areas, specimens, presentation boards, touch tables for children, touching screens and self-service

videos are used to increase visitors' understanding of protection, and to influence visitors' behavior and thus assist with protected area management. People will not pay attention to information that is not meaningful or useful to them. Managers of protected areas must face the challenge of finding out how to structure selected information (e.g., text, photos, and visual documents) and how to display that information to visitors to create the impact and support they want. Generally speaking, three kinds of methods of self-guided interpretive media can be found in protected areas in the United States.

Trail-side signs are the most used method for self-guided interpretation. All visited protected areas during the CPALAP training widely applied this method. Different types of signs are used for different types of protected areas. Generally, there are no standard regulations for trail-side signs, except for the national wildlife refuge system, for which USFWS makes trail-side signs with uniform color matching different sign categories. Three kinds of signs are installed along trails—interpretive signs, warning signs, and directional signs. Interpretive signs are descriptive ones that tell the story of the protected area. Warning signs remind visitor to behave appropriately in order to mitigate negative impacts on fragile resources or increase safety. Directional signs show visitors where they are and give trail information, including difficulty, length, required time, and so on. Self-guided trails need to have a theme in order to attract visitors to follow them all the way. The first sign should be an introductory one and the last one should be a conclusive one. The rest of the signs should be thematic ones. When deciding whether a trail is suitable for a self-guide trail, planners need to consider its interpretive potential (whether the natural resources along the trail are diverse and changeable), accessibility, user safety, and environmental impacts (Ham, 1992). Usually, for an 800-m trail, the number of stops for interpretive signs should not exceed 15, and it is better to install the majority of stops on the first half of a trail (Ham, 1992). Ham (1992) suggests that all interpretive signs should have three shared traits: focusing, explaining, and connecting. Focusing is to ensure that the targeted feature is visible to visitors, explaining is to introduce the feature to visitors in as few words as possible, and connecting is to ensure that the information on the sign explains the targeted feature

well and also to link this sign with others along the trail.

Trails have different purposes and strive to create different experiences for visitors. In the Adirondack Park the trail through the wetlands is an interpretive trail about wetland ecosystems and key features of such systems. The trail at the John Muir National Monument is related to the interpretation, history and value of the redwood grove through which it wanders. Boardwalk trails such as the one at Muir Woods provide an interpretive experience and protect the eco-system from being trampled. They also set up meditative zones so that visitors are encouraged to become quieter and more introspective as they progress through the trail. Protecting signs from weathering is another issue that managers of protected areas should consider, since it is time and resource-consuming to replace them. Some protected areas use shelters/roofs to protect interpretive signs, e.g., Great Falls Park in Washington, D.C. Materials that are resistant to ultraviolet rays are good for protecting outdoor signs from sunlight. Some precautions help to extend the life of outdoor signs.

There are also some self-guided trails where the visitor picks up an interpretive pamphlet that describes features by connecting the paragraph number to a numbered sign along the trail. For this method, a series of numbers are placed along the trail at points of interest, and visitors can then use their brochure to learn about these sites. Visitors can find the information that corresponds to each stop with the same code from the brochure. With the advance of technology, brochures in some instances have been replaced by headsets equipped with audio information (in different languages) for each stop. These can be triggered electronically when the appropriate stop is reached or can relay on numbers as in the previous example. The Pearl Harbor National Monument uses this method.

#### **4.3.4 CURRICULUM-BASED ENVIRONMENTAL EDUCATION**

Besides opportunities for visitors to understand nature in protected areas through the visitor experience, interpretive programs, and the media, protected areas in the United States have also created curriculum-based environmental education for school students. Education about protected areas provides students with many

opportunities to understand, experience, and learn from nature. National parks have designed environmental education suitable for students at different grades. For example, Haleakala National Park has developed curriculum-based programs as shown in table 4.5. Nearly half of the national park units have created curriculum-based programs in the National Park System. USFWS also conducts an environmental education program for school students. Such environmental education programs are designed to be correlated to the appropriate education standards. Non-profits such as the Seattle Discovery Park and the Hawaii Nature Center also deliver environmental education programs on state conservation or park areas.

**Table 4.5 Curriculum-based Programs in the Haleakala National Park<sup>1</sup>**

Grade	Theme	Activity	Time and students number
Kindergarten-1 <sup>st</sup> grade	Home is where the habitat is	Discover animals' needs for food, shelter and friends	1 hour, <25 students, ¼ mile
2 <sup>nd</sup> grade	<i>In development</i>	--	
3 <sup>rd</sup> grade	Who lives at Haleakala National Park?	Learn how wildlife and native species come to the island and survive there uniquely	9:00 a.m - 1:00 p.m (including lunchtime) <60 students, ½ mile
4 <sup>th</sup> grade	A walk through time	Understand how environment and culture interact with each other	9:00 a.m - 1:00 p.m (including lunchtime), <60 students, 1.5 mile
5 <sup>th</sup> grade	If Rocks could talk	Explore the landscapes in the park like a geologist	9:00 a.m - 1:00 p.m (including lunchtime), <60 students, 1 mile
6 <sup>th</sup> grade	<i>In development</i>	--	

<sup>1</sup> Data from: <http://www.nps.gov/hale/forteachers/index.htm>

## **4.4 VISITOR SERVICES AND FACILITIES**

Managers of protected areas and/or concessioners provide quality services and facilities to enhance visitors' experiences there. Of course, these services and facilities should be carefully designed and operated to minimize potential environmental impacts.

### **4.4.1 VISITOR CENTER**

A visitor center is an important facility in a protected area, especially in the United States. The main functions of a visitor center are to disseminate information, sell educational materials, and provide environmental education. A visitor center is usually established inside a protected area, but if the environment is too fragile to allow for construction inside, the visitor center must be located outside. A visitor center is established to serve visitors. Therefore, appropriate placement of a visitor center is crucial to fulfilling its functions. A visitor center is usually established at the site where visitors tend to congregate, or it is designed to direct visitors to the facility as a place to gather. Visitor centers not only stimulate the uses of protected areas, but also direct the use (Eagles *et al.*, 2002).

Designers of visitor centers should consider how best to blend them into their surrounding ecosystems. They should try to make them as unobtrusive as possible in their natural settings. In the Hanauma Bay Nature Preserve, the current visitor center is placed inside the man made volcanic rocks rather than at the top of the craters rim where the visual impact would be greater, and new facilities on the beach were designed after integrating comments and advice from public. The construction material and color of the visitor center in Haleakala National Park are in accord with its surrounding natural setting. These days the concept of "green building" to protect the environment, is gaining popularity when establishing a visitor center. A green building rating system—LEED (Leadership in Energy and Environmental Design) certificate requirements—has been applied by some protected areas when establishing a visitor center, e.g., Adirondack Wild Center in Adirondack Park, and the new Old

Faithful Visitor Center in Yellowstone National Park. Integrating cultural factors into the design of a visitor center will increase the appreciation of local communities and also help to promote the culture, too. Yosemite National Park considered the Native American culture in their visitor center, not only by displaying Native American culture inside, but also by placing a model pueblo outside. Sometimes, to save the budget and facilitate the operation of a protected area, visitor centers are combined with office buildings, e.g., the Bowdoin National Wildlife Refuge, and Waterfall Park in Washington, D.C.

The interior layout of a visitor center is important to stimulate and direct visitor use through different means of interpretation. First of all, exhibition boards, specimens, and audiovisual programs show visitors the value of a protected area. In addition, brochures, leaflets, and maps facilitate visitors' tours. In most cases, bookstores and gift shops are designed. Goods sold in gift shops are somehow linked with an interpretive message about the protected areas, for example, T-shirts, cups, towels, and cup holders, which display animals and plants of the protected area. To increase the attraction of visitor centers in the United States, interactive programs and audiovisual programs are very popular. Some programs suitable for children are also designed to increase their interest in nature. Classic wall texts are gradually being replaced by innovative interactive and audiovisual programs.

Visitor centers can be managed by employees, volunteers, NGOs, or concessioners of protected areas. Some NGOs produce the materials especially books and videos that are sold in visitor centers, stock the shelves of book stores and gift shops of visitor centers and donate the proceeds to the protected areas. Some older visitor centers are being rebuilt or renovated to meet the changing needs of visitors, e.g., the new Old Faithful Visitor Center.

### **CASE STUDY: THE WILD CENTER—NATURAL HISTORY MUSEUM OF THE ADIRONDACKS**

The Wild Center encompassing 31-acre is a natural history museum that opened on July 4, 2006 in New York State's Adirondack Park. The museum was designed by The Office of Charles P. Reay with the St. Louis architectural firm HOK. It took eight years to plan and build this

center. Multi-million dollar funding to build the Wild Center came from a mix of public and private funds. The total investment for the Wild Center is \$40 million. Seventeen million dollars was funded by the State of New York and the rest came from private donations. Presently, the Wild Center is operated by a private, non-profit institution whose budget comes from entry passes, grants from public and private sources and private memberships. The mission of the Wild Center is to promote Adirondack Park to the public. This green museum has earned LEED silver from the U.S. Green Building Council and is the first LEED certified museum in the State of New York. Local construction materials and local artisans and craftsmen were utilized in its construction and operation as much as possible. To save energy, more than 200 solar panels were installed on the roof to provide energy for the Center. In addition, one of the buildings on the campus has a green roof designed to save energy and keep the Center warm in winter.

State-of-the-art methods are used to interpret the Adirondack Park to public, including panoramic films, live animal exhibits, preserved specimen, guided trail walks, videos, documentaries, and interactive audio and olfactory exhibits. There are 70 different live species, from algae to otters, housed at the center. The concept with all of their programs is for the visitors to experience the natural world with multi-sensorial (touch, see, smell etc.) exhibits. The exhibits are around the walls of the museum follow the path of water from low elevations to the High Peaks. The aim here is to inspire visitors to explore the Park outside after exploring the exhibits. Many interactive programs have been created in the center to increase visitors' interest. For example, to help the public understand the nesting and rearing behavior of the osprey (*Pandion haliaetus*), a remote camera was installed on top of the nest. Visitors can watch the ospreys and their chicks via the monitor in the Center. Other innovative efforts, such as biodegradable flags are used as interpretive signs to introduce plants to visitors on the interpretive trails on the property. Compared with classic signs, this kind of sign is cheap and easy to maintain.

Every year, the center hosts 100,000 visitors, including 6,000 school students. For special events that often draw 1,000 or more visitors, they also install a large temporary tent next to the Center

to increase the number of visitors they can accommodate and to lengthen the season that would ordinarily be cut short due to cold temperatures. The Center itself and the tent can be rented to local community groups and individuals to provide opportunities for them to sell their products to visitors or to host events such as weddings and conferences. This type of activity helps to build the relationship between the Center and local communities and further gains their support for environmental protection in the Adirondack Park.

#### **4.4.2 HOTELS, LODGES, AND RESTAURANTS**

Managers of protected areas in the United States rarely provide hotels, lodges, or restaurants. Under most circumstances, visitors do not need stay overnight in protected areas. As for food, they can bring their own with them for their day-time visits. Such kinds of services are usually provided by public service or private sectors in the park vicinity. A few older protected areas in the United States do have hotels and restaurants that are managed by concessioners via concession contracts, e.g., Yellowstone National Park and Yosemite National Park. Originally these big, grand hotels were built to attract influential people to these protected areas to encourage them to assist with the preservation of these areas. Now, such kinds of development in protected areas have been almost entirely abandoned in the United States.

Under such situations, the hotels, lodges, and restaurants surrounding protected areas play a leading role in meeting visitors' accommodation needs and the economic health and development of the surrounding communities. They not only help to minimize the negative impacts on the environment of protected areas, but also contribute to increasing the revenue of local communities. However, hotels are not necessary for an area to successfully attract visitors. A typical example is the White Mountain Ski Area in Adirondack Park. Every year, more than 190,000 skiers visit, and in the summer this area offers gondola rides and a toll road for viewing, making the site a golden destination year-round. No hotels are available at the ski areas, so visitors need to stay at hotels in the surrounding areas. This

case tells us that it is the ski resources in the park that people are attracted to and that there is no need to have a hotel facility at the foot of the slope for visitors to come to the attraction.

#### **4.4.3 TRAILS AND WALKS**

Trails and walks close the distance between visitors and protected areas. Well-designed trails and walks help managers of protected areas minimize negative impacts on the environment. Depending on the fragility of the surrounding environment and the use intensity of trails and walks, certain hardening treatments on trails and walks are done to minimize environmental impacts, and to increase accessibility, as well as safety. Gravel, cement, asphalt, sand, and wooden debris are common materials used to harden surfaces. For wetlands and some fragile and dangerous areas, wooden, plastic or metal boardwalks are set up on the surface to protect both the environment and visitors.

Trail layout shapes fall under three main categories: linear, figure-eight, and circular. A 30-minute trail is a leisurely walk, while a trail that takes more than 45 minutes to finish is treated as a long trail (Ham, 1992). Usually, there are nine categories of trails that can be found in protected areas. Some of these are hiking trails, equestrian trails, bicycle trails, and interpretive trails. For most of the hiking trails in the backcountry, managers set out trail signs or route markers to keep visitors from getting lost in the forest. At the trailhead, a sign with a trail map is usually installed to illustrate the trail, including length, difficulty, and the time required to finish it. Some trails encourage visitors to sign in and out with contact information in a registration book to help rangers assess whether people have cleared that trail or may be in trouble. This information aides search and rescue in case of emergency. To ensure that many different kinds of people are allowed access, some protected areas might establish trails for the disabled, e.g., Bowdoin National Wildlife Refuge.

#### **4.4.4 CAMPGROUNDS**

Campgrounds may be set aside for overnight stays in protected

areas. In the United States, campgrounds can be designed for both recreational-vehicle camping and tent camping. Designers of both kinds of campgrounds need to remember to reserve areas for parking. Basic amenities may be provided, based on specific situations of campgrounds. For example, to avoid the use of generators, some campgrounds may provide electric utilities. Some managers of protected areas might limit the number of campground sites due to potential impacts on resources. For instance, NPS stipulates that no campground can exceed 250 sites without the approval of the Director of NPS (NPS, 2006). Shower facilities and tap water are available at most campgrounds. Advance reservations can be made at some campgrounds, but most campgrounds are available on a first-come, first-served basis.

In Adirondack Park, there are 42 State campgrounds administered by 500 workers, and more than 100 private campgrounds, which collectively can provide approximately 11,000 camping sites. For each State campground, lavatories, shower facilities, and tap water are provided. None have electrical or sewer hookups. Every year, these campgrounds are open to visitors from April to November, and the occupancy rate can reach up to 85 percent. Vendors can sell goods such as ice cream, ice and firewood in the campgrounds under permit from the State. The nightly fee for each campsite ranges from US \$18 to US \$22. Occupancy is limited on each site as are the number of vehicles. Fire can be used only at fire pits or fireplaces provided at each campsite. To avoid the dispersal of invasive species, untreated firewood cannot be transported to areas farther than 50 miles from its point of origin. Hence, most campers buy local firewood when they arrive at the campground from a local vendor. There are designated “quiet hours” and generators are allowed but cannot run for more than four hours every day.

#### **4.4.5 TRASH BINS**

Facilities for containing solid waste help to keep a protected area clean. Three issues should be considered when providing such facilities. First, trash bins should be placed at the areas most heavily used by visitors. For those regions that are less used,

identifying the main stops and placing trash bins there will help to avoid littering. Second, trash bins should not be open mouthed, as these attract animals. Therefore, the protected areas in the United States have provided specially-designed trash bins for areas frequented by wild animals, e.g., the trash bins used in Yosemite and Yellowstone National Parks. Third, to reduce environmental impacts and be climate friendly, separate bins should be provided to encourage visitors to separate solid waste that can be re-used and recycled.

## **4.5 COMMUNITY OUTREACH AND ENGAGEMENT**

### **4.5.1 COMMUNITY OUTREACH**

The purpose of community outreach is to disseminate park and resource information beyond the park boundary and to build support for the park and preservation of resources. It is an important supplement to interpretation and environmental education within the park. Community outreach can help protected areas to reach more people and gain their support for protected areas. Residential communities bordering a protected area impose impacts on that protected area. The protected areas themselves cannot tell adjacent communities how to behave in their community to minimize its impact on the natural environment of the park. These practices must be instilled in the surrounding communities through relationship building by managers of protected areas. This is the reason that the managers of these protected areas conduct community outreach and work to impress upon these communities the importance of the protected area and the appropriate ways to protect it. The ultimate goal of protected areas in the United States is to preserve and protect them for future generations. People's use and enjoyment of the protected areas must be compatible with protection. Education through outreach is the best way to get people to understand that. In the United States, no decision is made regarding use and management of protected areas without public input for two reasons:

(1) it is required by the National Environmental Policy Act (NEPA), and (2) it is the best way to run a protected area. Different protected areas conduct appropriate community outreach activities based on the needs of practical management. Below, we will give several examples of community outreach.

### **CASE STUDY: COMMUNITY OUTREACH IN CRISSY FIELD**

As a part of the Golden Gate National Recreation Area, Crissy Field successfully took a military airfield with runways and hangars and restored it to its original coastal wetland state through community outreach via mailings, community meetings, the establishment of a non-profit and the interpretation of the importance of coastal wetlands from 1998 to 2001. The goal of community outreach is to let the community understand that the Park needs their help. The Park recruited over 1,500 adult volunteers, plus 450 youth, and built broad community support for the project. These volunteers donated money, planted dune grass and did the majority of restoration work at the area. Another goal of community outreach here was to build a learning outreach center for people who have little or no opportunity to connect with nature. Crissy Field is surrounded by some of the wealthiest areas in California. To let middle and low-income people believe that the Park was also their park, the Park staff did active outreach with these communities by asking them what would bring them to the Park. They responded that they wanted leadership and education opportunities for their children. Based on this, the Park launched I-YEL, which stands for “Inspiring Young Emerging Leaders” in 2001, for children aged 14 to 17 years old. More than 40 youths have benefited from the outreach activities. Given the success of the program, the Park is planning to expand the program to all age groups and is beginning a new round of community outreach.

### **CASE STUDY: WILDLIFE CONSERVATION SOCIETY’S ADIRONDACK PROGRAM**

The Wildlife Conservation Society (WCS) is an international non-governmental organization focusing on studying wildlife in wild lands.

WCS is headquartered at the Bronx Zoo in New York City. In the Adirondack Park, WCS focuses on wildlife threats to wildlife habitat and conducts research to inform debates around contentious issues. The WCS developed the Adirondack Cooperative Loon Program to monitor the effects of air and mercury pollution to the common loon (*Gavia immer*) population in the Park. WCS is committed to providing the results of their research on wildlife health of to the community. WCS studies human-animal conflict between black bear (*Ursus americanus*) populations and campers and homeowners. Providing unbiased science-based information helps to dispel myths and helps the community to better understand how to coexist safely with wild animals. WCS also focuses on communities in the Park by building partnerships with those communities. For example, in the town of Inlet, WCS took an abandoned building and refurbished it to provide exhibits explaining the history of the community and the Park and the important relationship between the two. Since WCS put the information center in the community, other building owners have refurbished their buildings, and nine new businesses have moved into town. So not only did the project provide education and outreach but it acted as a catalyst for badly needed economic development in the town. WCS also initiated community exchange days that brings together leaders from the Park to talk about issues of importance, such as mapping, planning, and roads development in order to continue to maintain and strengthen the communication between the Park and the local communities.

#### **4.5.2 VOLUNTEER PROGRAMS**

Community outreach creates opportunities for people to understand protected areas, while volunteer programs provide opportunities for people to help protected areas. Volunteers have wide involvement in the management of protected areas in the United States. In the fiscal year 2008, 2,482,104 volunteers provided service for national park units in the United States. Many provided services that would otherwise have to be done by paid staff thus saving the parks many person hours in wages.

To encourage people to be volunteers, the Volunteer-In-Parks

(VIPs) campaign provides various volunteer opportunities across all American national park units for everyone who wants to be a volunteer. Even youths under the age of 18 can be volunteers, with the official, signed permission of a parent or guardian. The volunteer activities that are provided by the NPS include but are not limited to the following, as introduced in the website of the NPS: (1) answer visitors' inquiry at an information desk; (2) assist in patrolling; (3) maintain trails and build boardwalks; (4) design computer programs or park websites; (5) help to preserve museum artifacts, (6) assist in building and maintaining facilities, e.g., fences, cabinet building , painting; (7) guide nature walks and evening campfire programs; and (8) preserve living history demonstrations in period costumes. Some volunteer work requires a medical exam to ensure that the volunteer is physically fit for the requirements of that position. Due to security reasons, some volunteer activities also require background investigations. To be a VIPs volunteer, applicants fill in an application form (See Appendix 4.7.1) on which they specify their own skills and interests so that the NPS can better match their skills with the park's needs. A VIPs manager reviews the application forms and selects the qualified applicants for interviews. If there are no appropriate opportunities for an applicant, he/she will be notified. Once an applicant is selected as a VIPs volunteer, he/she needs to sign an agreement with a supervisor to specify duties, responsibilities, work schedule, and other relevant information. Volunteers are provided with appropriate training and orientation before starting to work. Volunteers do not receive any stipend, but they might get reimbursement for out-of-pocket expenses. Park housing might be available and for some volunteer activities, an official volunteer uniform may be provided. According to NPS regulations, for any injury on duty, volunteers are covered by workmen's compensation, and property damage, personal injury, and tort claim liability are applicable. Volunteer programs are also used at the state and county levels in all states as they move forward to better protect their fragile parks.

Similar to NPS, approximately 42,000 volunteers contribute their knowledge, time, and enthusiasm in national wildlife refuges

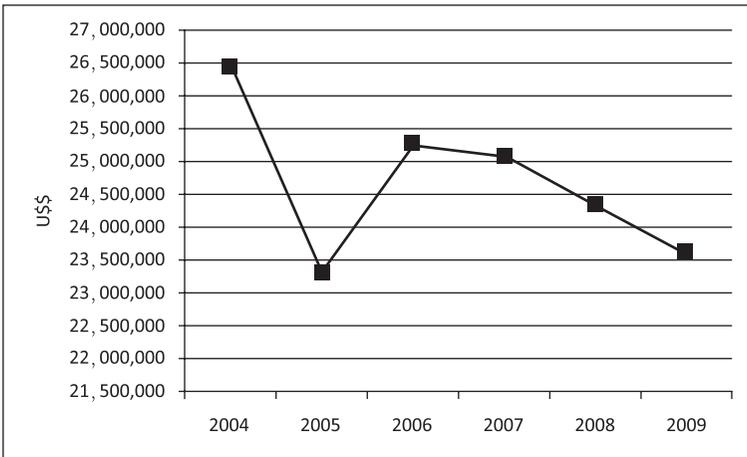
in the United States. Volunteers can be full-time or work only a few hours, weeks, months, or for a specific period. According to information from the website of USFWS, volunteers can assist in the management of national wildlife refuges through such activities: (1) participating in population surveys on fish and wildlife; (2) provide information for visitors and guide tours in the field; (3) provide assistance for laboratory research; (4) assist in special projects, e.g., banding migratory birds; (5) assist in clerical and administrative work; (6) provide technical support for computers and other technical equipment; (7) participate in habitat improvement, e.g., planting of native plants, (8) record natural and cultural resources with a camera; and (9) control and eradicate invasive species.

For the NLCS (National Landscape Conservation System) managed by BLM, in fiscal year 2009, volunteers contributed 447,177 hours for these conserved lands (BLM, 2009). These volunteer activities assisted with the following activities recreation, biological resources, wild horses and burros, cadastral surveys, riparian zones and watersheds, cultural and historic preservation, environmental education and interpretation, and administrative service.

NGOs also involve people as volunteers in their projects. For example, the Nature Conservancy in Hawaii conducts volunteer projects to clean the beaches by pulling out invasive seaweed. Such kinds of volunteer programs are common on protected areas managed by NGOs, too.

All in all, volunteers have become the main force of the management of protected areas in the United States. From large-size protected areas, e.g., Yosemite National Park to small-size protected areas, e.g., Hanauma Bay Nature Preserve, you can see volunteers assisting in the management of protected areas. All volunteer programs not only assist in preservation and other activities, they also help to keep the costs of managing natural areas down through the dollar value of their services which would otherwise have to be paid for. BLM calculated the values that volunteers contributed to them from 2004-2009 (Fig. 4.4).

**Figure 4.4 Value to BLM Contributed by Volunteers<sup>1</sup>**



### 4.5.3 SOCIAL FUNDS FOR PROTECTED AREAS

Community outreach also helps to raise money for protected areas from the public. According to Giving USA, donations for environment/conservation/animals in 2009 amounted to \$6.15 billion, accounting for only 2% of all charitable giving in the United States, which is approximately 2.24 times the total budget for NPS in fiscal year 2008. Therefore, social funds play a significant supplemental role in environment and wildlife conservation in the United States.

For NPS, national park units can receive donations (monetary or other properties) from supporters directly, through non-governmental organizations, and the National Park Foundation (NPF). NPS has improved their management of park units through partnering with non-governmental organizations. Park Friends are powerful partners of national parks in the United States. Some parks have their friend groups assist in their management by focusing on different areas. Yosemite National Park, for example, has three primary NGO partners: The Yosemite Fund, The Yosemite Association, and Yosemite Institute. The Yosemite Fund primarily raises money for the park by soliciting

<sup>1</sup> Data from BLM, 2009, [http://www.blm.gov/pgdata/etc/medialib/blm/wo/Law\\_Enforcement/education\\_\\_interpretation.Par.67421.File.dat/MakingADifference.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/Law_Enforcement/education__interpretation.Par.67421.File.dat/MakingADifference.pdf)

grants and by delivering programs for special projects within the park. This Fund allows for five to ten million dollars of work to be done that would not otherwise be funded. The primary function of the Yosemite Association is to support education through developing and selling books about the park. They also guide tours and provide financial support for some special programs. They mainly provide service assistance for the management of the park. Yosemite Institute focuses on park promotion through interpretation and environmental education.

According to the NPS website, park friend groups are usually created from a community perception of a need or from communication between a park superintendent and community leaders. In fact, the rationale behind establishing a park friend group is critical to the success of such a partnership. That is to say, a park friend group must clearly identify its roles in supporting a specific park. Usually, friends groups can assist with park management by raising money, providing volunteer services, helping with resource management, preservation, and environmental protection promotion, and so on. Once the intent of establishing a park friend group is confirmed, the next step is to establish a board composed of community members and to register an NGO, according to applicable laws and regulations. Most Friends groups apply for tax exempt status so that any money they solicit is tax deductible as a contribution to the park. Parks should address their needs clearly so that the friend group can determine how to help them and reach an agreement on proposed projects and timelines. Finally, the park should sign a three-five year agreement with the friend group to formally identify the responsibilities of each party. To maintain a good relationship with a friend group, the superintendent and staff of a park unit should spend time working together with that group, thus ensuring that the non-profit organization is really supporting the management of the park.

The National Park Foundation is an official foundation that was chartered by Congress to build a bridge between the public and national park units. NPF does not receive federal appropriations. The total assets held by NPF exceed \$70 million. NPF accepts applications from all national park units to strengthen their management activities.

#### 4.5.4 SOCIAL MARKETING OF CONSERVATION

Social marketing and advertising are used to change behaviors in order to accomplish the goals of conservation. RARE is an international non-profit organization that assists communities in building outreach and support for preservation of resources in their areas. RARE uses pride campaign strategies to advance conservation by calling for behavioral changes needed within a community to protect their resources. They do this through social marketing aimed at building personal pride and responsibility for the health of the resource. Usually, behavioral change has four stages: pre-contemplative, contemplative, action and maintenance. Following the four stages, RARE has developed a formula to stimulate behavior change as follows:  $K+A+IC+BR \rightarrow BC \rightarrow TR \rightarrow C$ . Working backwards in the formula, C=what must be conserved, TR=Threats to conservation at the site, BC=What behavior for what group must be changed, BR=What the barriers to adoption of new behaviors are, IC=What conversations are needed for people to change, A=What attitudes need to shift to begin to have those conversations, and K=What knowledge is needed to increase awareness and shift attitudes. Pride campaign strategies can be studied at four universities around the world.

#### **CASE STUDY: SOCIAL MARKETING FOR CONSERVATION—RARE AND ITS PRIDE PROGRAMS**

A successful application of pride campaign can be seen in the Sierra de Manantlán in Mexico, where forest fires caused by the farmers burning their fields posed threats to adjacent forests in the protected area. To stop this, the project champion, Salvador García Ruvalcaba, thought of a special bird—trogon that is in the forest and whose color matches the red, white and green of Mexican flag. This bird was adopted as the symbol for preserving the health of the forest with varied branding measures in the local area. A pride campaign using music and a person costumed as the trogon bird toured the country with a dance troupe spreading the message of the importance of the forests to the preservation of this bird and how people's behaviors were contributing to its decline. Local mariachi bands wrote songs about trogon that went to the top of the charts in five areas. Local priests started giving sermons about trogon and forest fires. Teachers

taught the story about trogon, forest and fire. A local corporation that delivered all the water adopted trogon symbol and played the music from the truck as they delivered the water. When this all came together, people felt compelled to help protect this bird. There was an outpouring of activity among young people, who formed volunteer fire groups to fight fires, and the farmers began to ask what they could do to reduce forest fires. Pride campaign strategies are very different from other conservation strategies that tell people to change their inappropriate behaviors. This strategy makes a community partner become part of the change. Through this kind of pride campaign, the local community achieved a 370% increase in knowledge about the environment, a 210% increase in community members that understood the benefits of the protecting the forest reserve, and a 78% decrease in forest fires. The campaign ended seven years ago, but fires are still down due to the continuing influence of the pride campaign.

Each year, RARE selects 12 individuals from 12 areas to travel to one of the universities that they work with to learn these methodologies. A pride program consists of 17 weeks of study in classroom which is part of a 2 year commitment to plan and implement a campaign in the field, and qualified campaign leaders successfully finish a pride program are awarded a master's degree from one of the universities. At the present time, RARE has offices in China that are based at Southwest Forestry University. In 2007, RARE signed a partnership agreement with the Ministry of Environment Protection to run a pride campaign in China. Beyond running a pride campaign, RARE also conducts training to promote the pride campaign formula in China. Therefore, RARE have established a training center in partnership with Southwest Forestry University. In the next two years, RARE China is likely to launch 10-12 campaigns to protect wildlife through arousing people's intrinsic pride in their wildlife.

## **4.6 REFERENCES**

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## 4.7 APPENDIX

### 4.7.1 VOLUNTEER APPLICATION FORM FOR NPS<sup>1</sup>

OMB 0596-0080 (Expires 08/2010)

<b>Volunteer Application for Natural Resources Agencies</b>		Instructions: Mark <input checked="" type="checkbox"/> in the appropriate boxes, for other items either print or type responses. if extra space is needed use item 18.																					
1. Name (Last,First,Middle)	2. Age	3. Telephone Number (    )	4. Email Address																				
5. Street Address (include apartment no.,if any)		6. City, State, and Zip Code																					
<p>7. Which general volunteer work categories are you most interested in?</p> <table border="0"> <tr> <td><input type="checkbox"/> Archeology</td> <td><input type="checkbox"/> Natural Resources Planning</td> </tr> <tr> <td><input type="checkbox"/> Botany</td> <td><input type="checkbox"/> Office/Clerical</td> </tr> <tr> <td><input type="checkbox"/> Campground Host</td> <td><input type="checkbox"/> Range/Livestock</td> </tr> <tr> <td><input type="checkbox"/> Construction Maintenance</td> <td><input type="checkbox"/> Research/Librarian</td> </tr> <tr> <td><input type="checkbox"/> Computers</td> <td><input type="checkbox"/> Soil/Watershed</td> </tr> <tr> <td><input type="checkbox"/> Conservation Education</td> <td><input type="checkbox"/> Timber/Fire Prevention</td> </tr> <tr> <td><input type="checkbox"/> Fish/Wildlife</td> <td><input type="checkbox"/> Trail/Campground Maintenance</td> </tr> <tr> <td><input type="checkbox"/> Historical/Preservation</td> <td><input type="checkbox"/> Tour Guide/Interpretation</td> </tr> <tr> <td><input type="checkbox"/> Pest/Disease Control</td> <td><input type="checkbox"/> Visitor Information</td> </tr> <tr> <td><input type="checkbox"/> Minerals/Geology</td> <td><input type="checkbox"/> Other(Please specify)</td> </tr> </table>				<input type="checkbox"/> Archeology	<input type="checkbox"/> Natural Resources Planning	<input type="checkbox"/> Botany	<input type="checkbox"/> Office/Clerical	<input type="checkbox"/> Campground Host	<input type="checkbox"/> Range/Livestock	<input type="checkbox"/> Construction Maintenance	<input type="checkbox"/> Research/Librarian	<input type="checkbox"/> Computers	<input type="checkbox"/> Soil/Watershed	<input type="checkbox"/> Conservation Education	<input type="checkbox"/> Timber/Fire Prevention	<input type="checkbox"/> Fish/Wildlife	<input type="checkbox"/> Trail/Campground Maintenance	<input type="checkbox"/> Historical/Preservation	<input type="checkbox"/> Tour Guide/Interpretation	<input type="checkbox"/> Pest/Disease Control	<input type="checkbox"/> Visitor Information	<input type="checkbox"/> Minerals/Geology	<input type="checkbox"/> Other(Please specify)
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<sup>1</sup> Extracted from: [http://www.nps.gov/getinvolved/upload/vip\\_brochure.pdf](http://www.nps.gov/getinvolved/upload/vip_brochure.pdf)

<p>8. What qualifications/skills/experience/education do you have that you would like to use in your volunteer work?</p> <table border="0"> <tr> <td><input type="checkbox"/> Backpacking/Camping</td> <td><input type="checkbox"/> Map reading</td> </tr> <tr> <td><input type="checkbox"/> Biology</td> <td><input type="checkbox"/> Mountaineering</td> </tr> <tr> <td><input type="checkbox"/> Boat Operation</td> <td><input type="checkbox"/> Photography</td> </tr> <tr> <td><input type="checkbox"/> Carpentry</td> <td><input type="checkbox"/> Public Speaking</td> </tr> <tr> <td><input type="checkbox"/> Clerical/Office Machines</td> <td><input type="checkbox"/> Research/Librarian</td> </tr> <tr> <td><input type="checkbox"/> Computer Programming</td> <td><input type="checkbox"/> Sign Language</td> </tr> <tr> <td><input type="checkbox"/> Drafting/Graphics</td> <td><input type="checkbox"/> Supervision</td> </tr> <tr> <td><input type="checkbox"/> Driver's License</td> <td><input type="checkbox"/> Other Trade skills(Please specify)</td> </tr> <tr> <td><input type="checkbox"/> First Aid Certificate</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Hand/Power Tools</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Heavy Equipment Operation</td> <td><input type="checkbox"/> Teaching</td> </tr> <tr> <td><input type="checkbox"/> Horses-Care/Riding</td> <td><input type="checkbox"/> Working with People</td> </tr> <tr> <td><input type="checkbox"/> Landscaping/Reforestation</td> <td><input type="checkbox"/> Writing/Editing</td> </tr> <tr> <td><input type="checkbox"/> Land Surveying</td> <td><input type="checkbox"/> Other(Please specify)</td> </tr> <tr> <td><input type="checkbox"/> Livestock/Ranching</td> <td></td> </tr> </table>		<input type="checkbox"/> Backpacking/Camping	<input type="checkbox"/> Map reading	<input type="checkbox"/> Biology	<input type="checkbox"/> Mountaineering	<input type="checkbox"/> Boat Operation	<input type="checkbox"/> Photography	<input type="checkbox"/> Carpentry	<input type="checkbox"/> Public Speaking	<input type="checkbox"/> Clerical/Office Machines	<input type="checkbox"/> Research/Librarian	<input type="checkbox"/> Computer Programming	<input type="checkbox"/> Sign Language	<input type="checkbox"/> Drafting/Graphics	<input type="checkbox"/> Supervision	<input type="checkbox"/> Driver's License	<input type="checkbox"/> Other Trade skills(Please specify)	<input type="checkbox"/> First Aid Certificate		<input type="checkbox"/> Hand/Power Tools		<input type="checkbox"/> Heavy Equipment Operation	<input type="checkbox"/> Teaching	<input type="checkbox"/> Horses-Care/Riding	<input type="checkbox"/> Working with People	<input type="checkbox"/> Landscaping/Reforestation	<input type="checkbox"/> Writing/Editing	<input type="checkbox"/> Land Surveying	<input type="checkbox"/> Other(Please specify)	<input type="checkbox"/> Livestock/Ranching	
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<p>9. Based on boxes checked in items 7 and 8, what particular type of volunteer work would you like to do?(Please describe any specific qualifications, skills, experience, or education that apply)</p>																															
<p>10. Are you a United States Citizen?  <input type="checkbox"/> Yes <input type="checkbox"/> No (If no,additional information may be required)</p>																															
<p>11. a. Have you volunteered before? <input type="checkbox"/> Yes <input type="checkbox"/> No  b. If Yes, please briefly describe your volunteer experience.</p>																															
<p>12. Would you like to supervise other volunteers? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>																															
<p>13. What are some of your objectives for working as a volunteer?(Optional)</p>																															
<p>14. Please specify any physical limitations that may influence your volunteer work activities:</p>																															
<p>15. a. Which months would you be available for volunteer work?  <input type="checkbox"/> January      <input type="checkbox"/> February      <input type="checkbox"/> March      <input type="checkbox"/> April  <input type="checkbox"/> May      <input type="checkbox"/> June      <input type="checkbox"/> July      <input type="checkbox"/> August  <input type="checkbox"/> September      <input type="checkbox"/> October      <input type="checkbox"/> November      <input type="checkbox"/> December</p> <p>15b. How many hours per week would you be available for volunteer work? Hours</p> <p>15 c. Which days per week would you be available for volunteer work?  <input type="checkbox"/> Monday    <input type="checkbox"/> Tuesday    <input type="checkbox"/> Wednesday    <input type="checkbox"/> Thursday    <input type="checkbox"/> Friday  <input type="checkbox"/> Saturday    <input type="checkbox"/> Sunday</p>																															

<p>16. Specify at least three states or specific locations within a state where you would like to do volunteer work.</p>
<p>17. Specify your lodging requirements:</p> <p><input type="checkbox"/> I will furnish my own lodging (such as tent; camper; own, relative's, or friend's place)</p> <p><input type="checkbox"/> I will require assistance in finding lodging</p>
<p>18. If a volunteer assignment is not available at the location specified in item 15, do you want your application forwarded to another location, or Federal agency, seeking volunteers with your background/interest?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No (Please specify)</p>
<p>19. This is provided for more detailed responses. Please indicate the item numbers to which these responses apply:</p>
<p style="text-align: center;"><b>Burden Statement</b></p> <p><i>According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0080. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.</i></p> <p><i>The U.S. Department of Agriculture (USDA) and U.S. Department of the Interior prohibit discrimination in all programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD)</i></p> <p><i>To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-6410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA and USDL are equal opportunity providers and employers.</i></p>
<p style="text-align: center;"><b>Notice to Volunteer</b></p> <p>Volunteers are not considered Federal employees for any purposes other than tort claims and injury compensation. Volunteer service is not creditable for leave accrual or any other benefit. However, volunteer service is creditable work experience.</p>

<p><b>Privacy Act Statement</b></p> <p><i>Collection and use is covered by Privacy Act System of Records OPM/GOVT-1 and USDA/OP-1, and is consistent with the provisions of 5USC 552a(Privacy Act of 1974), which authorizes acceptance of the information requested on this form. The data will be used to maintain official records of volunteers of the USDA and USDL for the purposes of tort claim and injury compensation. Furnishing this data is voluntary, however if this form is incomplete, enrollment in the program cannot proceed.</i></p>	
20. Signature (Sign in ink)	20. Date

#### 4.8 ACRONYMS

<b>1998 Act</b>	1998 Concessions Management Improvement Act
<b>BLM</b>	Bureau of Land Management
<b>CPALAP</b>	China Protected Area Leadership Alliance Project
<b>LAC</b>	Limits of Acceptable Change
<b>NLCS</b>	National Landscape Conservation System
<b>NEPA</b>	National Environmental Protection Act
<b>NPF</b>	National Park Foundation
<b>NPS</b>	National Park Service
<b>ROS</b>	Recreation Opportunity Spectrum
<b>USFWS</b>	U. S. Fish and Wildlife Service
<b>VERP</b>	Visitor Experience and Resource Protection
<b>VIMS</b>	Visitor Impact Management System
<b>WCS</b>	Wildlife Conservation Society

# 5

## **CONSERVATION TECHNOLOGY**

The loss of biodiversity worldwide has become all too apparent. As destructive human activities become more intensive with the growth of population as well as the increasing but incompatible demands for natural resources, the use of new technologies can help to conserve ecosystems and threatened species. In the last several decades, we have witnessed the advance of technology and its contributions to supporting biodiversity preservation. Several technological breakthroughs and innovations have created new opportunities for people to ultimately win the battle to save biodiversity. In this section, we will introduce some current technological techniques to promote their applications for conservation purposes and to support conservation decision-making.

### **5.1 3S TECHNIQUES**

#### **5.1.1 BACKGROUND**

Policy-makers and managers of protected areas have often been

puzzled both by the inadequacy of data and the unsatisfactory status of data for informative conservation decision-making (Heywood, 1997; Funk *et al.*, 1999). Developing conservation strategies based on limited information and poor analysis could have serious consequences (Salem, 2003), e.g., the degradation of habitat quality, the loss of endangered species, and the decline of population size. The revolution in the availability of information, the advance of technology, and its application to data processing and management, greatly help to solve such problems. Topographic, environmental, climatic, geological, species, community, ecosystem, administrative, and socioeconomic data in the form of text documents, tabular databases, figures, spatial databases (locations), and image files (e.g., satellite images) are collectively or partially used to support the development of conservation strategies (Salem, 2003). Advances in geoinformatics help to manage the process and to analyze such kinds of data systematically, and can display analytic results visually with documents and maps. Geoinformatics uses combined technologies, including Geographic Information System (GIS), Remote Sensing (RS) and Global Positioning System (GPS), to support biodiversity conservation, environmental management, and so forth, through collecting, analyzing, modeling, and processing complicated geospatial data (Trisura, 2009). GPS, GIS, and RS are also collectively called 3S technologies.

### **5.1.2 GEOGRAPHIC INFORMATION SYSTEM (GIS)**

GIS is usually defined as a computer-based system that captures, stores, manages, analyzes, and displays geo-referenced data (geographic data). GIS is not only a powerful reference base but also an effective way of communicating information, including maps of vegetation, climate, soils, land cover, topography, hydrology, bird migration, and distribution of fauna for biodiversity conservation (Salem, 2003). GIS also provides rich visual data for the development of conservation strategies. GIS is a fundamental tool used to assess and monitor biodiversity, as well as its association with surrounding environments.

Many GIS-based approaches have been developed to help assess

and ameliorate protected area systems locally, nationally, and even globally. GAP analysis created by NBII (National Biological Information Infrastructure) in 1987 is one of the best known GIS-based methods for identifying the representativeness of our present-day protected lands in protecting wildlife in a specific geographic region. The analysis and projection of threats to biodiversity have been conducted with different models based on GIS. For example, The Nature Conservancy (TNC) deploys ESRI (GIS software) technology for climate change analysis. Launched by TNC in 2009, Climate Wizard, allows people free access to different climate change projections for the United States. Conservation International uses GIS to help assess the influences of land changes on endemic biodiversity in Bolivia. GIS has also been used as an indispensable supportive technology for diverse research relevant to biodiversity conservation. Biomass and carbon stored in American forests are also calculated using GIS-based methodology by scientists at the Woods Hole Research Center. GIS assists in displaying the national carbon sequestration (NatCarb) in the United States and Canada. A series of geospatial data, e.g., carbon sources, potential storage sites, land use, and transportation, has been collected to model and establish a database by the U. S. Department of Energy's Regional Carbon Sequestration Partnerships (RCSPs). Finally, a GIS-based nature value assessment system (Natural Capital Project) has been developed to calculate values of biodiversity in a specific scale under the partnership of TNC, WWF, and Stanford University, which has provided reliable scientific support for creating reasonable eco-compensation mechanisms, frameworks, and standards.

GIS is also a fundamental tool for nearly all biodiversity information management systems (Salem, 2003). TNC has taken a leading role in establishing the Natural Heritage Program and the Conservation Data Center Network (now taken over by Nature Serve, which became independent of TNC in 1994) in the United States. This system provides early warning for any habitat with high conservation priority that becomes endangered so that the appropriate conservation tools, e.g., land acquisitions, conservation easements, etc., can be applied. Similarly, Climate Wizard and NatCarb databases are GIS-based. They encompass volumes of available and necessary data for appropriate modeling analysis.

### 5.1.3 REMOTE SENSING (RS)

RS data and GIS are important for most analyses in biodiversity conservation. RS technologies collect electromagnetic energy reflecting and radiating from objectives via sensor devices often attached to helicopters, planes, and satellites at varying heights above the Earth's surface. Passive (which directly measure radiation from the detected objective) and active sensors (which emit a pulse first and then gauge the energy returned or bounced back) are usually used. Land cover and land use monitoring generally use passive sensors, while surveys on vegetation and ground surface elevations commonly apply active sensors (Turner *et al.*, 2003). Remote sensors could be cameras, scanners, or radar. Received electromagnetic waves, with wavelengths ranging from visible to near infrared, are finally produced in the form of film or digital imagery.

Usually, conservation researchers and protected area managers, as well as policy makers, purchase remotely sensed imagery and analyze it with GIS-based models, according to their own research objectives, e.g., vegetation classification or protected area delineation. Remote sensing is more frequently used to quantify flora data rather than fauna data. The utilization of telemetry technology can locate or track animals and movement patterns while habitat selection can also be assessed by combining this with other GPS tools.

RS can be used to identify biodiversity at finer resolutions, e.g., species assemblages or even individual trees with recent advances in the sensitivity of sensors. Spatial resolution ranges from tens of meters to several meters. New hyper-spectral sensors used by current remote sensing make it possible to identify individual organisms, species assemblages, or ecological communities (Turner *et al.*, 2003). In addition, RS can be applied to predict the biodiversity richness of a site by analyzing selective environmental parameters of the site (Turner *et al.*, 2003). GAP analysis relies on remotely sensed data to identify habitats and to predict species assemblages expected to be found in those habitats with GIS-based models. The combination of RS with GIS has the potential of aiding in decoding species diversity patterns at fine-scale resolution. Remotely sensed imagery also helps people to monitor habitat change trends (DeFries *et al.*, 2000), as well

as to identify species and species assemblages (Kokaly *et al.*, 2002; Albright *et al.*, 2002), to understand species richness with remotely sensed primary productivity (Waring *et al.*, 2002), to predict species distribution with remotely sensed climate variables (Johnson *et al.*, 1998), and to interpret the relationships between habitat structures and topography (Johnson *et al.*, 1998; Nagendra, 2001).

Although RS is a powerful and commonly used technology which helps to answer many questions related to biodiversity conservation, it has some disadvantages. For example, it is very expensive to get imagery and other data products. The high costs of software for analysis are sometimes daunting, and there is a shortage of professional expertise familiar with imagery interpretation and relevant software application. To ensure that this technique can better support biodiversity conservation, the tool should be widely promoted as a basic toolkit for conservators.

#### **5.1.3.1 LIGHT DETECTION AND RANGING (LiDAR) or (AIRBORNE LASER RADAR)**

As an active remote sensing technology, LiDAR provides a breakthrough for biodiversity conservation in identifying plant species and forestry biomass. The incident pulse of energy reflects from canopy and ground surfaces and back to the LiDAR instrument. The time difference between pulse emission and return can be used to calculate the distance between the instrument and the object. Large-footprint LiDAR systems rather than small-footprint systems are used for mapping forest structure because of the following advantages: (1) larger footprint size is larger than the average crown diameter of a canopy-forming tree (10-25m); (2) laser energy can reach the ground even in dense forests; (3) it can produce a wide image swath; and (4) it can digitize the entire return signal to provide a vertical distribution of intercepted surfaces from the top of the canopy to the ground (Dubayah and Drake, 2000).

Some main forest characteristics, such as canopy height (Dubayah *et al.*, 2000), subcanopy topography, or vertical distribution of intercepted surfaces (Lefsky *et al.*, 1999) can be directly measured with LiDAR. Aboveground biomass (Dubayah *et al.*, 2000), basal area (Means *et al.*, 1999), mean stem diameter, vertical foliar profiles, structural diversity (Levick and Rogers, 2002) and canopy volume can

be modeled from collected LiDAR data. In addition, this technology has been used to monitor biodiversity by measuring the vertical structure of forests, the health of the ecosystem, and mapping coastal habitats as well. LiDAR could become a powerful tool to assess habitat loss and fragmentation, which has been identified as the first contributors to global biodiversity loss.

### **5.1.3.2 VERTICAL-LOOKING RADAR**

As a RS technique, vertical-looking radar is able to detect insects migrating at higher altitudes, ranging from 150m to 1,200m above ground. Vertical-looking radar gives off vertical beams to detect insects. With this system, readings are taken within 15m height bands, 45m deep, separated from each other by a non-sampling interval of 26m. This technique can record information from all the height bands automatically for a 5-minute period, every 15 minutes per day. Consequently, values of seven parameters depicting insects' migration, including speed, direction, alignment, shape and size, can be inferred from the collected information and stored in a computer (Chapman *et al.*, 2002). This technique can detect insects with a weight of about 2mg at the lowest height band and 15 mg at the highest height band (Chapman *et al.*, 2002).

Better understanding of the migration or movement of insects has implications for pest management, conservation, and environmental change monitoring (Drake and Gatehouse, 1995). Compared to traditional light-trap catches, or mechanical sampling with aircraft and tethered balloons, the vertical-looking radar technique can detect insects with a wider altitude range (more than 1km) and sample insects in larger quantities (Chapman *et al.*, 2002). This technique is unique in its ability to monitor insects continuously and autonomously, and this obviously saves a lot of labor and time (Beewinkle *et al.*, 1995).

This method has been used to monitor the movement of diverse insects, including mosquitoes, locusts, moths, aphids and bees, with low costs and labor worldwide. By integrating with GIS, this method can be enhanced to establish an early warning system for pest management. Moreover, this method can assess the loss of insect biodiversity caused by deforestation and the utilization of pesticides.

#### 5.1.4 GLOBAL POSITIONING SYSTEM (GPS)

GPS is a satellite-based navigation system that is composed of 24 geosynchronous satellites owned and maintained by the U.S. Department of Defense. GPS has been made available for civilian use since the 1980s. GPS satellites with atomic clocks constantly transmit unique radio signals while they circle the earth twice a day in very precise orbits. The radio signals can pass through clouds, glass, and plastic, but they weaken when passing through solid objects (e.g., buildings) and they cannot pass through metal objects. Simultaneously using the same unique code, GPS receivers communicate with satellites, which then determine the position of the GPS receiver through pseudo range management. To calculate a 2D position (latitude and longitude), GPS receivers must simultaneously receive signals from at least three satellites. To determine a 3D position (latitude, longitude and altitude), signals from more than four satellites should be received at the same time. Due to satellite array, any site on Earth can have at least four satellites within communication range at any given time. It is worth considering that GPS receivers might not receive signals when under thick forest canopies, underground, or underwater. A position expressed as latitude and longitude is calculated with the World Geodetic System 1984 datum (or WGS-84). Usually, a 10-30 m bias happens when positioning an object, which can be calibrated with differential correction methods.

There are many options for GPS receivers with differing results in accuracy. Users should select those which appropriately meet their survey needs. Furthermore, some software packages are available on the market to extend GPS receivers' functions in the United States, e.g., ArcPad (software for professional), Garmin Mapsource (free mapping software preinstalled in Garmin GPS receiver), Trimble®GPSPathfinder®office (software for Trimble GPS Pathfinder receivers), Google Earth (available from the internet free or paid), DNR Garmin GPS application (free software), and MapGuide Open Source (web-based software).

GPS has been widely used in land surveying, including identifying the boundaries of protected areas, locating species positions in the

field, marking baseline conservation information of a protected area (e.g., patrolling routes, protection stations, road network etc.), tracking and marking the movement or migratory patterns of animals, and marking sampling sites/plots. GPS has become a basic tool for the management of protected areas worldwide.

## **5.2 INFRARED-TRIGGERED PHOTOGRAPHY**

The technique of combining infrared detection and cameras has become popular with the rapid development of the digital camera (Swann *et al.*, 2004). The camera shutter is triggered to take a photo when the object animal crosses an infrared beam or series of beams. This technique can assist in identifying hard-to-find and secretive animals with visual images rather than inferring their existence indirectly through various signs (e.g., scat, burrows, tracks, hairs), as has been done in the past. Usually, cameras with active and passive infrared sensors are used (Table 3.1) (Brown and Gehrt, 2009). Active infrared sensors are activated by a broken IR beam, while passive ones are activated by a rapid change in the amount of heat detected in a certain area. In order to photograph animals at night, either an incandescent or infrared flash is used. Compared to an incandescent flash, an infrared flash is more expensive, but the advantage is that it doesn't frighten animals (Brown and Gehrt, 2009). Trigger speed ranges from 0.15 seconds to 5 seconds. Some cameras allow recorded images to be sent to a computer with a license-free radio frequency system up to 2 miles away.

The process of using this technique is described below, according to a summary made by Brown and Gehrt (2009). Correct placement on the appropriate site is critical for taking photos with infrared cameras. Cameras should be fixed to a tree or post at least 5 feet from any bait or attractant. Trails, latrines, buck scrapes or rubs, food plots, water sources, bird feeders, or any other areas frequently used by animals are optimal placement sites. In addition, any branches or leaves that might shade cameras should be appropriately cleared away. Before starting monitoring or research, camera testing is essential.

**Table 5.1 Comparisons of Two Types of Infrared Camera Sensors**

Type	Advantages	Disadvantages
Active Infrared Sensor	<ul style="list-style-type: none"> <li>• Set at a desired height to exclude some species</li> <li>• Relatively insensitive to changes in ambient temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive</li> <li>• Time-consuming</li> <li>• Sensitive to vegetative movement</li> </ul>
Passive Infrared Sensor	<ul style="list-style-type: none"> <li>• Easy to setup</li> <li>• Large detection zones</li> <li>• Low sensitivity to vegetative movement</li> </ul>	<ul style="list-style-type: none"> <li>• Low tolerance for rapid changes in temperature or movement of sunlight within the detection area</li> <li>• Less sensitive to small animal movement</li> </ul>

This technique has created a new era for collecting present/absence data, identifying criteria for habitat selection, and collecting population numbers of some elusive animals by integrating with the mark and recapture method (Karanth and Nichols, 1998; Cutler and Swann, 1999, Martorello *et al.*, 2001; Wilson and Delahay, 2001; Wolf and Swann, 2002; Bridges *et al.*, 2004; Li *et al.*, 2009).

### 5.3 MARKING AND TRACKING TECHNIQUES

These techniques are used for tracking animals to better understand some of their behaviors (e.g., foraging, migration and movement, mating). Knowledge of population dynamics and their interaction with habitats is essential to species habitat management, species management and restoration, and protected areas delineation and management.

#### 5.3.1 RADIO AND SATELLITE TELEMETRY

Radio-telemetry is a well-tested technique for tracking animals. This method allows researchers to receive signals emitted by a transmitter placed on free-ranging animals with receivers tuned to specific radio

transmission frequencies. This method has been widely applied to understand habitat use (Madsen, 1984; Marsh and Rathbun, 1990; Mellen *et al.*, 1992), home range size (Worton, 1987; Samuel and Green, 1988; Naef-daenzer, 1993), mortality and survivorship (Rappole *et al.*, 1989; De Young, 1989), and migration timing and routes (Garshelis and Garshelis, 1984; Andrews and Calkins, 1995) for many animals, ranging from amphibians to large mammals.

A transmitter consists of an antenna, a power source, and a transmitter unit (tag) and can be a one-stage or two-stage transmitter. A two-stage transmitter is composed of a basic oscillator and an amplifier. It weighs more than a one-stage transmitter. Therefore, two-stage transmitters are suitable for animals that are large enough so as not to be encumbered by the weight. Otherwise, one-stage transmitters should be placed on small animals with short-distance movement. Radio-telemetry can collect other information besides merely location. It can also include activity and temperature as well as light sensors. Activity sensors provide real-time data to record the activities of animals and time-delay sensors to study mortality and activity status.

Attaching the correct transmitter to the captured animals is a key step in conducting any study with this method. Body type, shape, size, and lifestyle of the study species determines the transmitter type, size, and placement position (Table 3.2) (Ministry of Environment and Lands and Parks Resources Inventory Branch, 1998). Generally, no tag should exceed 5% of an animal's body weight. For bats, less than 4% is optimum. Transmitters should be tested both before and after attachment, and more than one animal should be tagged in a group in case of potential failure. If animals with transmitters will not be recaptured, then transmitters with breakaway or "rot-away" capability are recommended. Once animals with transmitters are released, researchers receive signals via antenna. Static electricity from clothing or other objects might damage receivers. Receivers are also sensitive to moisture. Therefore, tracking animals in the rain could become problematic. Antennas can be handheld, mounted to a boat, vehicle, aircraft, or fixed-site receiving station. Once a transmitter is mounted and a receiver is set up, researchers can locate animals in the field with ground and aerial survey methods.

**Table 5.2 Methods of Attachment of Transmitters**

Animals	Methods of Attachment
Frogs and toads	Ingested tags, surgical implant
Salamanders and newts	Surgical implant
Snakes	Surgical implant
Lizards and skinks	Surgical implant or backpacks or adhesive mounts
Turtles	Carapace mount
Small rodents	Collars attached under or on top of neck, glue to backpack, subcutaneous/intraperitoneal implant
Bats	Glue to back, head or collar
Insectivores	Implanted or glue to back/tail
Furbearers and large carnivores	Collars attached under or on top of neck, satellite collar
Ungulates	Collars attached under or on top of neck (satellite collar for wide-ranging ungulates), ear-tag, implanted
Web-footed birds	Collars, backpack, tail-mounted, leg band, satellite transmitters,
Shorebirds	Glue on back
Raptors	Tail-, backpack-, bewit- and poncho-mounted,
Game birds	Poncho-, bib-, backpack- and harness-mounted
Hérons and cranes	Leg-, backpack-mounted
Swallows, swifts and goatsuckers	Backpack-mounted or glue-ons
Passerines, pigeons and doves	Glue (wax) or sewn or attached to tail feathers
Animals often run through tubular passageways	Attached to backpack with a harness

It should be noted that radio-telemetry has some intrinsic shortcomings. For example, tagging animals might be detrimental to them. Also, this tool is expensive and time-consuming. Since this technique is invasive to animals, especially for animals with implanted transmitters, some countries even require permits and peer review before transmitters are mounted on captured animals (Ministry of Environment and Lands and Parks Resources Inventory Branch, 1998). However, this methodology is among the most popular and widely used technique. New innovations in telemetry technology continually increase the utility of this technique.

Similar to radio-telemetry but more powerful, satellite-telemetry has attracted the interest of researchers in order to better understand the movements of birds, mammals, fish and other marine animals (Boustany *et al.*, 2002; Ferraroli *et al.*, 2004; Hays *et al.*, 2004; Jouventin and Weimerskirch, 1990). Satellites receive signals emitted by satellite transmitters attached to animals. Transmitter attachment for satellite-telemetry is similar to that used in radio-telemetry. Compared to radio-telemetry, satellite-telemetry is expensive but saves labor and time. Satellites as receivers help researchers to obtain up-to-date location data tailored to specific projects. Unlike radio-telemetry that locates animals within limited distances, satellite-telemetry allows collecting data from animals in remote locations. Obviously, this kind of tracking is especially suitable for animals with a large habitat range or migration routes over long distances (Block *et al.*, 1998; Read *et al.*, 2007).

During the training, we learned that Yellowstone National Park has used this technique to assist in gray wolf restoration, and that the American Prairie Foundation is using this technique to monitor bison restoration and to study the home range of antelopes and cougars with GPS (global positioning system) radio collars.

### **5.3.2 GENETIC MARKERS**

Genetic markers include morphological, cytological, biochemical, and molecular markers. As inborn markers of animals and plants, genetic markers have been extremely useful in population analysis, e.g., population size and pedigree. Molecular markers are commonly used

in conservation biology. The most frequently used molecular markers include restriction fragment length polymorphisms (RFLPs), random amplified polymorphic DNA (RAPDs), and variable number tandem repeats (VNTRs), including multi-locus minisatellite DNA, single-locus minisatellite DNA, microsatellite DNA (SSRs), and DNA sequences. Advantages of using genetic markers include: (1) they are easier to sample in the field, and (2) molecules are stable and can remain for a long time, even hundreds of millions years. Molecular markers can be extracted from any cell of an organism. Non-invasive sampling methods (e.g., nails, scats, hair, blood, oral cells) are encouraged.

From the perspective of biodiversity conservation, molecular markers help us to understand genetic diversity in order to support development of conservation strategies for endangered species, including restoration (Garshelis *et al.*, 2008), identifying taxonomy of species (Stewart *et al.*, 1996), depicting pedigree (Jones and Wang, 2010; Tuskan *et al.*, 1996), identifying conservation priority for species conservation (Swensen *et al.*, 1995), and population size, structure and viability (Bello and Sanchez, 1999; Sunnucks, 2000; Vucetich *et al.*, 2001).

### 5.3.3 FLUORESCENT PIGMENTS

Animal tracking is difficult, especially tracking nocturnal mammals. Radio tracking, infrared scopes, starlight scopes, and infrared video have not been widely applied due to certain limitations, such as expense or technique constraints. Tracking small mammals with fluorescent pigments has the following advantages: (1) one can accurately identify the location of animals and trace their movement for up to 900 meters; (2) it is inexpensive; and (3) it involves a low level of toxicity (Lemen and Freeman, 1985; Cook and Hain, 1992; Hovland and Andreassen, 1995; Kalcounis-Ruppell *et al.*, 2001).

Tracking animals with fluorescent pigments helps to describe the patterns of movement of animals in order to identify their habitat selections, home ranges, and forage behavior. As for small mammals, e.g., rodents, this method involves setting traps at sunset and checking them about 3 hours later, putting the trapped animals into a plastic bag with pigments and shaking the bag gently before

releasing the animals, and then tracking them the next night with an ultraviolet lamp (Lemen and Freeman, 1985). Lemen and Freeman (1985) found that red, orange, and green pigments are the easiest to detect and distinguish in the field. Fluorescent dyes have been used for diverse insect studies to investigate their dispersal patterns in order to provide informative knowledge for pest management (Jeffrey *et al.*, 1999). Pigments were mixed experimentally in order to discover the best tracking results. In addition, scientists also mark food with fluorescent powders to study how habitat fragmentations influence biodiversity conservation and whether corridors help to fix the problems as designed (Levey *et al.*, 2005). The main limitation of this technique is that it is hard to trace animals on the ground without vegetation cover since poor trails are left by the animals (Lemen and Freeman, 1985).

#### 5.4 STABLE ISOTOPE

As intrinsic markers, stable isotopes have been widely used as a well-developed technique in ecology and environmental science (Dawson *et al.*, 2002). Stable isotopes are incorporated into animal tissues from diet with different degrees of trophic enrichment (Rubenstein and Hobson, 2004). Stable isotopes help us to understand the relationships between wildlife and their environments. Four light stable isotopes ( $\delta^2\text{H}$ ,  $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$ ) and two heavy stable isotopes ( $\delta^{87}\text{Sr}$  and  $\delta^{206,207,208}\text{Pb}$ ) are frequently used to show the relationships due to their nonradioactive and nondestructive traits (Dawson *et al.*, 2002). For animal ecology, stable isotopes have been widely used to analyze food resources, food chains, food webs, communities, and the movements of animals. Stable isotopes are also used to discover gas exchange in a specific ecosystem, as well as the functions of ecosystems and their responses to climate change.

Wildlife conservation requires understanding the patterns of movement of wild animals in order to identify their habitats and food resources. This, in turn, helps to determine the boundaries of protected areas and their consequent effective management of wild

animals. From the perspective of biological conservation, use of the stable isotope is a promising alternative to extrinsic markers (e.g., bird banding) and radio or satellite transmitters to trace the movement of animals because they do not require marking or recapturing animals and are not constrained by the body size of animals. Stable isotopes provide information relevant to geographical regions (Hobson, 1999; Rubenstein and Hobson, 2004). Rubenstein and Hobson (2004) explained that there are three steps to understanding migratory connectivity with stable isotopes: (1) selecting a tissue representing the appropriate temporal period of integration of geographical information; (2) differentiating populations with isotopes; and (3) linking populations between seasons by inferring geographical origins with isotopic similarity. Metabolically inert tissues (e.g., baleen, bill, claw, feather, hair, horn, nail or ear bones) and active tissues (e.g., blood plasma, liver, muscle, eggs, adipose fin or bone collagen) are preferred for studying seasonal movement patterns and proximate spatial information respectively. In the United Kingdom, this technique was employed to study the elusive, rare woodland bat nationwide for the first time.

Stable isotopes have been used to study mammals (e.g., bats, ungulates, elephants, and marine mammals), birds, and fish to infer their habitat selection (Tietje and Teer, 1988; Mizutani *et al.*, 1990), migratory movement (Fry, 1981; Minami and Ogi, 1997), dietary compositions (Romanek *et al.*, 2001; Ben-David *et al.*, 1997; Darimont and Reimchen, 2002), and so forth. Rehme (2010) used stable isotopes to study habitat selection of grassland songbirds at national park properties in order to recommend habitat management strategies for the NPS.

Experts forecast that stable isotopes will greatly help us to understand natal dispersal patterns (Hobson *et al.*, 2001), population mixing and segregation (Rubenstein *et al.*, 2002) and links between breeding and non-breeding demography (Marra *et al.*, 1998) in the future. However, isotopic routing, which means that different stable isotopes are not equally distributed among different tissues of an animal, should be considered when applying this technique so that the best match between isotope and the species being studied can be made (Schwarcz, 1991).

## 5.5 BIOACOUSTIC TECHNIQUE

Many animals, including birds, mammals, amphibians, fishes, insects, and arthropods produce sounds when moving, communicating, or sensing their environment (Sueur *et al.*, 2008). Bioacoustic diversity can be studied in order to evaluate and map biodiversity and monitor the impact human activities have on them (Pavan, 2008). Bioacoustic diversity is becoming an innovative and economic way to assess biodiversity. It can provide the most basic information for biodiversity conservation and the establishment of protected areas, whereas traditional biodiversity assessment methods, whether rapid biodiversity assessment (RBA) or all-taxa biodiversity inventories (ATBI), are not always used because they are costly and/or invasive (Sueur *et al.*, 2008). In dense or steep forests or in aquatic habitats where animals are difficult or even impossible to see, bioacoustics can be collected and analyzed to identify species like birds, mammals, insects, and so on (Pavan, 2008). Therefore, bioacoustics opens another window for rapid biodiversity assessment. Riede (1993) used acoustic techniques to study the diversity of the cricket community in Ecuador. The diversity of insectivorous bats in protected areas of Venezuela was also assessed with acoustic methods (José *et al.*, 2000). Sueur *et al.* (2008) appraised biodiversity in Tanzanian coastal forests in the same manner. Lammers and others (2008) used the bioacoustic technique to monitor coral reefs and other marine habitats around Oahu in the State of Hawaii. Differential habitat uses by bats have also been studied with acoustic techniques (Sherwin *et al.*, 2000).

The bioacoustic technique is an attractive tool because it is non-invasive and can be used in inaccessible habitats. However, limited song documentation greatly hinders the application of this technique to all species. Luckily, this situation might be improved. For example, the Australian Phonotek (CSIRO) has established a labeling system by assigning number codes for species with uncertain taxonomic status and a German bioinformatics project is working on digitizing and pooling major Orthoptera sound collections through a “virtual Phonothek” system (Riede, 1993).

Equipment to study animal sounds typically includes: (1) microphones or hydrophones, including directional microphones and parabolic reflectors; (2) digital sound or ultrasound recorders; and (3) hardware and software for sound analysis (Pavan, 2008). If sounds of bats are recorded, bat detectors and specialized equipment for recording ultrasounds are required. Hard-disk and solid-state recorders are now widely used. PDA (personal digital assistant) based recorders interfaced with a microphone preamplifier, and an AD converter, running either Linux or WindowsMobile, comprise portable equipment to record and download sound to a traditional computer. The constraints of PDA based recorders include incompatibility of hardware and power duration in the field, since it is difficult to recharge the battery. Sometimes, sounds are directly recorded on the computer.

Finally, as a kind of natural resource, NPS has managed soundscapes for almost 20 years with bioacoustic techniques in order to mitigate noise from human activities, e.g., aircraft, snow machines, watercraft, and road vehicles (Miller, 2008). In this way, bioacoustics can be an alternative way to monitor human disturbance.

## **5.6 REPEAT PHOTOGRAPHY**

Repeated oblique photography can be an inexpensive but useful tool to record and quantify changes in an ecosystem through tracking changes in vegetation, land use, stream channels, and so on (Rogers *et al.*, 1984). Repeated photos can also assist in recording the historic conditions and trends of an ecosystem. Photography has been adopted widely since it is inexpensive and easy to implement. This method has been popular since the 1960s in the United States (Byers, 1997). However, some constraints have hampered the accuracy of this method, such as the lack of sufficient usable historical photos and adequate descriptive information on those photos (BLM, 1996).

Repeat historical photos must follow four steps: (1) screening existing photos—only historical photos with basic background information, such as where the photos were taken, are useful; (2) locating the original photo points to recreate photos on the exact

same points where the historical photos were taken; (3) replicating the conditions by retaking photos at the same time of year and the same time of day as the original photo; (4) replicating the equipment; (5) establishing a permanent record; and (6) analysis (BLM, 1996). When it is difficult to pinpoint the original photo points, valid comparisons can still be conducted, even though repeat photographs do not match exactly (Rogers *et al.*, 1984). Frequently, 100 percent replication of the historic conditions is unrealistic, due to the lack of available information on historical photos. Modern cameras with wide-angle zoom lenses usually meet the needs of retaking the photos. To ensure that enough information is collected, standard field data sheets help to document and manage relevant information. Sample field data sheets used by BLM are shown in appendix 5.9.1 (BLM, 1996).

Repeat photos have been used to monitor vegetation change (Hendrick and Copenheaver, 2009), land use change (Kull, 2005), landscape change in national parks (Byers, 1997; Byers, 2000), and the influence of climate change on glaciers in protected areas (e.g., Basagic, 2008). Research conducted by Kull (2005) indicates that repeat photography is an efficient, effective, and useful method to track land use changes when compared with air photos and satellite images. The USGS initiated the Repeat Photography Project in 1997 to systematically document the changes of glaciers at Glacier National Park. The USGS has also developed quantitative methods to analyze glacier recession with repeated photographs. Given the unparalleled advantages of this methodology, repeat photography offers a large potential to assist in management of protected areas in China by monitoring landscape change, vegetation change, and land use change.

## **5.7 DISTANCE SAMPLING**

Distance sampling is used to estimate densities and abundance of populations. Reliable population abundance estimation is necessary to categorize threatened species, guide early intervention, and assess the effects of conservation management (Barraclough 2000). Distance sampling is commonly conducted with point and line transects for

a wide variety of systems and species (Sutherland, 1996). Although the technique is a classic one, the advances of statistics and distance measurement equipment have made the technique more useful. The laser rangefinder is a modern and timesaving device to measure distance (Ransom and Pinchak, 2003). Aerial counting is also used to detect targeted animals (Kingsley and Reeves, 1998; Heide-Jørgensen *et al.*, 2008). Aerial counting can be used for surveys of animals living on grasslands, prairie, ocean, coastline, or open water bodies, where good visibility is available.

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## 5.9 APPENDIX

### 5.9.1 SAMPLE OF FIELD DATA SHEET FOR REPEAT PHOTOGRAPHY

<b>PHOTOGRAPHY FLELD DATA</b>	
Photo Number: _____	
Location: _____	
View Direction: _____	
General Description: _____	
<b>Original Photo</b>	<b>Duplicate Photo</b>
Date: _____	Date: _____
Time of Day: _____	Time of Day: _____
Photographer: _____	Photographer: _____
Photo Source: _____	Camera Lnformation: _____
_____	_____
<b>Vegetation:</b>	<b>Vegetation:</b>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
<b>Comments:</b>	<b>Comments:</b>
_____	_____
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_____	_____
_____	_____
_____	_____

## 5.10 ACRONYMS

<b>ATBI</b>	All-Taxa Biodiversity Inventories
<b>BLM</b>	Bureau of Land Management
<b>CI</b>	Conservation International
<b>GIS</b>	Geographic Information System
<b>GPS</b>	Global Positioning System
<b>LiDAR</b>	Light Detection and Ranging
<b>NBII</b>	National Biological Information Infrastructure
<b>RAPDs</b>	Random Amplified Polymorphic DNA
<b>RBA</b>	Rapid Biodiversity Assessment
<b>RCSPs</b>	Regional Carbon Sequestration Partnerships
<b>RFLPs</b>	Restriction Fragment Length
<b>RS</b>	Remote Sensing
<b>SSRs</b>	Microsatellite DNA
<b>TNC</b>	The Nature Conservancy
<b>USGS</b>	U.S. Geological Survey
<b>VNTRs</b>	Variable Number Tandem Repeats
<b>WGS-84</b>	World Geodetic System 1984
<b>WWF</b>	World Wildlife Fund

China-U.S. Strategic Philanthropy Partnership Project (CUSP)  
China-U.S. Media & Philanthropy Leaders Delegation  
led by Wang Zhenyao  
October 1-12, 2011

## **Impressions and Thoughts<sup>1</sup>**

Written by Lu Dezhi and Zhu Guangming  
November 12, 2011  
*(Translated by Wang Qinghong & John Carroll)*

At the invitation of the National Committee on United States-China Relations, from October 112 we visited the United States as members of a representative delegation of leaders from China's media and philanthropy sectors. During that sojourn we visited several philanthropic institutions, media organizations, high-level educational institutions and IT companies in New York, San Francisco, Hawaii, and other locations. Traversing the entire United States from east to west, we were able to appreciate the local conditions and customs of the diverse regions of that nation, and get a better feel for U.S. society—particularly the special allure of public-interest philanthropy. Although it has already been several days since our return to China, we still find it hard to calm down, and are itching to jot down impressions of what we learned and felt during our U.S. trip, recollections that we have organized into ten micro-essays. We would like to share them with you, and hope that you will freely critique them.

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<sup>1</sup> Source: based on the original Chinese essay at the following web link [http://www.chinahuaamin.org/hm/action/article?op\\_type=d&seq\\_no=412](http://www.chinahuaamin.org/hm/action/article?op_type=d&seq_no=412)

## **-1- Revelations and Insights We Brought Back from Our American Trip**

During those few days we spent in the United States, we visited quite a few foundations and nonprofit organizations. We also went to universities and dropped in on a renowned school of social work. From these experiences we drew the following impressions and insights:

**First, U.S. foundations and NPOs, especially family foundations, all are organizations with their own ideals, their own goals and their own mechanisms for strategic planning. Furthermore, they all have their own distinct values.** They stoutly maintain these institutional values, in some cases having steadfastly adhered to them for one or two centuries. If a foundation can be likened to an actor, then it uses its physical involvement to solve concrete social problems, seeking to elicit public support, and getting the public to accept its message. So in that sense, I think these family foundations can be viewed as representatives of NGOs in terms of acting as moral apologists or spiritual practitioners—in the manner in which they thoroughly introduce and put into practice their faith and ideals, and offer positive proof to society and the public that the vitality and validity of their faith and ideals are their most important aims. Since the goals of the majority of these foundations have already been determined, these groups seldom brook interference from outside forces. Because organizations like the Ford Foundation and Rockefeller Foundation are mammoth family foundations, frequently with access to anywhere from billions to more than tens of billions of dollars in resources to draw on, it is very difficult for actions of even the U.S. government or Congress to sway their decision-making. Within China some people harbor the belief that foreign foundations are agents out to advance “peaceful evolution” and to instill their values among average Chinese citizens. Here we need to make clear distinctions in how we handle the situation. If the values in question are good, why shouldn’t we accept them? If we believe that they are faulty values, all we need to do is refuse. There is no need to go into detail on that score here. That is the first insight we garnered from our trip.

**Second, the rich in their philanthropy should not only have a lofty view of wealth and good taste in their approach to living, but should let such a sublime view of life and graceful lifestyle complement and mutually reinforce these activities.** A mature outlook on wealth guides a man in deciding for whom he is accumulating wealth, and how he should go about creating and handling his wealth. It instills enthusiasm and drive in that person and points his businesses in a lofty direction, while allowing his own life to continuously develop in a more sublime direction. Such an outlook on life is meant to allow that man to address questions such as how he can discover happiness and joy in a simple and prosaic lifestyle, while attaining a sense of quietude and release within his soul. An “elegant” approach to living should be reflected in a low-key attitude toward one’s life and a spare lifestyle.

During our time in the United States, we felt that the lifestyles of Americans are especially simple. For example, over and over again we would see the same varieties of dishes served, with the taste pretty much the same, even to the point where what we were eating seemed to lack any taste whatsoever. Likewise, the clothes they wear don’t stand out. Unless dressing for business or a formal dinner, they are inclined to wear rather casual clothes, even to the point of not changing colors or styles. Their gift-giving is simple too. Any small gift is fine, as long as it has an appropriate logo or other labeling. You won’t find any of the brain-racking of the Chinese who must give careful consideration to all the special characteristics involved, as well as the price—with it always being the case of the more expensive the better.

We were particularly struck by the simple lifestyle of the philanthropists Sam and Mary Cooke when we visited them in Hawaii. Their Tudor-style mansion is a structure built a century ago. But while maintaining its historical appearance the Cookes have not gone in for any luxurious renovation. Mrs. Cooke enjoys flower arranging and gardening. However, she considers these as personal interests and expressions of her love of life, certainly not egotistical showing off. The Cookes are as meticulous in their care of their garden as they were in raising their own children or caring for their own lives, going to great lengths to gather specimens of a large number of endangered

species from throughout Hawaii in their beloved garden.

During our meeting Mr. Cooke told us that they have decided to leave their property and the garden, together worth more than \$30 million, to the Manoa Heritage Center upon their deaths. He explained that his three daughters did not want to inherit the property, that it would be difficult to divide up among them, and that even if it could be fairly divided, their offspring would have to pay estate taxes that might run as high as 50% of the property value. Besides, even after that there would continue to be hefty expenses for maintenance. Mr. Cooke added that since the family property could end up being a burden to his children, it would probably be better to make a donation of the house and land. In other words, since their children have experienced living simply, based on the pursuit of good taste and experiences in their own lifestyles rather than enjoying luxurious existences, leaving them enormous amounts of material wealth would conversely compel them to change their modes of living, and this really would constitute a form of covert spiritual coercion and mental burden.

At the same time, a scaled-back lifestyle should not be equated with nonchalant indolence. Rather, it emphasizes the responsibility of the individual, and demands diligent work. When we visited the Rockefeller Brothers Fund, we learned that its president, Stephen B. Heintz was suffering from leukemia. Yet although that very morning he had undergone chemotherapy, that same afternoon he was back at work as usual and came in person to meet us. Even after he saw us off following our chat, he still had to chair a work meeting. His work intensity had not been diminished, and he would not let even serious illness dampen his sense of responsibility or give him an excuse to escape from work. For Americans of his type their ways of looking at wealth and their own lifestyles are interlinked. They believe that to a considerable extent wealth and material riches are proof positive of whether or not they have been diligent and represent the fruits of that diligence. However, that does not justify their indulgence in lavish spending, since devotion to a refined and muted lifestyle in and of itself demands that they work diligently.

**Third, since plunging into philanthropic work just requires bold resoluteness, we need to acquire concrete experience through**

**action and more action.** Back in the days of Andrew Carnegie, John D. Rockefeller, Henry Ford and their peers, recognition and acceptance of philanthropy was not at the level it is today. Nor did philanthropic activities enjoy mature theoretical guidance; systems had still not been perfected; and philanthropists did not have any superior policies. Nevertheless, those early philanthropists were determined to make things work; and they have continued to work for the last one hundred years. So even today we have the Carnegie Foundation, Rockefeller Foundation, Ford Foundation and other such groups accumulating glorious achievements in terms of U.S. philanthropic work on behalf of the public. Currently we are striving to establish philanthropic undertakings with Chinese characteristics; not hesitating to tackle the early stages. However, we should not fret too much about this, nor saddle ourselves with unnecessary psychological baggage. Precisely because we don't know exactly where the path we are on is headed, we need to press on and open up new vistas. Feeling for the stones as we cross the river. Experiencing on the one hand, and contemplating on the other. When we encounter problems in actual situations, we can establish and perfect appropriate theories. And through our quest we will surely open up new paths, and build a new world.

**Fourth, China's non-public foundations should (indeed must) follow the path of internationalization.** On this trip we visited various kinds of organizations. No matter whether it was a foundation, another kind of non-profit, a media organization or an IT company, all considered that they had global responsibilities, and not only had a vision of the future but also a global perspective. Even organizations with tiny staffs thought this way. Only by having this degree of self-confidence, aspiration and sense of responsibility will we be able to develop the ability to take our place on the global stage, on a global scale, and be able to score high marks and achieve first-class accomplishments as the course of globalization takes new turns. Developing modern philanthropic undertakings with Chinese characteristics similarly demands that we gain perspective on the entire world, go out into the world, and within the process of globalization ferret out breathing space for further development. Also, even as we develop we must seek to win the understanding, respect

and recognition of others, so that we might realize the goals of a tremendous renaissance for the Chinese people and a harmonious domestic environment, as well as a more amicable international climate.

One hundred years ago the Rockefeller Foundation had already come to China and established the Peking Union Medical College and the Hsiang-Ya Medical College, initial steps in China's internationalization. Today, a century later, isn't it perplexing why China's non-profit organizations are still so hesitant? When we visited Rutgers University, the Huamin Charity Foundation was able to sign a memorandum of cooperation with that school, lay the groundwork for the establishment of a Huamin research center, and thus initiate the process of internationalization for the Huamin Charity Foundation. We are taking advantage of these opportunities, confident that there is still time to rise and catch up with those who have gone before.

## **-2- Wall Street: A venue for dialogue between rich and poor; a veritable chessboard**

The name "Wall Street" has become a synonym for wealth. It is heaven for the rich, and also has become a forum for dialogue between the rich and the poor—a game board for a high stakes game. We visited Wall Street on several occasions, and were thus able to observe at close quarters the "Occupy Wall Street Movement." We saw demonstrators carrying signs and passing out handbills to passersby. Some people in the park where they had settled in were playing music, strumming guitars, and we could even smell sausages grilling. Policemen stood far off to the side, and although they carried firearms, they seemed very relaxed, and both sides frequently traded jokes. We were told that some of the demonstrators had been arrested by the police a few days before for having spray painted the giant metal statues of bulls in front of the New York Stock Exchange. The handbills spoke of the Occupy Wall Street Movement having similar goals with the Arab Spring "Jasmine revolutions" in Tunisia and Egypt. But from what we could see on the spot, the ranks of the marchers were very peaceful, there was little friction between the

demonstrators and the police, and traffic was not blocked at all. The protestors expressed a motley variety of opinions, but no matter what the opinion, they all agreed that the poor needed to register their dissatisfaction with the rich.

Marxism contends that class struggle, in other words the contradiction between rich and poor, is the key contradiction in capitalist society, and that capitalists represent the rich in expropriating the surplus value created by the poor. In a nutshell: the hard labor of the poor supports the rich. “Occupy Wall Street” represents a chess match between the rich and the poor in America under new historical conditions. Although in form the situation may resemble descriptions from Marxist classics, the actuality involved has undergone a tremendous metamorphosis. Since the disintegration of the Bretton-Woods System, the rich and intellectual elites in the United States have through a series of carefully crafted plans unceasingly gobbled up wealth and natural resources from around the world in order to maintain and safeguard the U.S. welfare system and employment demand. In a certain sense, the minority of rich in the United States has been supporting the majority of poor. When an economy is growing, the contradictions between the rich and the poor do not stand out. However, when an economy begins to flag, or when faced with a crisis, the contradictions between the rich and the poor surface with a vengeance. On the one hand, the rich indeed are receiving more than the poor, while on the other hand welfare, employment, etc. for the poor are being severely impacted. Consequently, the poor now direct their anger against the rich—and particularly against Wall Street.

If we think about it a bit deeper, we can discover that the “Occupy Wall Street” movement reflects the relationship between the United States and the rest of the world. Particularly explosive are the contradictions between the United States and comparatively large developing countries like China. Since the dissolving of the Bretton-Woods system and the divorce of the U.S. dollar from gold, the dollar has served as the dominant global currency, and the United States has used the dollar as a weapon. It thus has been able to a certain extent to control the global economy, and the hard labor of Chinese workers has created the wealth that has gone to maintain and serve lifestyles

and development in the United States. After the currency crisis, in order to save its own economy the United States took advantage of dollar superiority to engage in the policy of “quantitative easing,” which really amounted to the printing of money. That approach is getting the United States into new difficulties. On the one hand, it has been printing a lot of money, which saps faith in the dollar as a currency. That in turn could make it more difficult for that country to borrow money. And if it finds that it cannot borrow money, the United States could go broke. On the other hand, if it finds itself unable to repay the money it owes, in order to reduce the amount it owes, its only recourse would be to devalue the dollar. That means it would have to continue to print money.

The “Occupy Wall Street Movement” does not just reflect the domestic contradictions regarding wealth within the United States, but also the contradictions between the United States and the rest of the world. Unless those contradictions are resolved, it may be difficult for this movement to truly stop. But the poor in the United States are not able to actually occupy Wall Street. If they were to occupy it, they would find themselves at an impasse, since if they did so it would amount to the American dream and American values going up in smoke. For that reason Wall Street has become the locus for talks between the rich and the poor, a kind of gaming board upon which the two sides engage in a non-stop game of negotiations, until they can realize equilibrium of interests.

The “Wall Street Movement” also reflects the fact that the American system or American economic model has truly entered a hornet’s nest of problems, and these problems have created a vicious cycle. I believe there are two approaches which can save the United States:

**1. Domestically it needs vigorous initiatives and public-interest philanthropy undertakings. Philanthropic activities could prove the right prescription for what ails the U.S. welfare system and the fundamental U.S. system.**

Philanthropic activities could assuage the conflict between the rich and poor, and establish communication channels between the two sides. They could also serve as the mechanism for direct negotiations and mutual understanding, as well as a continuous

search for common ground, allowing both sides to face the social crisis and deal with it. We can say that philanthropic activities already offer systemic advantages, are morally impeccable, and are fully capable of allowing the rich and poor to coexist.

**2. The United States needs to bolster its involvement with the rest of the world and cooperate with developing nations represented by China.**

As things now stand, the United States too easily relies on its military might and the dollar to solve issues. But since it does not have the means to solve its own problems, it is naturally unable to solve the world's problems. When discussing these things at the East-West Center, I told my American friends: "The United States should bolster its cooperation with China, and not struggle to the end to keep a lid on China's development. If now the United States should choose to turn its back on China, it will face harsher days. But even if China should distance itself from the United States, it still has ways to develop." If Americans want to play the role of top dog, we don't have any opinion. However, you can't always expect to be able to give back just a portion of what you owe for material goods or loans. The United States has no option but to make a concerted effort to cooperate with China if it wants to be able to more effectively weather this period of crisis. The diligence and wisdom of 1.3 billion Chinese has created the wealth that has been provided to Americans for their enjoyment. So Americans ought to be prepared to offer to China more of the sophisticated science and technology discovered by its geniuses. Likewise, it should import more of China's contemporary culture and advanced management experience. If in this way we adopted each other's good points, wouldn't that have a beneficial impact?

So we would encourage wealthy individuals in the United States to study the examples of Bill Gates and Warren Buffet, who have thrown themselves into philanthropic work. Then you would receive the thanks of poor people in the United States and throughout the world. That might also serve as the trigger for more cooperation between China and the United States. That in turn would be of service not only to China and the United States, but the entire world as well.

Wall Street makes people happy, and makes people worry. But if there were no rich people, that would make daily life all the more

difficult for the poor. If the poor did not express their complaints and demands, then the rich would not understand how to act better as wealthy individuals. Just as a world without the brilliance of the United States would be a drab place, so too if the United States does not study the feelings of others—especially the feelings of its strategic partners—then cooperation will prove unsuccessful. In such a case, the United States too will not be able to attain stability, will it? Confrontation will not bring victory; negotiations are the only option.

### **-3- Our Visit to the Clinton Foundation**

The Clinton Foundation is a foundation named after former U.S. president Bill Clinton. Our direct contact with this foundation established by the former president made us feel that it indeed does have something of a “presidential aura” about it. President Clinton and his associates in the project appear to have adopted a presidential style when it came to founding and operating the foundation. Especially during our discussions, the Foundation president Bruce R. Lindsey let something interesting slip which was quite funny. He said: “President Clinton really enjoys being president.” This remark was fascinating. Hearing that made us feel that President Clinton must suffer from “official-mania,” that is the need to serve in public office. So if he couldn’t continue to be president of the United States, he wanted to be “president” as leader of his own foundation. However, after giving it a bit of thought, we concluded that philanthropy is a form of volunteerism, a sector inherently egalitarian yet multi-dimensionally virtuous. So no matter what good he might accomplish, no matter how grand the scale he may operate on, and no matter how formidable his strengths, no one can become “president” of the philanthropy world. President Clinton has to be aware of this fundamental truth. So what President Lindsey no doubt meant to say was: “President Clinton wants to be of service not just to the United States where he lives, but to the entire world.”

Since President Clinton himself is not a wealthy man, in order for his foundation to engage in philanthropy, its first task has to be eliciting donations from the general public. In many ways this is similar to the fundraising he engaged in while a politician trying to

get elected. Lindsey, the chief executive officer of the foundation, is one of the most important members of the team that former president Clinton assembled. During our discussions, we also inquired about fundraising issues the Foundation faces. But Mr. Lindsey and his associates did not seem to feel that this was a particularly thorny problem. This certainly partly derives from President Clinton's incomparable personal charisma, and also hinges upon a highly effective, top-notch fundraising team led by CEO Lindsey.

This is a special point that a majority of foundations raising money from the public have paid a great deal of attention to. For example within China on the one hand they tend to enlist stars to act as goodwill ambassadors, their image spokespersons, and so on. On the other hand, they like to stage charity banquets, benefit performances, auctions, etc. and other activities to raise donations from the public. These are not things that most private non-profits normally need to be concerned about. Although it is not entirely clear to us exactly how the Clinton Foundation goes about securing donations, no doubt President Clinton's star power has an enormous impact in this regard. During a few short years, this foundation quickly grew to be quite large, and every year has been able to invest \$200-300 million into the philanthropic sector, with involvement on six continents throughout the world in more than 100 countries and regions.

Seeing as how President Clinton embodies his consciousness of service to society and the world, it really does not matter whether he is serving as president of the United States or engaged in philanthropy, he always acts as a director and coordinator of the work at hand, a trailblazer in practical activities. He definitely is not content to act like a "pontiff" preaching from some sacred perch above it all. Since that is the case, his foundation adopts a "serve the people" stance in its involvements and efforts to solve practical social problems. It is not interested in inculcating or proselytizing certain values and ideals among the general public. Perhaps President Clinton and his foundation do adhere to certain ideals and values, but propagating and trumpeting their own values does not constitute the basic function of the foundation. (This is completely different from those non-profit foundations which clearly announce their ideals

to society.) Besides, for foundations run by famous people there is a constant quest to expand the scale of involvement by the public in order to propagate certain ideals, which can result in a certain degree of exclusionism. That in turn may result not only in decreased acceptance among the public of the foundation in question and its objectives, but can also have a deleterious impact on its fundraising. Opening up the annual report issued by the Clinton Foundation, we saw that among the various categories of activities listed there were such items as medical care, health and environmental protection. The content is not heavily infused with a feeling of propagation of its ideals, but instead there are introductions to specific themes, with the specific personal stories accompanying each being especially notable. An even more distinguishing feature is that when the Clinton Foundation enters a given country or region to carry out a project that involvement is premised on an invitation from the government of the host country or region, and it seeks to respect its partner's wishes and choices.

Foundations which have a famous celebrity like Bill Clinton to furnish them with background or color can become imbued with the special characteristics of that celebrity's active involvement. They can thus brag about their sense of social responsibility and their consciousness of service to society. So that they inevitably have to ask the famous person to act closely with the foundation, act conscientiously, and cannot just raise the philanthropic banner in order to collect money or engage in money laundering. Because celebrities and foundations advertise and acknowledge that they want to solve social problems, then that means that in their implementation they need to provide evidence to the public or make clear the methods, processes and effects they are offering for solving social problems. Thus, here they especially need to emphasize their scientific nature, management parameters, openness of information, and transparency. The six key program areas the Clinton Foundation is involved in each has its own independent mechanism and ways of doing things, so that each of the themes is independent but interrelated. This is in order to guarantee that each of these themes is complete and has specific management mechanisms, and at the same time necessarily decreases the foundation's own administrative and

operational costs. As a result, in 2010 management costs were only 3.8%, or when fundraising-associated costs are added in, total costs come to just 5.5%.

The Clinton Foundation model cannot serve as is as a complete model for Chinese foundations. But its ways of thinking, approaches to doing things and results truly merit being used for reference and study by Chinese foundations.

#### **-4- The Rockefeller Brothers Fund (Philanthropy for an Interdependent World): A Classic Example of a Family Foundation**

The Rockefeller Brothers Fund (RBF) is a family foundation established in 1940 to be jointly managed by the five sons of John D. Rockefeller Jr., namely: John D. Rockefeller III, Nelson Rockefeller, Laurance Rockefeller, Winthrop Rockefeller and David Rockefeller. In 1954, Abigail Rockefeller Mauze, John D. Rockefeller Jr.'s only daughter and older sister to the five brothers, joined the Board of Trustees of the Fund. The original mission of the Fund was to allow the five Rockefeller brothers to sponsor philanthropic proposals and interchanges in research fields, and thereby allow for the most favorable results for the philanthropic endeavors they coordinate and promote. Currently this fund is devoting itself to and promoting social development in order to build a more equitable, sustainable and peaceful world. It considers the most critical areas as the practice of democracy, sustainable development, global peace and security, progress for humankind, etc. Generally speaking, we can draw lessons from the Fund's activities in the following areas:

##### **1. Establishing consistent ideals and values.**

The Rockefeller Brothers Fund particularly emphasizes its own ideals, advocating the principles of fairness, justice, democracy, etc., and has a very political tinge to its approach. It is a prime vehicle for the Rockefeller family to influence government policy. Not only is the Fund not swayed by the United States Government, it even functions as the "world's physician." It looks upon its own philanthropic activities as being analogous to an acupuncturist's needles, able to stimulate the ecosystems of human society to attain improvement and

perfection. During the first part of the 1970s, the younger generation of the Rockefeller family judged that their elders themselves had in fact been impeding the ideals of democracy and liberty. That gave rise to rather fierce generational confrontations within the family, which nearly led to the closure of the Fund. Eventually, in a massive tax reorganization the Fund booked half of its assets as expenses, and after weathering that crisis it increased its support and promotion of ideals such as democracy, fairness and justice.

## **2. Philanthropic maintenance and guidance for family development.**

The Rockefeller family places enormous emphasis on education in philanthropic ideals for later generations, and all members of the family from when they are small participate in philanthropic activities. The Rockefeller Brothers Fund really is an important stage for thoroughly implementing and putting into practice its philanthropic ideals, as well as fostering philanthropic consciousness among family members. Family conferences are used to choose outstanding family members to join the Fund's Board of Directors, with the family member with the greatest prestige and integrity being chosen as chairman. Already third generation family members have joined the RBF's Board of Directors. Rockefeller family members do not spare any effort in order to guarantee the Fund's sustainable development, and family members remain both the greatest asset of the Fund and its most stable source of funds. Just last year the current head of the Rockefeller family, David Rockefeller, decided to leave \$5 billion dollars, the bulk of his personal wealth, to the Rockefeller Brothers Fund.

## **3. Protecting and increasing the value of a family fund is the key to sustainable development**

The Rockefeller Brothers Fund places immense emphasis on preserving and increasing the value of its assets. At the start, the Fund chose financially successful individuals to form small investment teams, but since their duties were performed on the volunteer basis efficiency was not very high. Later it recruited highly paid investment specialists, who carried out investment with the risk dispersed throughout several areas. After 2004 it also established an investment advisory committee and steadily developed a specialized, highly efficient investment team and mechanism

## **4. An open development strategy**

Even though it is a family foundation, the Rockefeller Brothers Fund not only possesses a global perspective, it also has an open approach and welcoming attitude towards those who are not members of the Rockefeller family. Moreover, it greatly emphasizes integration of family influence with the wisdom of non-family members. From 1968, the position of president of the Fund has consistently been entrusted to non-family members. At present of the 16 members of the Board of Directors, eight are non-family members drawn from diplomatic and business circles, academia, NGOs and other walks of life. The Fund also is apparently considering fundraising by other than family members.

#### **5. Professionalized services**

The Fund is staffed with professionals specializing in various areas all the way from the Board of Directors and top executives down to the regular staff. Although they have chosen to work in relatively low paying positions, and a work environment that focuses on low cost environmental planning and refurbishing, nevertheless they throw themselves totally into their work to the degree of forgetting about themselves, with their enthusiasm for their work never flagging. For example, take the case of Mr. Heintz who despite being seriously ill will not let his passion for his work diminish one iota. Precisely because it has such professionals and work groups which respect their work, the ideals of the Rockefeller Brothers Fund have continued to be implemented and expanded without interruption.

During mid-November of this year, the Rockefeller Brothers Fund held a China-U.S. philanthropists interchange event to which we were invited. However, since we had previous commitments which we could not abandon, with great regret we had to forego this learning opportunity. However, we are firmly convinced that wealthy Chinese should learn from and draw on the experience of the Rockefeller family. Chinese philanthropists invited to participate in this interchange event can truly gain a great number of insights from the actual track records of groups like the Rockefeller Brothers Fund. Best of luck to them all! Would that China could produce non-public family foundations like the Rockefeller Brothers Fund!!

## **-5- Our Visit to Rutgers University**

Having been invited to visit Rutgers University by its president, Dr. Richard L. McCormick, during the hiatus in our schedule between our visits to New York and San Francisco we headed for that school to engage in academic interchange and personal visits.

Chartered in 1766 as Queen's College, this Ivy League school was the eighth university to be founded in the British colonies that were to become the United States, and is the oldest public university in the country. In 1945 Rutgers official name was changed to The State University of New Jersey. Its principal campus is located in New Brunswick, New Jersey, a 45-minute ride by car from New York City. This is a clean and quiet small city, resembling a shy and pure young maiden. Although the city may not be large in extent, Rutgers University and several prestigious firms occupy about half of its area. Amidst the placid greenery, tall buildings rise up into the sky, with most of them exquisitely detailed. Although the roads are not wide, with just enough room for one vehicle to pass on each side, they are very clean and well made. Strolling along these roads is very agreeable. You cannot help but feel that you are enjoying a pleasant ramble without a care, and that you are engaging in a convivial heart-to-heart dialogue with this old town.

When we got to our hotel and put down our luggage, we found that Dr. Richard Edwards, interim executive vice president for academic affairs, was there waiting to receive us. He had arrived in his own car to drive us to the official residence of the president for a dinner party to greet us hosted by Dr. McCormick and his wife. Dr. McCormick's mansion is a villa nearly 200 years old, and is surrounded by an extensive, emerald green lawn. In the distance we could see three or four sika deer walking and relaxing on the lawn. Nearer to us, several of Dr. McCormick's large dogs were cavorting about.

As soon as we got out of the car, Dr. McCormick came out to greet us, calling out to us in a friendly manner, and warmly inviting us to go inside. When we entered the drawing room, we discovered that there were already quite a few guests gathered there. After Dr. McCormick made introductions, we realized that the attendees at the dinner that day included the university's four vice-presidents, including one who

was also responsible for the Rutgers University Foundation. Also there representing the University School of Social Work were the head of that institution and some of the professors there.

Dr. McCormick is a highly knowledgeable professor of history. Although we had to trouble Professor Huang Jianzhong to handle the laborious task of interpreting, the language barrier really did not interfere with our interchange, and this interchange was extremely free-spirited and pleasant. What really surprised me was that Dr. McCormick did not expect us to do much explaining, but instead asked us precise questions and observations about the ideals and methods of the Huamin Charity Foundation. It was as if we had long been engaged in such interchange.

Only later did we discover that prior to our arrival Dr. McCormick had directed Dr. Edwards to convene a working group to decide on a plan for how we should be treated. They inquired about conditions at the Huamin Charity Foundation from teachers and students at the School of Social Work who had visited us, and assigned people to translate various materials produced by the Huamin Charity Foundation for research and study. Their final verdict was: Mr. Lu is a Chinese philanthropist deserving of respect, and should be accorded the most respectful possible treatment. Thus, during the welcoming party Dr. McCormick gave us a certificate inscribed in his own hand which attested that we are in the process of pioneering a distinctively Chinese variety of modern philanthropy, and are making valuable contributions to China's economic development and social harmony.

We do not understand much English, but it appears that since we met with visiting teachers and students from the Rutgers School of Social Work when they visited the Huamin Charity Foundation during the previous six months, this certificate commemorating our visit to Rutgers University was meant to express appreciation for the help we had extended on that occasion. Therefore, we felt very honored and happy. However, since we ourselves did not understand the English spoken, at that time we could not comprehend the actual situation, so we could not respond adequately. We could catch them saying that despite the fact that the Huamin Charity Foundation had only been in existence for a bit more than three years, it already had a very fine reputation. What we did not grasp is that Dr. McCormick and Rutgers

University were offering to extend their goodwill and friendship into other areas. Looking back at things now, we realize that this certificate was on the one hand meant to be an honor, and on the other hand was also a form of encouragement, since they realized that our devotion to modern philanthropic work with Chinese characteristics is not a pastime or private passion, but is a form of social duty and mission.

The Rutgers University School of Social Work is one of the Big Three schools of social work in the United States. (The other two are Columbia University's School of Social Work and the University of Maryland's School of Social Work.) Since it is a public institution primarily funded by the State of New Jersey, in addition to conducting teaching and research Rutgers University's School of Social Work has to engage in advisory work on a gratis basis with various non-profits in New Jersey, which in turn has produced a large number of classic case studies and a wealth of practical experience. Soon afterwards, we visited the School of Social Work as well as its Center for Nonprofit Management and Governance and the Institute for Families. Although these services are on behalf of the State of New Jersey, the services rendered to the non-profits and families have become quite internationalized, participated in by researchers—including those with masters and PhD degrees—who hail from various regions of the world.

All in all, we were deeply impressed by the friendship and goodwill shown to us by Rutgers University during our visit. In order to facilitate our understanding of relevant conditions, they even enlisted Chinese exchange students to translate materials into Chinese. Because the School of Social Work and its subordinate organizations are in scattered locations, a professor who was close to 70 years old took us around wherever we needed to go on campus in his car. This elderly gentleman had previously served for 12 years as head of the Civil Affairs Department of the State of New Jersey. That such a distinguished veteran civil administrator should be acting as our chauffeur made me feel simultaneously uneasy but very moved. Furthermore, he would always let us off exactly where we needed to go before going off on his own to search for parking. Finally, when we gave a brief lecture at the School of Social Work, there was not

an empty seat in the room and two of the university vice-presidents even attended. Rutgers University also prepared nice gifts for all the members of our party. And since we had to catch a plane, they also arranged to have them specially packaged so that they would not be damaged in transit. There were oh so many such instances of sincerity and kindness, which made one feel happy and respectful.

#### **-6- A Stage for Interchanges that Cannot be Overlooked: The Asia Foundation**

The Asia Foundation is a foundation with a strong political tinge to it. It might be characterized as the forward guard or mouthpiece for the United States in the Asian region. When we began to translate the Asia Foundation's annual report, we found that the very first line read: "The Asia Foundation is engaged in building a more open Asian society." From the tone of this statement it sounds even grander than pronouncements from the U.S. Government, and it feels like they consider themselves the "tutor" for the Asians peoples.

The Asia Foundation sees as its mission the promotion of peace, prosperity, fairness and openness, and the areas in which it is active all have a public philanthropy look to them, including using its strength to influence and prod the governments of various Asian countries to reform their legal systems, and optimize their related policies and measures. The Asia Foundation thus uses its public connections to provide direction to the central governments of various Asian countries and to influence local governments. For example in Afghanistan in one of the projects that it is pursuing it is handling specialist policies for issues of independence, persuasiveness and transparency faced by provincial-level governments.

The various activities undertaken by the Asia Foundation are intimately connected to the U.S. national consciousness and national strategy. For example, this year the Asia Foundation took up the South China Sea issue, while one of its specialized organization on one occasion sponsored closed-door trilateral talks among China, the United States and Vietnam. Since the South China Sea question involves China's territorial sovereignty, in this area we do not have any room for concessions. But the various countries on the periphery of the South China Sea are all interested in developing natural resources

in the South China Sea, especially the abundant petroleum resources, and these same countries would like to invite U.S. companies to help them exploit them.

Although we cannot accept their interest claims, nevertheless this should not interfere with our interchanges with them. When discussing the significance of this approach, the Asia Foundation can be a very good platform. If someone wants to give money to get people together, that is certainly better than not having anyone provide the opportunity for interchanges.

We certainly can use this platform to express our own claims and positions, and also a perfect opportunity to protect and preserve our sovereignty. But we should make appropriate use of it. The Asia Foundation ideally could serve as a bridge for interchange and cooperation with various Asian countries, as well as a stage for China to build a more peaceful and stable development environment, even to the point where we might make them a bit “red?” Doesn’t this make a good deal of sense? As Wang Zhenyao, the head of our visiting delegation, put it: “[This concept] is truly appealing!”

### **-7- Silicon Valley: The cradle that produces geniuses**

Silicon Valley has produced any number of geniuses who have built today’s Hewitt Packard, Intel, Apple, Yahoo and other global IT giants. The emergence of geniuses presupposes a suitable environment. When we visited Google Inc. and Facebook, Inc. we were deeply impressed by the freedom, egalitarianism, and work approaches and atmosphere at those companies. As soon as we walked into the Google headquarters, we were truly astonished by the degree of freedom evident. Employees can bring their dogs to work. The employee coffee shop is open 24 hours a day. Those who like photography can use the company’s professional photography lab to develop and work with their photos. And if they make a reservation ahead of time they can go bowling anytime they get the urge in the company bowling alley.

At Facebook too there are many free perks. Workers can get their favorite drinks, food, expendables, etc. anytime they want. The workers are also encouraged to scrawl on the walls of the company,

writing or drawing whatever they feel like. The work desks resemble long, oval dinner tables. They have no drawers and computers, monitors and paperwork all have to be kept on top of the desks. To the visitor it looks like there is only one department in the company and everyone is doing the same kind of work. Even the president of Facebook uses the same kind of desk as all of his employees. What we felt there was that a group of vigorous young people in the prime of life were working all out with enthusiasm. Although they all seemed very busy, the atmosphere was quite relaxed and they did not appear to be under the slightest bit of pressure.

In reconsidering these work environments, the first thing we would note is that in the case of Facebook the company headquarters consists of only one two-story warehouse-like building. The atmosphere is very clean and neat, although there is no unnecessary decoration. That suggests the three slogans of its corporate culture. Furthermore, these are printed on sheets of A3-size paper which are pasted on the walls of meeting rooms. Seeing this kind of scene raised a doubt in our minds, namely: Is this really the famed Facebook corporation that already has eight hundred million users worldwide and has topped \$80 billion in market value?

For its part, Google Inc. headquarters only has three or four stories. Although there are no escalators, there are electrical outlets everywhere, so that workers can plug in their computers and get to work just about anywhere. At each of our seats were placed journals with the company logo on them for use in jotting down notes during our talks. They did not seem particularly concerned about what gifts they gave to visiting guests. Here in many respects we can detect a pronounced "scruffiness." Yet none of us would deny that whether it be Google or Facebook, these are cutting-edge creative giants, and this is where geniuses who are also world-class citizens have been produced.

In fact, in Silicon Valley, we could hardly come across any individuals or companies which were not world class. Even the smallest of companies looks at issues from a global perspective, with a real concern for the world. People here consider global affairs and issues their own responsibility. Google Inc. is basically an Internet search engine enterprise, but its work involvement extends to areas

like communicable diseases, earthquake monitoring, or even the spending of several hundred million dollars in corporate funds on innovative energy sources. Facebook only has a bit more than 2,500 employees, and was only founded seven years ago. Although it still regards itself as a small business, it also considers it a duty to help make the world a more open and more inter-connected place.

Summing up, we would say that giving birth to first-rate geniuses requires an atmosphere that can produce genius, as well as acknowledgment among people of genius that they have weighty responsibilities and must cultivate a deep understanding of human nature. That day when we visited Silicon Valley was the very day that Apple's CEO Steve Jobs died. We thought to ourselves: Even though Jobs had passed from this life, the work of genius which he accomplished lives on; besides, the enormous vitality of genius that infuses the atmosphere of the Silicon Valley will continue to create such geniuses in the generations to come.

China too has its counterpart to the Silicon Valley in Zhongguancun, which has been developing by leaps and bounds. But there remains an enormous gap between its way of doing things and how things are done in Silicon Valley. We always declare that we desire creativity and crave excellence, but we lack the kind of atmosphere that flourishes there in Silicon Valley. Nor do we exhibit the depth of concern shown by the people and companies of Silicon Valley. So how then can we become the navigators for future development for the world?

## **-8- Our Visit to the East-West Center**

As soon as we emerged from the terminal at Honolulu International Airport, we ran into Carol Fox (Fan Kerou), Wang Qinghong and others sent from the East-West Center to meet us. Although Ms. Fox, who is the director for special projects at the EWC, is already over 60, she remains a regular dynamo brimming over with energy, and can speak fluent standard mandarin Chinese to boot. The Tencent Foundation's secretary general Dou Ruigang hit the nail on the head when he noted that not only did Ms. Fox speak English better than us, her standard Chinese was also better than ours. That made us realize right after

getting off the plane that the EWC was truly different. That is to say: it already serves as a stage for social interaction between East and West, and epitomizes East-West cultural confluence.

The East-West Center is a public non-profit organization established by the U.S. Congress in 1960 with the mission of forging friendly relations between the United States and the Asian region, as well as fostering cooperative research and dialog. Since it was founded during the height of the Cold War and is an organization subsidized by the U.S. government, during its early days it was unable to escape having a certain ideological cast in pursuing its objective of exporting American values, even to the extent of having a political inclination towards “peaceful evolution”(from socialism to capitalism). Be that as it may, it cannot be denied that in its 50 years of history the EWC has made significant contributions in terms of promoting peace and prosperity within the Asian region, with its efforts looming especially large in terms of assisting social development in the Asian region and training professionals. Puongpun Sananikone (Chen Liejin, an ethnic Chinese born in Laos), chairman of the EWC’s Board of Directors, and his wife (born in Vietnam) both studied in Hawaii in the latter part of the 1960s as EWC grantees. The Center’s education exchange program specialist, Wang Qinghong, himself came to Hawaii after graduating from Beijing University and with the help of grants from the EWC completed his master’s and PhD degrees at the University of Hawaii. If we are going to talk about the effects of “peaceful evolution,” it is really hard to pin down who really has been changing whom.

We came to see how Hawaii, where the EWC is located, really is different from New York, San Francisco and other places we had visited. According to Wang Qinghong, among the residents of the State of Hawaii, more than 20% are of Japanese ancestry, about 10% are of Chinese ancestry, and there are also numerous Koreans, Filipinos, natives of Southeast Asia and others with Asian roots. Overall, residents claiming Asian ancestry account for a majority of Hawaii’s population. Consequently, regardless of whether it be food preferences or local customs and manners, there is a decided Asian, especially Japanese, feeling to things. For examples, there are Japanese-language TV stations, and a lot of the labeling restaurants

is also in Japanese—for example price tags in shops and menus in restaurants.

Looking back at conditions prevailing 50 years ago, we can realize that at that time the U.S. and Congress still had an openly antagonistic attitude towards Asia and China, and there was still divergence between the orientation and functions of the East-West Center. However, along with the economic and social development of Asia, especially the emergence of China, their attitudes have clearly evolved. At least as far as the individuals whom we had contact with is concerned, we would say have to say they have a very favorable attitude towards China, and even at a subconscious level they deeply appreciate Eastern culture.

Take Ms. Fox, for example. In her home she has quite a bit of furniture and household utensils from China, and all of her family members speak some Chinese. Through our interaction we were able to discover that Americans like her have a very objective and intelligent view of the emergence of China and other Asian nations. Moreover, for the most part they believe that both China and the United States are indispensable sources of strength for future global development, so that both sides need to establish and develop cooperative partnership relations. Even concerning the question of Taiwan, the two nations are increasingly sharing common understandings. Bolstering dialogue and cooperation between China and the United States is a key link for peace and development not just in Asia but the entire world. For its part, the East-West Center can act as a conduit between East and West, a link and stage for China-U.S. relations, and in the future should play an increasingly critical role in this regard.

The East-West Center handled overall coordination for the activities of our media/philanthropy leaders group while in Hawaii. We hope that in the future we can consider ways to enlist the help of the East-West Center as a superior platform for development of China-U.S. interchanges regarding theories of philanthropy, inquiries concerning philanthropic systems, and even cooperation in philanthropic programs, so as to deepen mutual understanding between our two countries and expand ties of friendship between our two peoples.

Naturally, we should also take advantage of Hawaii's unique geographical advantages in order to establish our own research organizations, observe things at close quarters, compare and acquaint ourselves with the various development paradigms for Chinese and American philanthropic activities, as well as their distinguishing characteristics and regulations, and thus be better able to grasp and promote the development of modern philanthropic activities with Chinese characteristics.

### **-9- The Allure of United Way Fundraising**

The United Way is a professionally operated philanthropic organization. Its structure is both dispersed and well organized. We can say it is dispersed because it exists in various locations throughout the world, but within a single nation—say the United States—it is found in every state, as well as metropolitan areas, cities, and even individual neighborhoods. These United Way organizations found in different localities vary in size, but their reciprocal relationship does not involve superior-subordinate status. Within the United Way network, everyone is considered an equal member of the organization. But there are no issues concerning who is directing whom; in fact it is a completely spontaneously organized purely citizens' organization. These variously-sized United Way chapters can boast of very close ties with their local communities, great trust from local residents, and highly capable fundraisers. At the same time, they have a more direct understanding than the general public of the situation concerning donations, and therefore are more efficient as philanthropic organizations in the administration of donations. If a given philanthropic organization is lax in abiding by rules governing the use of donations that can easily lead to problems of corruption. The funds involved might even be spirited out the country, and it will not receive any contributions in the future.

Such situations do not call for stricter government regulations, but rather should totally be a matter of self-control within the private sector. And a sector like this should establish of its own accord strong internal controls, which would compel the various philanthropic organizations active within the field to conduct their operations

strictly in accordance with regulations. This would prove much more efficient than specially creating a supervising agency.

The China Youth Development Foundation is an association of fundraising member units, and is said to be thinking of establishing within China a form of network similar to that of the United Way. However, that would be rather difficult. That is because the United Way style of fundraising has formed spontaneously within the private sector. Depending upon the government or a government-tinged organization, would do away with the spontaneity of philanthropy, and be very hard to carry off properly.

Of course, China is crying out for the appearance of organizations or systems like that of the United Way, so as on the one hand to promote the nurturing and advancement of a philanthropic consciousness and philanthropic enthusiasm. On the other hand, this would also serve as powerful impetus for the development and perfection of a philanthropic system. We can imagine how within a certain district there could be exploration and the acquisition of experience, followed by further expansion. China's private sector public interest leaders need to take the initiative here. Experience can provide genuine knowledge. I recall how several years ago, Mr. Xu Yongguang gave a push to this kind of work, although at that time conditions were still insufficiently ripe. So now we need to give it another try. How can we not but admire the foresight of Mr. Xu.

### **-10- The Chinese Smile**

In the United States, whether it be in the hotels, on the street or on the subway, you can see Chinese everywhere. At the organizations we visit, regardless of whether it was a philanthropic organization, media outfit, institution of higher learning or IT company, there were always Chinese workers taking part and greeting us. They were enthusiastic, broadminded, optimistic and full of passion, and showed devotion to their work. Moreover, they feel tremendous pride in China's development and her accomplishments. At the same time—as in the cases of Mr. Zhou Weidong at BSR and Mr. Wang Qinghong at the East-West Center—many of them are earnestly engaged in work

to bolster China-U.S. interchanges. These Americanized Chinese, although living in a foreign land, have all developed quite well, adapting to local customs, and fitting in nicely in the local culture. We felt that they exhibited more self-confidence than native born, native bred Americans because the development of their native land has afforded them with more opportunities, and offered better external conditions for development.

In today's America, the involvement of Chinese in politics is not a tall tale. For example, the Deputy Assistant Secretary of State for East Asian and Pacific Affairs (Kin Moy), the U.S. Ambassador to China (Gary Locke), the chairman of the East-West Center, and the recently elected mayor of San Francisco (Ed Lee) are all of Chinese ancestry. Perhaps one day a Chinese will be elected as President of the United States.

With the current third-wave of immigration, more and more Chinese immigrants are coming to the United States. The majority of these new immigrants are entrepreneurs with money. There are also quite a few professionals with special knowledge and technical skills in their ranks. We certainly do not oppose emigration. On the one hand, the freedom to choose where one desires to live is an inherent human right, and these countrymen of ours who have chosen to emigrate have their reasons. For example, they might yearn for spiritual freedom and the development of their individuality. These represent part of the American spirit and are important implications of the "American Dream." On the other hand, they might point to things like the superior level of education, the more comfortable living environment, more stable social welfare, and safer legal guarantees. Chinese society certainly is in the midst of the flux of development, and in these respects is still not complete and well-rounded. There is no denying that the United States is superior to China in these areas.

On the other hand, the arrival of this third wave of Chinese immigration is a testimony to progress that has been made in the development of Chinese society. When the wealth of the people accumulates to the point where the conditions for emigration are present, that translates into the actual phenomenon of emigration and basic social acceptance of that option. Going hand in hand with

that is the government allowing people more freedom in deciding where they want to live. Some people claim this is a case of “voting with one’s feet,” while others refer to it as “buying insurance.” We feel these explanations are all understandable. There is nothing wrong with these emigrants. They just want a good life, a good job, while still being able to do service for the development of the motherland. That is especially true for the many whose nationality has “taken a walk.” But people are still developing back home within China.

Nevertheless, we also have to bear in mind that those who have moved abroad certainly represent advanced productive forces. So shouldn’t we give thought to examining the defects in our systems in order to be able to fashion a more equitable and just development environment? We have the continuing belief that if we do not accelerate the processes for democracy and rule by law, and develop education for a civil society, the ranks of those choosing to emigrate will only increase. We cannot deny that this would be a source of pain for the Chinese people. At the same time, those who already have managed to become rich should be able to see that it was precisely because we were able to rely on the current “environment” that we were able to develop as we have. We are the biggest beneficiaries of the reform and opening up strategy. We are after all children of the New China, and we should simply accept that fact. Shouldn’t we also accept greater social responsibilities, and help our fellow countrymen who still need to develop?

Of course, I am in no position to emigrate. I am poor at foreign languages, and not accustomed to living overseas. But those considerations are not important. The most important thing is that I love the yellow soil of my motherland, and I feel a responsibility to protect our land. If everyone became an emigrant and left the ancestral land to grow wild, that simply would not do. So if some our people leave China to go out and change the world, others must stay behind to preserve the rivers and mountains left to us by our ancestors, to help their native land to develop, to construct well, and help China to go forward in step with the rest of the world. These too are very splendid and harmonious sentiments.

We believe that the course of social development and progress will lead to the day when those Chinese who have assumed the

burden of preserving the ancestral land and those Chinese who have undertaken to change the world stand together on the great global stage. And it is indeed possible that we will stand together on this patch of soil. After all the roots of all of us are to be found here. For it is this very soil that can sufficiently nourish a tree capable of soaring into the limitless heavens.