MODULE 3: CONSERVATION STRATEGIES
LECTURE NOTES

This module describes a variety of applied strategies in conservation. The module reviews Liberia's conservation governance history and outlines the opportunities and challenges of preserving and sustainably utilizing its critical natural resources.

Learning Objectives

Students will be able to:

- Communicate the goals and principles of conservation.
- Describe the relevant international and national policies, laws, regulations and agreements for specific conservation issues and ecosystem types.
- Describe and differentiate a variety of global and local conservation strategies for protected areas.
- Outline the policymaking and planning process for conservation projects and their sustainable management.
- Describe Liberia's key protected areas and identify critically endangered and threatened species in the country.
- Describe and appreciate traditional conservation strategies.

Key Topics

- What is conservation?
- Conservation Governance
- Conservation Planning
- Conservation Management
    - Research, Monitoring and Evaluation
- Protected Areas in Liberia
    - Process for Protected Areas establishment in Liberia
    - Types of Protected Areas in Liberia

Key Topics

- What is conservation?

The Cambridge English Dictionary defines **conservation** as, "protection of plants, animals, and natural areas". One of the earliest attempts within the conservation community to define **conservation** can be found in The World Conservation Strategy published by IUCN in 1980:

  - To maintain essential ecological processes and life support systems
  - To preserve genetic diversity, and
  - To ensure the sustainable utilization of species and ecosystems
  - To advance biodiversity governance

- Conservation Governance

Governance of protected areas is critical to their outcomes and presents a significant challenge for effective management. For purposes of this module, we identify two broad categories of protected area governance: a) government managed protected areas, and b) co-managed protected areas, community conserved areas, and private reserves. The latter are protected areas governed either jointly, or independently owned and managed, by local and indigenous communities, cooperatives, private individuals, corporations, etc. There is wide variation across and within these broad categories of PAs in terms of governance arrangements, ecological representation and functional performance. Some of these areas have been designated under international and regional treaties and agreements.

  - International Agreements
    - Convention on Biological Diversity (CBD), United Nation Framework Convention on Climate Change (UNFCCC), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), etc.

There are a number of international and regional policy instruments that designate or recognize specific protected areas directly or indirectly, giving them an international status. In general terms, the different initiatives vary in both geographical and thematic coverage. For example, the World Heritage Convention and the Ramsar Convention (Convention on Wetlands of International Importance especially as waterfowl habitat) have both developed lists of specific sites where governments have made commitments to protection under the convention, adding an important international dimension to protected areas. The UNESCO Man and the Biosphere Program establishes Biosphere reserves, or 'sites which innovate and demonstrate approaches to conservation and sustainable development'. Certain other conventions, such as the Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aim to conserve terrestrial, marine, and avian migratory species throughout their range through a number of measures including the creation and strengthening of protected areas.

Frequently, specific sites are recognized under multiple conventions or agreements. Each of the different conventions and programs have a different nomination form and process, and monitoring and reporting requirements vary widely. Although there is much variation in the legal standing of the international agreements, the fact that governments have made an international commitment provides extra incentive for the site's good management. With many of these agreements, there is a considerable element of prestige associated with international recognition, which may provide a powerful factor in

strengthening protection. The Convention on Biological Diversity and the Durban Accord, signed at the World Park's Congress, have significant implications for protected areas.

The Convention on Biological Diversity (CBD) requires countries to prepare a national biodiversity strategy (or equivalent instrument) and to ensure that this strategy is mainstreamed into the planning and activities of all those sectors whose activities can have an impact (positive and negative) on biodiversity.

United Nation Framework Convention on Climate Change (UNFCCC) sets limits on greenhouse gas emissions for individual countries but it contains no enforcement mechanisms.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a multilateral treaty that protects endangered plants and animals. CITES aims to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild

Multilateral Environmental Agreement (MEA) – treaties, conventions, protocols and other binding instruments – to which Liberia is party. Usually applied to instruments of a geographic scope wider than that of a bilateral agreement (i.e. between two states).

- Convention on the International Trade in Endangered Species (CITES, 1973)
- Convention on Biologogological Diversity (CBD, 1992)
- RAMSAR Convention on Wetlands
- International Tropical Timber Agreement (ITTA, 1983). Revised agreement (ITTA, 1994).
- United Nations Framework Convention on Climate Change (UNFCCC, 1992).
- Kyoto Protocol (1997)

Liberia Conservation / Forest Laws

- Forestry Governance prior to and after the creation of Liberia Forest Development Authority
  - Colonial forestry
  - Creation of FDA and FTI
    - 1976 Act creating the Forest Development Authority (FDA)
- Environment Protection and Management Law 2002
- Act to Establish Protected Forest Network 2003
- National Forestry Reform Law of 2006
- Community Rights Law of 2009
- National Biodiversity Strategic Action Plan (2015)
- Wildlife Conservation and Protected Areas Management Law of 2016
- Protected area gazettement Act (e.g. East Nimba Nature Reserve Act, Lake Piso Sustainable Multiple-Use Reserve Act, Gola National Park Act, etc).
- Land Rights Law of 2018

The Forest Act 1953 provided for the creation of reserves, national parks, and 'Communal Forests'. This Act provider for the establishment of the Bureau of Forest Conservation within the Department of Agriculture and Commerce and describe the basic legal framework for forest and wildlife management in Liberia. Provisions concerning Communal Forests allowed for the protection of very small areas immediately adjacent to villages, however no such communal forests were established.

The law paved the way for the creation of reserves and national parks which resulted in the declaration of eleven National Forests over the following decade. It has emerged recently that there is substantial overlap between areas annexed to create the permanent National Forest estate, and private deeded land. This has occurred without compensation, as would be required under the constitution for such expropriation, and remains a matter yet to be resolved.

The 1953 law was replaced in 1976 by An Act Creating the Forestry Development Authority. This provided for the institutional administration of Liberia's forests by the Forestry Development Authority (FDA), run by a board and managing director. It gives the FDA the power to establish Government Forest Reserves, Native Authority Forest Reserves, Communal Forests and National Parks. The FDA remains the government body responsible for Liberia's forests. This Forest Law has been complemented by many Forest Regulations issued by the FDA to control various aspects of the forestry and wildlife activities of concessions and other forest users.

Wildlife and National Parks Act 1988
The Wildlife and National Parks Act calls for the creation of a network of protected areas and the need to protect threatened wildlife.

The Strategic Commodities Act passed in 2000 granted the President the sole power to execute, negotiate, and conclude all commercial contracts or agreements with any foreign or Domestic Investor for the exploration of any of the strategic commodities of the Republic of Liberia. This opened the way to large scale companies to get established and reduced the proliferation of small logging concessions. Moreover, the President became the only responsible for awarding concessions, sidelining any other country authority.

As a consequence of what was considered as an illegitimate use of revenue for timber during the Civil War, the UN Security Council imposed sanctions in 2003 on all Liberian timber exports to prevent revenue generation to fuel in-country and regional civil unrest, spurring forest sector reform (United Nations Security Council Resolutions 1478 and 1521).

READINGS

Government of Liberia Acts relevant to conservation (not exhaustive)
2002, "Environment Protection and Management Law"
2003, "Act to Establish Protected Forest Network"
2003, "Protected Areas Gazettement Act"
2006, "National Forestry Reform Law"
2009, "Community Rights Law"
2016, "National Wildlife and Protected Area Law"
2018, "Land Rights Law"

http://www.fao.org/forestry/lfi/31586/en/

Strategic Commodities Act (2000)
Grants the President of Liberia the sole power to execute, negotiate, and conclude all commercial contracts or agreements with any foreign or Domestic Investor for the exploration of any of the strategic commodities of the Republic of Liberia. The President became the only responsible for awarding

concessions without the intervention of any other country authority. Among other consequences, this opened the wayto large scale companies to get established reducing the proliferation of small logging concessions.

Land Rights Law (2018)
The Government recognizes and protects the land rights of communities, groups, families, and individuals who own, use, and manage their land in accordance with customary practices and norms, as equal to Private Land rights. The Land Rights Law provides four basic types of rights: Public Land, Government Land, Customary Land, and Private Land. A Protected Area is land which may fall under the Government Land, Customary Land, or Private Land categories but which must
be conserved for the benefit of all Liberians.

- Conservation Project Planning, Administration, and Management
    - Project scope and targets
    - Assessing threats in conservation planning
    - Priority Setting
    - Strategy selection
        - Methods to achieve key project interventions.
        - Activities required to achieve objectives.
    - Results Chain
    - Monitoring and Evaluation
        - Effectiveness of Protected Areas
        - Corridors & Connectivity
        - Adaptive Management

- Habitat and hotspot approach to conservation (in-situ conservation)
    - Protected Areas: concepts and historical background

During the past century, the standard practice for safeguarding the maintenance of biodiversity and reducing the rate of biodiversity loss has been the establishment of protected areas. There has been a steady and significant increase in the area protected and number of protected areas created over the past three to four decades. Over the years, the design of protected areas (sometimes referred to as PAs) has evolved from the creation of small refuges for particular species to the protection of entire ecosystems that are large enough to maintain most if not all of their component species. Although many other important measures to conserve biodiversity (e.g., comprehensive land-use planning, sustainable development) have been developed, protected areas remain the cornerstone of many conservation strategies aimed at limiting the destruction of biodiversity.

However, protected areas are subject to a wide array of pressures that influence their ability to fulfill their role of biodiversity protection. Direct threats to biodiversity include loss of habitat due to clearing for agriculture, hydroelectric power (dams), mining, road development, and overexploitation of natural resources through illegal hunting and logging. Poverty, population pressures, urbanization, and escalating demand for natural resources from both the developing and developed countries are primary drivers of these threats. Often, these drivers are compounded by conflicting national policies, poor governance, and weak institutions.

Protected area management is therefore strongly influenced by complex and interacting social, economic, and cultural dimensions. The long-term success or failure of PAs particularly, but not only, in developing countries depends significantly on the degree of ownership, engagement, and commitment of local communities, stakeholders, and local governments. The complexity that characterizes PA management is attributable to the diversity of attitudes towards conservation. Creating a protected area sometimes challenges the identity, values, and livelihoods of affected communities. Hence, understanding traditional power structures and resource tenure systems can be particularly important in determining the success or failure of PAs.

Protected areas have a critical role to play in conserving biodiversity against a backdrop of complex and interacting threats. Multiple issues influence the performance of protected areas, ranging from fundamental aspects such as what is being protected (species, ecosystem services), who is protecting (governance issues), to more complex and emerging factors related to financing and effectiveness. This synthesis provides a broad overview of such issues that are both directly and indirectly linked to the performance of PAs in conserving biodiversity.

READING

Bruner et al (2001), "Effectiveness of Parks in Protecting Tropical Biodiversity"

Bowker et al (2016), "Effectiveness of Africa's tropical protected areas for maintaining forest cover"

- Roles of protected areas in biodiversity conservation

The objective of **protected areas** is to protect representative examples of rare, threatened, fragile or otherwise valuable species, habitats, and ecosystems. For example, this may include:

- rare, endangered or endemic species of plants and animals which are restricted to one or a few protected areas, such as the pygmy hippo in Tai, Ivory Coast
- 'flagship' species, such as elephants or gorillas, which attract a lot of public attention and can be used to generate support for other conservation activities;
- areas of intact rain forest surrounded by logging concessions or farmland, as is the case for many of Africa's rain forest protected areas;
- areas with fragile montane floras and faunas, which also have high tourist potential, such as Mt Nimba.

Different protected areas do not all have the same objectives. Protected areas may serve to maintain ecosystem functions, such as:

- reducing the intensity of floods and droughts, which are common in areas where there has been significant deforestation;
- protecting the soil from erosion by maintaining vegetation cover;
- limiting the extremes of local climates - in areas where there has been widespread deforestation streams may stop flowing in the dry season and local weather patterns may be altered;

Protected areas may also serve as refugia for useful or commercially valuable species, such as:

- wild plant species related to domesticated food plants, such as the many species of wild coffee, *Coffea* spp. and the yams, *Dioscorea* spp.;
- wild relatives or forms of domestic animals, or species with recognized potential for domestication;
- species harvested for food, medicine or other uses, which are likely to become over-exploited, including rare timber trees, rattans, crocodiles, bush meat, etc.;
- species vital for fulfilling functions on which other harvests depend, such as forest dwelling bees which pollinate crops such as coffee and cocoa;
- species providing known or potentially useful drugs;
- species which are useful research models for studies of human behavior, physiology, etc., such as chimpanzees.

Protected areas also provide areas where rural populations can continue to live their traditional lifestyles, for example:

- most central African cultures have evolved in close association with the forest and there are many beliefs and traditions associated with the forest - reserves ensure cultural continuity by providing people who no longer live within the forest the opportunity to visit and experience its sights and sounds;
- the forests of central Africa contain rich archaeological remains which are a testimony to Africa's unwritten history, such as the network of earthworks around Benin City in southwestern Nigeria, which surpass the Great Wall of China as the longest (unmechanized) human excavation ever undertaken, some of which are preserved in the Okomu Reserve.

Protected areas also provide opportunities for research and education, for example:

- tropical rain forests remain poorly studied and therefore represent a natural laboratory offering countless opportunities for original research projects for students of botany, zoology, ecology, geography, anthropology, archaeology, etc.;
- applied research, addressing questions such as how best to manage tropical forests for sustained timber or bushmeat production, is often undertaken in reserves, where conditions can be more easily controlled;
- school children can learn natural science by seeing and experiencing natural phenomena by visiting a reserve to see the different animals and plants occurring there.

Protected areas can provide opportunities for complementary rural development and the rational use of marginal lands, for example:

- there is a growing interest in rain forest tourism, which depends to a great extent on protected areas;
- forest reserves can be sensibly managed for sustained timber production long-term economic development without destroying the resource base.

    - Types of Protected Areas

In an attempt to accommodate the multiple mandates of protected areas, the IUCN created a recently updated system of PA categories which recognizes that, while some PAs are more strictly protected

against consumptive human activities (e.g., Categories I and II), others allow for certain types of interventions such as the sustainable use of natural resources (e.g., Categories V and VI).

Category I: Strict Nature Reserves / Wilderness Areas

Protected areas managed mainly for science or wilderness protection.

Category 1a Strict Nature Reserves

Areas of land and / or sea possessing some outstanding or representative ecosystems, geological or physiological features and / or species, available primarily for scientific research and / or environmental monitoring.

Category 1b Wilderness areas

These are protected areas managed mainly for wilderness protection. They should include a large area of unmodified or slightly modified land, and / or sea, retaining their natural character and influence, without permanent or significant habitation and should be protected and managed so as to preserve their natural condition.

Category II: National Parks

Protected areas managed mainly for ecosystem protection and recreation. These are natural areas of land and / or sea, designated to:

- protect the ecological integrity of one or more ecosystems for present and future generations;
- exclude exploitation or occupation likely to degrade the area; and
- provide a foundation for spiritual, scientific, education, recreational and visitor uses, all of which must be environmentally and culturally compatible.

The objectives of management in National Parks include:

- to protect natural and scenic areas of national and international significance for spiritual, scientific, educational, recreational or tourist purposes;
- to perpetuate, in as natural a state as possible, representative examples of physiogeographic regions, biotic communities, genetic resources and species, to provide ecological stability and diversity;
- to manage access for educational, cultural and recreational purposes at a level which will maintain the area in a natural or near natural state;
- to eliminate and thereafter prevent exploitation or occupation likely to result in degradation;
- to ensure that the ecological, geomorphologic, sacred or aesthetic attributes which warranted designation are maintained;
- to take into account the needs of indigenous people, including subsistence resource use, in so far as these will not adversely affect the other objectives of management.

National parks should contain a representative sample of major natural regions, features or scenery, where plant and animal species, habitats and geomorphologic sites are of special spiritual, scientific, educational, recreational and tourist significance. National parks should also be large enough to contain one or more entire ecosystems not materially altered by current human occupation or exploitation.

This type of protected area represents the most common category of governance, as government agencies have the main responsibility for protected area systems globally. A government body, such as a Ministry or Park Agency reporting directly to the government, holds the authority, responsibility and accountability for managing the protected areas. This body also determines the PA's conservation objectives, subjects it to a management regime, and often also owns the PA's land, water, and related resources. Over the years, many countries have encouraged decentralization of central government agencies responsible for PA management, thus resulting in decision-making becoming less centralized and more delegated to regional authorities.

Category III: Natural Monuments
Protected areas managed mainly for conservation of specific natural features. These are areas containing one, or more, specific natural or natural / cultural features which are of outstanding or unique value because of their inherent rarity, representative or aesthetic qualities, or cultural significance.

Category IV: Habitat / Species Management Areas
Areas of land and / or sea where active management interventions are undertaken so as to ensure the maintenance of habitats and / or to meet the requirements of specific species.

Category V: Landscapes and seascapes
Protected areas where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural, and scenic value; and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other value). Category V protected areas recognize the value of human interactions with nature, and the role that humans have had in shaping many of the world's ecosystems. These areas can accommodate diverse management regimes, including customary laws governing resource management. Examples of Category V areas are the buffer zones of Royal Chitwan National Park in Nepal, and the Gobi Gurvan Saikhan National Park in Mongolia. Category V areas have proven to work well in places where strict PAs have failed due to lack of community support.

Category VI: Protected areas allowing the sustainable use of natural resources
Category VI protected areas conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

Category VI allows for the sustainable flow of goods and services to meet community needs through multiple resource use. However, it differs from other categories in that it comprises 'an area of predominantly unmodified natural systems' (as opposed to human-modified landscapes) which is to be managed so that at least two-thirds of it remains that way (Phillips 2003). Categories V and VI have obvious relevance in the context of rural poverty

Managed resource protected areas should contain at least two-thirds of the area in a natural condition, although it may also contain limited areas of modified ecosystems; but large commercial plantations are

not appropriate for inclusion. The area should be large enough to allow sustainable resource exploitation without detriment to its overall long-term natural values.

The majority of protected areas in the African forest zone are either national parks (Category II), or forest reserves in which natural resources are managed for a sustained harvest (Category VI). However, many protected areas in the African rain forest zone date back to colonial periods, and the original objectives have often been forgotten or become outdated. Furthermore, management of reserves for timber production has resulted in severe degradation of many managed resource protected areas (forest reserves) and if they are to continue to fulfill their intended role new management guidelines are required.

In addition to government-managed protected areas, there are a variety of other governance arrangements for protected areas that are on lands not owned by the government. These types of protected areas fall under individual, cooperative, community, or corporate ownership. Authority for managing the protected land and resources rests with the landowners, who determine conservation objectives, impose a conservation regime, and are responsible for decision-making, subject to applicable legislation.

The overlapping categories of governance described in this section (co-managed protected areas, community conserved areas, and private reserves) complement government-managed protected areas as they often protect habitats under-represented in a country's public park system, lands under heavy development pressure, or the last remnants of rapidly disappearing habitat. These types of protected areas enhance a country's network of PAs as they can provide corridors and linkages, often between two or more officially protected areas.

In protected areas, complex processes and institutional mechanisms are employed to share management authority and responsibility among a number of stakeholders. These can range from national to sub-national (including local) government authorities, from representatives of indigenous, mobile, and local communities to user associations, as well as private entrepreneurs and landowners. The various stakeholders recognize the legitimacy of their respective entitlements to manage the protected area, and agree on subjecting it to specific conservation objectives.

Community conserved areas (CCAs) can be broadly described as ecosystems under minimum to substantial human influence that are conserved by concerned indigenous, mobile, and local communities through customary laws or other means. These ecosystems can be natural or modified, and may have significant biodiversity or cultural values, or provide ecological services. Typically, the communities involved would have substantial dependence on the natural resources contained in the ecosystems for survival, livelihoods, and cultural sustenance. At the same time, many CCAs include areas where many or all forms of use are prohibited, ranging from very small to large stretches of landscape and waterscape within their areas of control. CCAs are therefore subject to extreme pressures from developers, from both the private sector and the government.

CCAs enhance livelihood security by providing access to economic opportunities including natural resource based enterprises (for example, community-based ecotourism) and employment in conservation and land/resource management. Furthermore, they provide strengthened or new access to ecological services that are critical for survival of human communities such as water, productive soil and microclimatic stabilization

Authority and responsibility for the management of these areas rest with the communities through a variety of forms of governance or locally agreed upon organizations and rules. For instance, land may be collectively owned and managed, but other resources may be individually owned or managed on a clan-basis. Communities have developed management regulations and organizational structures, which may or may not be legally sanctioned at the national level. In general terms, CCAs offer crucial lessons for participatory governance of official PAs, useful to resolve conflicts between PAs and local people. Specifically, they offer lessons in systems of conservation that integrate customary and statutory laws.

There are a number of key factors that emerge as being major determinants of the success or failure of CCAs. These include:

- **Tenure security** - the most successful community conservation initiatives are those where the communities have legal ownership of the area, i.e., rights over resources, or de facto control over the resources;
- **Equity and transparency in decision-making** - the equal representation of all sections of the community in information sharing, and a transparent and impartial process of decision-making, are essential features of successful and sustained community initiatives. Unequal access to funds or power, and social inequities of other kinds, often threaten or undermine community-based conservation initiatives;
- **Local leadership** - in most successful community initiatives, local leaders play a crucial role. These leaders generally need to be apolitical and inclined to focus on the wider social good.

Common property regimes and common pool resources

Common property regimes refer to institutional arrangements for the cooperative use, management, and sometimes ownership of natural resources. Common-pool resources such as forests, oceans, pastureland etc. are defined as goods that can be kept from potential users only at great cost or with difficulty, but are subtractable in consumption and can thus disappear through overexploitation. There is a vast body of theory that addresses governance aspects of 'common property regimes' for forests and other natural resources that are relevant to CCAs. Common-property regimes are immensely variable and a wide range of institutions have been found to have the potential to protect and manage common-pool resources.

Private reserves

Private reserves include areas under individual, cooperative, corporate for-profit, and corporate not-for-profit ownership. Authority for managing the protected land and resources in these reserves rests with the landowners, who determine conservation objectives, impose a conservation regime and are responsible for decision-making, subject to applicable legislation. It is sometimes difficult to distinguish between private reserves and co-managed or community conservation areas. One could also argue that in the final analysis these reserves are "game reserves" or "ecosystem service-related", and have an overriding "business plan" approach to financing PAs. In Africa, the significant potential for nature tourism and a long history of game ranches have provided many opportunities for private reserves. Like all conservation approaches, there are both advantages and disadvantages of private parks.

A principal disadvantage of private reserves from an ecological standpoint is their potentially tenuous status. Unlike government-authorized and permanently supported public parks, most private reserves are informally protected. Compounding this problem is their typically small size.

One of the key attributes of private reserves is their potential profitability. For-profit private reserves, when engaged in ecotourism, frequently represent a conservation strategy capable of both economic and ecological viability. Economic benefits of private parks accrue not just to landowners, but also to governments, since they represent an augmentation of public PA systems with lands that governments might otherwise need to purchase and protect. However, private reserves are frequently dependent on ecotourism, and this poses an economic risk since ecotourism as an industry is vulnerable to wide fluctuations, due to terrorism, political unrest, natural disasters, etc.

A more serious shortcoming of for-profit private reserves is the potential conflict of interest between ecological and economic considerations. By emphasizing profit over protection, reserve owners may contribute to the degradation rather than conservation of resources. This conflict of interest takes many forms, one of which is keeping animals captive on the premises to encourage tourism. Related problems include excessive or inappropriate infrastructure, which facilitates tourism but incurs ecological costs. Economic returns from private reserves may never reach the local communities, who may be paid only minimum wage with most of the profits benefiting wealthy landowners and international corporations, etc.

- Transboundary Initiatives

- Conservation Project Planning, Administration, and Management
  - Project scope and targets

A conservation project may be thought of as having three parts:

A. The **conservation target**, i.e., target condition (such as biodiversity within a protected area) that the project ultimately would like to influence. In most projects, this biodiversity is defined spatially as the species and ecosystems at a specific site, the scale of which can range from a small area to an entire continent. For some projects, however, the targeted biodiversity cannot be tied to specific sites, but must be regarded as a stand-alone entity (e.g., populations of migratory birds or pelagic fish).
B. **Causal chains of direct and indirect threats affecting the conservation target**. Direct threats are factors that immediately affect the target condition or physically cause its destruction and include habitat fragmentation, invasive species, pollution, overexploitation, and global climate change. Indirect threats are defined as factors that underlie or lead to the direct threats. Often referred to as underlying causes of biodiversity loss, indirect threats are complex and stem from many interrelated factors, including population growth, migration, poverty and inequality, civil unrest, weak institutions and governance structures, weak legislation and lack of enforcement, and market forces and failures.
C. The third part of the model is a description of the **conservation actions** (objectives and activities) that project managers can use to counter the threats to their conservation target.

Once the conservation project has identified the direct and indirect threats influencing the focal conservation target, the next step is to assess the relative importance of these threats. An assessment of threats helps determine which threats need to be addressed or modified to have some impact on the status of the conservation target. Threats are ranked on the basis of area, intensity, and urgency.

TNC's Conservation Action Planning (CAP)
The Nature Conservancy has developed a method known as the Conservation Action Planning process that includes developing strategies, taking action, and measuring success at any scale including at the site level. The system is based on the earlier 5-S Framework for site conservation. The five S's include:

- **Systems**: the biodiversity targets occurring at a site, and the natural processes that maintain them, that will be the focus of planning
- **Stresses**: the types of degradation and impairment afflicting key attributes of the system(s)
- **Sources**: the agents generating the stresses
- **Strategies**: the types of conservation actions deployed to abate sources of stress (threat abatement) and altered attributes of the systems (restoration)
- **Success**: measures of system viability and threat abatement

The conservation approach is based on the principle that stresses must be abated to ensure viable conservation targets. The approach develops and implements conservation strategies to (1) abate the critical sources of stress (i.e., threat abatement), and (2) directly reduce persistent stresses (i.e., restoration).

Managers of protected areas have a very wide ranging job. A PA manager must:

- direct the management of the ecosystem;
- design and implement relevant applied research and ecological monitoring, and ensure that management activities respond to the findings of this research program;
- ensure the safety of people within the protected area;
- ensure that wildlife are adequately protected within and in the vicinity of the protected area;
- ensure the development and implementation of a community conservation program, to build local support for the protected area and to enable neighboring communities to benefit in appropriate ways;
- ensure the development of a Tourism & Commercial program, where relevant, to improve visitor satisfaction and maximize profitability of the protected area, consistent with UWA policies and programs;
- ensure the proper management and maintenance of the protected area's infrastructure, vehicles, machinery and equipment;
- supervise the planning and monitoring of protected area management;
- liaise with major stakeholders in the protected area and with potential collaborators, relevant donors and non-government organizations;
- develop a competent and well-motivated team of protected area staff;
- ensure proper financial management of the protected area.

- Project scope and targets

Desired Change

- *Maintain*. Use when you believe the current condition is acceptable or when you want to set a threshold desired condition (e.g., maintain a population of 200 individuals).
- *Limit*. Use when you wish to set a threshold on an undesirable condition or state of the species or habitat (e.g., limit Noxious Weed A cover to 50%; limit mortality to 50% per year).
- *Increase*. Use when you want to improve some aspect of the species or indicator (e.g., increase the average density by 20%; increase the number of populations to 16).
- *Decrease*. Use when you want to reduce some negative aspect of the species or indicator (e.g., decrease livestock utilization of inflorescences (the buddings and flowerings of plants) to 50% or less; decrease cover of Noxious Weed A by 20%).

- Assessing threats in conservation planning

Conservation strategies designed and implemented by practitioners to protect species, landscapes, and ecosystems are largely in response to threats to biodiversity. Government and non-government conservation organizations must pay attention to three broad questions:

- What targets should be conserved?
- How should conservation strategies be designed?
- Are conservation strategies effective in achieving conservation goals?

Threat assessment involving the identification, evaluation, and ranking of threats to specific conservation targets is an integral part of conservation planning and management. Given the urgency for conservation action within the context of limited financial resources and a growing recognition of the deepening biodiversity crisis, the emphasis on systematic conservation planning and evaluation of management effectiveness has greatly increased in recent years.

Threat assessment is a significant component of conservation priority setting processes for species and ecosystems. For example, regional conservation planning may identify several hundred potential conservation areas within a planning region on the basis of ecological criteria alone such as diversity, *endemism*, uniqueness, or the value of ecological services. Some areas, however, are in more urgent need of action than other areas. Therefore, a further step in the conservation planning process prior to implementation is to set priorities for action within the planning region. Threat assessment is an important criterion used to set such priorities.

Once sites have been selected, threat assessment can help design strategies to conserve biodiversity targets. Conservation practitioners design projects by identifying threats to conservation targets (such as species and ecosystems) at a site and then developing interventions or strategies that explicitly address these threats.

Conservation practitioners are increasingly asked to measure the effectiveness of their efforts to conserve biodiversity in ways that are scientifically sound, practical, and comparable across sites. One way to assess effectiveness of management action is to monitor threats to conservation targets; for

example, are the most critical threats that affect biological diversity at a park changing in their severity or geographic extent as a result of conservation strategies (or lack thereof)? Or, has poaching declined as a result of efforts to develop and improve domestic livestock practices as a protein source for local communities? Threat assessment methodologies can be used in monitoring protocols to measure the effectiveness of management action.

The following section provides a brief overview of four approaches to assessing threats at the species level. These approaches use threats as one of several criteria to prioritize species or their habitats:

1) The IUCN Red List Programme evaluates the status of species relative to other species in terms of a species' extinction risk and allows for monitoring.
2) The Important Bird Areas Programme identifies critical sites for birds.
3) The Key Biodiversity Area approach identifies, documents, and protects networks of sites critical for the conservation of global biodiversity.
4) Range-wide priority setting approaches use threat assessment to set conservation priorities for individual species (for example, Tiger Conservation Units and Jaguar Conservation Units).

The IUCN Red List Programme

The IUCN (International Union for the Conservation of Nature and Natural Resources and also known as the World Conservation Union) Red List is a tool to help assess and monitor the status of biodiversity at the species level (www.redlist.org). Threatened species lists such as the Red List provide a qualitative estimate of the risk of extinction.

The goals of the IUCN Red List Programme are to:

1) provide a global index of the state of degeneration of biodiversity, and
2) identify and document those species most in need of conservation attention if global extinction rates are to be reduced.

The listing process utilizes a comprehensive system of threat classification and criteria to place species in one of seven broad categories: "extinct in the wild," "critically endangered," "endangered," "vulnerable," "lower risk," "data deficient," and "not evaluated". The assessment includes species from a broad range of taxonomic groups including vertebrates, invertebrates, plants, and fungi.

There are four common ways threatened species lists are used:

- to set priorities for resource allocation for species recovery,
- to inform reserve system design,
- to constrain development and exploitation, and
- to report on the state of the environment.

Such lists fulfill important political, social, and scientific needs, and are frequently the only tools based on sound ecological knowledge available for decision-making.

Important Bird Areas (IBA) Programme

BirdLife International, an international NGO (non-governmental organization), has been analyzing and documenting the status of the world's threatened bird species since the 1970s, and is the official Listing Authority for birds for the IUCN Red List. BirdLife collates information on threatened birds from a global network of experts and from published and unpublished sources. This information is used to assess each species' IUCN Red List category (and hence extinction risk) using standard quantitative criteria based on population size, population trends, and range size.

The information generated by the Red List Programme outlined above is also used to focus global conservation efforts and to guide BirdLife's priorities for action. For example, BirdLife International's Important Bird Areas (IBA) Programme is a worldwide initiative aimed at identifying, documenting, and protecting a network of critical sites for birds. IBAs are key sites for conservation—small enough to be conserved in their entirety and often already part of a protected-area network. They fulfill one (or more) of the following criteria:

- Hold significant numbers of one or more globally threatened species
- Are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species
- Have exceptionally large numbers of migratory or congregatory species

Key Biodiversity Area Approach

The goal of the Key Biodiversity Area approach is to identify, document, and protect networks of sites that are critical for the conservation of global biodiversity. This methodology builds up from the identification of species conservation targets (through the IUCN Red List) and nests within larger-scale conservation approaches (such as IBAs). Sites are selected using standardized, globally applicable, threshold-based criteria, driven by the distribution and population of species that require site-level conservation. Such species fall into two main and non-exclusive classes: species that are threatened or species that are geographically concentrated. Thus, the criteria address the two key issues for setting site conservation priorities: vulnerability and irreplaceability.

Key Bioidiversity Area criteria cover:

- Globally threatened species that have been assessed following the IUCN Red List criteria as having a high risk of extinction
- Restricted-range species with small global distributions
- Assemblages of species confined to a particular broad habitat type, or biome
- Congregations of species that gather in large numbers at specific sites during some stage in their life cycle

Range-level priority setting for individual species

Threat assessment is also used to set conservation priorities over the entire range for individual species, such as tigers and jaguars. For example, a framework to identify high priority areas and actions to conserve tigers in the wild uses scoring indices for threats to tigers, such as habitat degradation and poaching, to prioritize Tiger Conservation Units, which are defined as "blocks of existing habitats that contain, or have the potential to contain, interacting populations of tigers". Similarly, the Wildlife Conservation Society's range-wide priority setting for jaguars identified and prioritized Jaguar Conservation Units (JCUs) as having high, medium, or low probability of long-term survival of the

population using a weighted scoring system that included criteria such as JCU size, connectivity, habitat quality, hunting of jaguars, hunting of jaguar prey, and jaguar population status. Such range-wide priority setting approaches can potentially be applied to other taxa as well.

- Priority setting at global, regional, and local (site) scales

Planning methods and conservation strategies of governmental and non-governmental organizations are increasingly focusing on large spatial areas or regions inhabited by many species and natural communities. Threat assessment forms an important component of conservation planning methods helping to prioritize sites within large, terrestrial spatial areas. There are three "simplified" planning scales typically considered by conservation planners: global, regional, or local.

Global-scale conservation priority setting exercises are numerous and include World Wildlife Fund's Global 200 *Ecoregions*, Conservation International's *Biodiversity Hotspots*, Birdlife International's Important Bird Areas, and the Wildlife Conservation Society's *Last Wild Places*. These analyses identify the entire planet as the planning universe, and then attempt to identify all the places (usually large regions or ecoregions) that require increased conservation attention. The priority areas identified in these global prioritization schemes are invariably large (e.g., the Caribbean, or the Tropical Andes) but sometimes include smaller areas (e.g., Important Bird Areas).

The criteria for determining priority areas for conservation are many and varied, but almost always include threat assessment at some point. Conservation International's Hotspots are defined on the basis of habitat loss (>70% of primary vegetation lost) and endemism. The Wildlife Conservation Society's Last Wild Places are identified using threat proxies (population density, accessibility, power infrastructure, and land transformation) for human influence.

The Global 200 initiative of the World Wildlife Fund (WWF) defines "ecoregions" as relatively large units of land containing a distinct assemblage of natural communities and species with boundaries that approximate the original extent of natural communities prior to major land-use change. The Global 200 Ecoregions are considered by WWF to be the richest, rarest, and most distinctive examples of all the Earth's diverse natural habitats.

The Global 200 uses threats at a secondary level to prioritize conservation actions within ecoregions that are identified on the basis of purely ecological and *biogeographical criteria.* Conservation assessments of the Global 200 Ecoregions are based on features such as total habitat loss, the degree of fragmentation, water quality, and estimates of future threat. The different ecoregions are classified into one of three broad categories: critical/endangered, vulnerable, or relatively stable/relatively intact.

Similar to the Global 200 approach, World Resources Institute's approach defines Frontier Forests as large, ecologically intact, and relatively undisturbed natural forests of the world and uses threat criteria to classify frontier forests secondarily as "threatened" or "low-threat" potentially vulnerable forests.

Regional planning scales are intermediate between "coarse" global planning scales and the "fine" local scales typically associated with single site planning. Regional scale conservation planning often involves selecting one or a cluster of ecologically defined regions as the planning universe, and establishing a set of geographic priorities and strategies within them (Olson et al. 2001). Threat assessment is a useful tool for setting priorities for action among conservation areas within a region.

Conservation planning at local scales involves less of a focus on priority setting and more attention to specific site conservation strategies. At global and regional scales, the driving question is frequently where to work, and the process involves selecting candidate areas (where to conserve). At local scales, the decision has already been made to work at a particular site or area, and the driving question becomes how to protect the biodiversity contained in that site; site management issues replace site selection concerns. For conservation areas at typical, local site scales (e.g., protected areas, conservation reserves, etc.), it is extremely important to know the nature and status of biodiversity *plus* the distribution, severity, and intensity of threats impacting the sites.

In general, the role of threat assessment for site conservation planning is to identify and rank threats to conservation targets in order to select appropriate conservation strategies. There are a variety of different approaches to characterizing threats to conservation targets such as protected areas, conservation reserves, etc. The simplest and most common approach is a textual description of the threats to a particular conservation target. While this method identifies threats, it generally does not adequately characterize them for conservation planning purposes. In contrast, a formal assessment measures the relative importance of threats affecting a particular conservation target and thereby informs the most effective selection of conservation strategies.

- Strategy Selection

Conservation Management objectives are specific actions or tasks undertaken by project staff to reach a project objective. Central to the plan is a statement of goals and measurable objectives to guide the management of the area. These goals and objectives form the framework for determining what actions to take, when they will be taken and the budget and personnel needed to implement them. The plan should describe any specialized training needs of staff such that a competent team is maintained as and when transfers are made. An effective objective meets the following criteria:

- *Impact oriented*. Represents desired changes in critical threat factors that affect the project goal.
- *Measurable*. Definable in relation to some standard scale (numbers, percentages, fractions, or all/nothing states).
- *Time limited*. Achievable within a specific period of time.
- *Specific*. Clearly defined so that all people involved in the project have the same understanding of what the terms in the objective mean.
- *Practical*. Achievable and appropriate within the context of the project site.

A good activity meets the following criteria:

- *Linked*. Directly related to achieving a specific objective.
- *Focused*. Outlines specific tasks that need to be carried out.
- *Feasible*. Accomplishable in light of the project's resources and constraints.
- *Appropriate*. Acceptable to and fitting within site-specific cultural, social, and biological norms.

Usually a management plan is for 5 years, or a limited period of time, after which the plan is evaluated and modified. Annual workplans are developed during the implementation phase using the longer-term management plan as a guide. The management plan is a dynamic document subject to arrival of new circumstances and new information.

The Conservation Action Planning process involves the following 4 stages and a total of 10 steps:

a) Defining the project
b) Developing conservation strategies and measures
c) Implementing conservation strategies and measures
d) Using Results to adapt and improve

The following is a brief description of the activities under each stage:

A. Defining the project.

Step 1. Identify people involved in the project with the selection of project leader, team members and assignment of roles.

Step 2. Define project scope and focal conservation targets with a brief text description and basic map of project area or scope, a statement of the overall vision of the project and a selection of no more than 8 focal conservation targets and explanations of why they were chosen.

B. Developing conservation strategies and measures.

Step 3. Assess viability of focal conservation targets including (i) the selection of at least one key ecological attribute and measurable indicator for each focal target, (ii) assumptions regarding acceptable range of variation for each attribute, (iii) determination of current and desired status of each attribute) and (iv) brief documentation of viability assessments and any potential research needs.

Step 4. Identify critical threats including the identification and rating of stresses and sources of stress for each focal target. In Step 4, the process identifies four variables used to measure threats:

- *Scope of Damage* is "the geographic scope of impact to the conservation target expected within 10 years under current circumstances."
- *Severity of Damage* is "the level of damage to the conservation target over at least some portion of the target occurrence that can reasonably be expected within 10 years under current circumstances."
- *Contribution* is "the contribution of a source, acting alone, to the full expression of a stress."
- *Irreversibility* is "the level of reversibility of the stress caused by a source of stress." Each threat is scored for each variable using a 1-4 ranking and the variables are combined through a series of rules to give an overall score for each threat.

Step 5. Conduct Situation Analysis. This would include indirect threats/opportunities and associated stakeholders behind all critical threats and degraded attributes and a picture in narrative form or a simple diagram of hypothesized linkages between indirect threats and opportunities, critical threats and focal targets.

Step 6. Develop strategies: objectives and actions.
This would include identifying good objectives for all critical threats and degraded key ecological attributes that the project is taking action to address and one or more strategic actions for each conservation objective.

Step 7. Establish measures
This would include a list of indicators and methods to track the effectiveness of each conservation action.

C. Implementing conservation strategies and measures.

Step 8. Develop work plans.
This would involve developing lists of major action steps and monitoring tasks, assignments of steps and tasks to specific individuals, timeline, brief summary of project capacity and a rough project budget.

Step 9. Implementation through actions and measures

D. Using results to adapt and improve.

Step 10. Analyze, learn, adapt and share.
This step would involve appropriate and scheduled analyses of data, updated viability and threat assessments, modification to objectives, strategic actions and work plans as warranted, updates of project documents and identification of key audiences and appropriate communication prlecture oducts.

- Results Chain
- Monitoring and Evaluation

There are a number of different topics for which the manager will require accurate, scientifically collected biophysical information before he or she can plan for the long-term management of a protected area. These topics can be divided into the following categories:

1) Baseline Information / Inventory
2) Species needs
3) Ecological relationships
4) Monitoring and dynamics of change

Managers also need socio-economic information, including:

1) Resident and neighboring populations
2) Economic valuation
3) Recreation and tourism
4) Management and administration

In planning biological and socio-economic research programs for protected areas, managers must consider the following:

- What knowledge already exists about the protected area? - are there already maps, inventories, biological information, human population censuses, etc.
- What information is lacking?
- How can this information be obtained?

- Who will do any necessary research?

The following guidelines will help managers determine the priorities and direct research for the benefit of management:

Identification of the information needed for the management of the protected area
The management plan should include a section on research and monitoring. Each protected area will have different management objectives and specific management issues that will require special attention. A research component in the management plan, as well as in the protected area zoning plan, will help determine which areas will be used for research and what the research objectives of the protected area will be.

Promotion of the protected area as a site for research activities
Facilities such as research stations and special study-zones will act as incentives to facilitate scientific study. At the very least, each protected area should have a system for long-term monitoring of basic components such as wildlife populations, vegetation changes, water quality, weather and visitor use. Much of this work can be carried out by protected area staff.

Adequate priority must be given to social and economic research programs
One of the largest problems facing protected area managers today involves the park / people interface. Managers need to be able to quantify the financial and economic benefits that protected areas provide, through conservation of biodiversity, protection of watersheds, tourism, etc. as well as the impact of economic activities on the reserve.

Research projects should be approved by the management authority of the protected area
research projects should be compatible with the objectives of the reserve.

Activities of researchers must be monitored by management authorities
Researchers should submit written progress reports and occasional verbal presentations to the protected area staff to keep the managers (and other staff) up-to-date with their activities.

There must be clear guidelines for research projects which involve collection of specimens
Collection of plant and animal materials in the protected area must require specific permission of the management authority. Material to be taken outside the country may also require a special permit.

Maintenance of records of all research undertaken in the reserve
Final reports including findings of relevance to management and recommendations must be forwarded to the PA manager. Papers published should be sent to the park. Summaries written in popular style could be used for interpretative literature on the park. In addition, researchers should leave copies of qualitative and quantitative data for the files for management purposes.

- Effectiveness of protected areas

READING:
Bruner et al, "Effectiveness of Parks in Protecting Tropical Biodiversity"
Bowker et al, "Effectiveness of Africa's tropical protected areas for maintaining forest cover"

Are PAs working? For a number of reasons, this seemingly simple question has extremely complex answers. PAs frequently have multiple mandates. Biodiversity conservation or the preservation of ecological integrity is only one of several objectives of protected areas that may include other diverse goals related to sustainable development, poverty alleviation, peace, social equity, etc. Furthermore, the poor availability of data on ecological and social conditions, and their change over time, has resulted in the lack of a unified measure of protected area integrity (Naughton-Treves et al. 2005). Hence, measuring PA effectiveness in a meaningful way is often a very difficult task.

Still, there are a number of approaches that have been developed, and studies that examine PA effectiveness broadly address the following three questions:

- is the design of the site or system appropriate to the values it seeks to maintain;
- are the management systems and processes adequate and appropriate for the needs of the site; and
- is the site or system effective in maintaining biodiversity, abating threats, and achieving other management objectives?

These three questions have evolved into three separate areas in PA assessments: design, management processes, and ecological integrity. The first, design, provides parameters for assessing the adequacy of the design of a protected area or system, and provides criteria for determining new reserves. The second, management processes, includes assessments of a range of management elements. The third, ecological integrity, includes concerns such as intactness, species viability, ecological processes and functioning, and the threats and pressures facing a protected area. Table 4 (modified from Ervin 2003a) provides a non-exhaustive review of park effectiveness studies within these broad categories.

Monitoring is the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective. This definition includes the periodic collection of data relative to stated project goals, objectives, and activities. Monitoring is critically essential to determining the extent to which protected areas are effective in conserving biodiversity or achieving other management objectives.

Monitoring can be defined 'as data sampling which is: repeated at certain intervals of time for management purpose; replicable over an extended time frame; and focuses on rates and magnitude of change. Monitoring helps to identify priority areas for research and conservation, and to quantify the response of plant and animal populations to disturbance and management interventions.

Countries contracting to the Convention on Biological Diversity are obliged to monitor biodiversity (Article 7b), and donors increasingly demand accountability and quantifiable achievements in return for their assistance. Given that biodiversity conservation is one of the key objectives of protected areas, the development of biodiversity monitoring systems for protected areas now attracts a significant proportion of the international funding for biodiversity conservation.

Monitoring is critical, for example, in managing threatened and endangered species, measuring the effects of management activities and natural perturbations, and documenting compliance with regulatory requirements or contractual agreements. Through monitoring, we can determine whether management was a success and should be continued or whether it was a failure and should be abandoned or altered. An effective monitoring program is a vital part of determining if those resources are well spent. Several components can be monitored in a conservation project: the state of the target condition (species, ecosystems, protected areas, etc.), the success in mitigating threats to the target condition, and the process of implementing interventions.

Monitoring and Evaluation that provides assessment and identification of threats and problems, in a manner that allows managers to respond effectively, is central to good conservation management. Yet, there are conflicts between the scientific ideals and practical realities of monitoring that influence the implementation and effectiveness of monitoring systems. For instance, most practitioners agree that in an ideal world, monitoring programs would always be spatially and temporally comprehensive, rigorous in their treatment of sampling error, and sustainable over the time scales necessary to examine population and community level processes. Nevertheless, monitoring of biodiversity and resource use in the real world is often costly and hard to sustain, especially in developing countries, where financial resources are limited. Moreover, such monitoring can be logistically and technically difficult, and is often perceived to be irrelevant by resource managers and the local communities. Many suggest the need to identify some middle ground between requirements for rigor and goals for program sustainability.

In addition to conserving biological diversity, PAs are often expected to provide economic benefits, alleviate poverty, protect threatened cultures, and promote peace. The challenges for PAs in the future will be to implement these multiple objectives in the face of population growth, increasing demand for resources, and political, social and economic instability. Although the lack of sufficient financial resources is a significant obstacle to the effectiveness of PAs, increases in the allocation of financial resources for PAs would not eliminate challenges associated with managing PAs to fulfill multiple, often conflicting mandates.

Planning, implementation and monitoring of effectiveness of protected areas are key aspects of PA management that require the engagement and commitment of a range of stakeholders with diverse interests. To ensure that protected areas fulfill their objective of biodiversity requires a shared vision for biodiversity conservation.

Protected areas continue to represent an important cornerstone for biodiversity conservation. However, the disparate and often conflicting global mandates for PAs pose the greatest challenge for the development of effective strategies. Greater awareness of the need for and the importance of PAs has led to the creation of many opportunities to increase their effectiveness in meeting human needs and achieving biodiversity conservation goals. The need for reconciliation of conflicting mandates will drive the design and implementation of innovative approaches for management, governance, financing, and monitoring of PAs, all of which will directly and indirectly impact their effectiveness in conserving biodiversity.

- Corridors & Connectivity

When existing protected areas are small, connecting them to other protected areas may increase their ability to sustain their fauna and flora. Connectivity between protected areas is critical as few of them are large enough to sustain species on their own. Four basic species movements are important to consider in ensuring landscape connectivity: daily, small-scale home range movements; annual seasonal migrations; dispersal of young from their parents; and geographic range shifts. These different species movements as well as the type of species found in a particular landscape are all important factors when increasing connectivity or designing protected area networks.

One way to increase connectivity is by creating wildlife corridors. Corridors are linear strips of land that allow species to move among different habitat types for breeding, birthing, feeding, roosting, annual migrations, dispersal of young animals away from their parents, and as an escape path from predators or disturbance. Riparian zones are good examples of corridors that link forest patches. There are few studies that show that animals actually use corridors, or that can separate between the effect of the corridor itself from that of the additional habitat provided by its creation.

Landscapes have naturally occurring borders that are not determined by political boundaries. Many political borders are freely crossed by animals to access the resources they need for survival, while others including many international borders, not only appear on maps but are bounded by fences or other obstacles that fragment landscapes and ecosystems. These boundary markers may present an impenetrable barrier to species that can limit a population's access to needed resources or prevent migration and movement through a landscape.

Cross border conservation solutions have been used more and more frequently to facilitate conservation cooperation between countries around the world. Typically, solutions like this are called Transfrontier Conservation Areas (TFCA's) or Transboundary Natural Resource Management solutions. These cross-border efforts are instrumental in reunifying artificially-divided landscapes and can facilitate development of coordinated conservation practices. Other benefits include improved political relationships between countries, increased tourism opportunities, and the involvement of local communities in crafting conservation solutions that will provide direct local benefits.

- Financing protected areas

Adequate financial support is key for the effective functioning of PAs. While funding is only one of several basic needs for creating functional PA systems, inadequate financial support plays a central role in the loss and degradation of natural resources as it limits PA management effectiveness. Many PAs in the developing world currently suffer from an extreme funding deficit, and many areas have no budget at all. Insufficient funding means that many PA systems have inadequate staff, equipment, and other management necessities. Overall, lack of sufficient financial investment has led to the creation of 'paper parks' with ineffective or insufficient management, and the progressive degradation of the resources that the parks and reserves were established to protect. However, funds allocated to PAs have not always resulted in long-term sustainable conservation outcomes. Much PA finance has been short-term and focused on capital investment, with very limited support for sustaining structures and institutions over time.

International and domestic funding for protected areas has struggled to keep pace with the growth in the number and area of PAs, especially in the tropics. Many governments have reduced their budgets for protected areas. Changing global and national priorities and development imperatives have also had major impacts on both the amount and the purpose of funding for protected areas and biodiversity conservation. Some argue that there has been a shift in official donor and government priorities away from biodiversity conservation and protected areas and towards social and poverty reduction goals.

The costs of a protected area system can be divided into three categories: (i) Recurrent management costs for existing areas; (ii) System-wide expenses needed to support a network of protected areas; and (iii) Costs of expanding the protected area system. The funding gap is acute in developing countries and for marine protected areas in the high seas. For example, the current protected area budget as a percentage of necessary annual spending is estimated to be approximately 20% in Cameroon and across the Congo Basin, 35%-45% in Ghana, and 70% in Bolivia.

Financial sustainability of protected areas means the ability to secure sufficient, stable and long-term financial resources, and to allocate them in a timely manner and in an appropriate form, to cover the full costs of protected areas, and to ensure that they are managed effectively and efficiently with respect to conservation and other objectives. Securing adequate funds is a necessary, but not sufficient, condition for protected areas to be managed effectively and financed sustainably.

Elements of protected area financial sustainability include: 1) building a diverse, stable and secure funding portfolio while minimizing funding risks and fluctuations; 2) improving financial administration and effectiveness; and 3) taking a comprehensive view of costs and benefits: ensuring that those who bear PA costs are recognized and adequately compensated, and that those who benefit from protected areas make a fair contribution to their maintenance.

There are broadly three basic mechanisms to finance protected areas:

a. annual allocations from a government's budget;
b. user fees, fines, and environmental taxes that are earmarked for parks and nature conservation; and
c. grants and donations from individuals, corporations, foundation, nongovernmental organizations (NGOs) and international donor agencies.

Annual governmental allocations

Most governments in developing countries give higher priority to funding economic development and social programs than parks and wildlife conservation. However, governments can sometimes be persuaded to increase their budget allocations for PAs if it can be demonstrated that protected areas provide substantial economic benefits. These can be garnered for example through wildlife and nature-based tourism, protecting watersheds (to ensure the supply of drinking water and hydroelectric power), protecting spawning grounds for fish that can later be commercially harvested, and carbon sequestration. For many parks around the world, annual government allocations constitute the only source of funds for park management. These funds are frequently insufficient to cover PA management costs.

User fees, fines, and taxes

Many countries collect fees, fines, and taxes from people who "use" protected areas. These include fees for entry, fishing, hunting, diving, climbing, hiking, etc. These fees also include concessions and taxes paid by businesses operating in protected areas, such as visitor lodges, stores, and tour operators, or fines for environmental transgressions. In many cases, however, only a small part of such revenues is used to support protected areas and biodiversity conservation. More commonly, the generated revenue flows into the government treasury and is then allocated for other budgetary purposes. A second problem is that these fees and taxes are often set much lower than what many people would be willing to pay. Surveys have shown that most park visitors are willing to pay significantly higher fees and taxes if this money is used solely for conserving parks. Table 3 describes these fees in more detail.

Notwithstanding the large revenue-generating potential of earmarked user fees, fines, and taxes, they cannot be relied upon to cover the core costs of managing PAs. Revenues generated from tourism can suddenly and dramatically decline as a result of domestic or international political or economic crises. Similarly, the revenues generated from user fees and taxes on natural resource extraction such as logging or mining can also fluctuate dramatically as economic conditions change, or as the resource itself becomes depleted. Hence, user fees, fines, and earmarked environmental taxes should be regarded as a supplement to regular government budget allocations and donor funding, rather than as a replacement for those two sources.

Grants and donations

The third main source of financing for protected areas and biodiversity conservation is grants and donations from individuals, corporations, foundations, NGOs and international donor agencies. These include conservation trust funds and debt-for-nature swaps.

Conservation trust funds

Are an increasingly common way of providing long-term funding for parks and conservation in developing countries. A trust fund can be broadly defined as money or other property that: (1) can only be used for a particular purpose; (2) must be kept separate from other sources of money, such as a government agency's regular budget; and (3) is managed by an independent board. Conservation trust funds can offer a number of important benefits including providing long-term sustained funding, financing recurrent costs, serving as a catalyst for environmental policy reforms, strengthening the role of civil society, increasing local participation, and decentralizing decision-making.

Establishment of a trust fund is often a very political process. These funds can lack a clear focus or clear criteria for making grants, and may experience excessive political interference, high administrative

expenses, and low returns. Designing the trust fund is a complex process, but good design is a requirement for success. There is no single model or set of "best practices" for an ideal conservation trust fund. Each trust fund needs to be custom designed to fit a country's political circumstances, its legal code, its human resource capacity, its environmental problems and the requirements of the fund's donors.

Debt-for-nature swaps

Represent a financial mechanism that has enabled developing countries to reduce external debt while generating funds for conservation activities. Debt-for-nature swaps can take three forms: (1) swaps of debt owed by developing country governments to international commercial banks; (2) swaps of debt owed by developing country governments to the governments of developed countries; and (3) swaps of debt owed by corporations or commercial banks in developing countries to international commercial banks.

Debt-for-nature swaps offer transparent, accountable and multi-stakeholder mechanisms for mobilizing and administering large amounts of funding. They can provide long-term and sustainable finance for protected areas, as well as ensure that a degree of control over the allocation of funds remains with PA managers and other local stakeholders. Debt-for-nature swaps are complex instruments to negotiate, set up and administer, requiring elaborate legal and institutional structures and strong technical capacities. Moreover, substantial inputs are often required from third parties (usually international NGOs). In addition to the technical complexities of the debt swap process, the ultimate success of a debt-for-nature swap depends on the success of the conservation programs that it finances.

Payments for ecosystem services (PES)

Biodiversity conservation is increasingly justified in terms of "ecosystem services" provided to people. Examples include the natural water filtration function of wetlands (which often benefits people far downstream), the storm protection function of coastal mangrove forests (which benefits coastal properties and infrastructure), and carbon sequestration in biomass (which benefits the entire global community by abating climate change). Ecosystem services provided by PAs are typically enjoyed by offsite producers and consumers at low or zero cost, who make little or no contribution to PA finance. Systems of payments for ecosystem services (PES) seek to create financial incentives for resource users and managers to voluntarily adopt activities and technologies that generate environmental benefits. The use of PES to generate funding for PAs is a relatively recent phenomenon; most schemes have been developed in the last decade or so.

Payments by government to farmers to conserve or restore native vegetation, or to adopt low-external input farming practices, are two common examples of PES. Other examples of PES used to generate funding for PAs include payments for watershed protection, carbon sequestration, and biodiversity conservation. Payments for hydrological services have been applied in a wide range of cases and countries, and range from transfers between public hydropower and water utilities to PA agencies and conservation NGOs, to direct payments by governments to small-scale farmers.

Payment for ecosystem services for watershed protection

Protected areas can be a cost-effective means of maintaining healthy watersheds that produce a steady and reliable source of water. Protected forests, in particular, have significant influence on the hydrological cycle, especially in mountainous areas. While empirical data on the relationship between vegetation cover and water supply is scarce, some studies suggest that forest conservation and appropriate farming methods can: 1) **reduce sediment loads in waterways**, decreasing sedimentation of reservoirs and associated construction and maintenance costs for irrigation systems, hydro-electric power (HEP) plants, water supply systems and fisheries; 2) **regulate water-flows** so as to reduce flood risk in the wet season and the likelihood of water shortages in the dry season; 3) **increase the volume of water** available, either year-round or specifically in the dry season; and 4) **improve the quality of water** for domestic use. Overall, the economic value of watershed services provided by PAs can be substantial.

- Adaptive Management

Adaptive management is about systematically implementing management in order to achieve a desired outcome. In recent years, growing interest and effort has gone into measuring the conservation success of such programs. An adaptive management framework helps you to form management goals and convert these into monitoring goals, sampling and analysis, as well as how to effectively report results to stakeholders.

In adaptive management, monitoring is used to measure progress toward or success at meeting an objective, providing the evidence necessary for deciding whether to change or continue a specific management practice. Adaptive management in conjunction with monitoring is a “learning by doing” process.

Adaptive management is about systematically implementing management in order to achieve a desired outcome. It involves several specific steps as outlined below:

(1) Establishment of a clear management goal to describe the desired condition of a species, ecosystem, protected area or other conservation interest.
(2) Development of a management plan to clearly identify both threats to the target condition and activities that will reduce these threats, thus achieving the project goal. Threats might include invasive species or poaching, for example.
(3) Development of a monitoring plan, to focus (assess) on these target conditions, threats and activities.
(4) Implementation of the management and monitoring plans.
(5) Data analysis and communication of results.
(6) Iterative use of results to adapt and learn. Only by carefully tracking a system in response to management actions can we learn how our actions affect it. Management is adapted (changed) if objectives are not reached or if the new knowledge from monitoring suggests a better course of action.

Conservationists must translate general aims into clear management goals, which they must then further refine into precise and measurable monitoring objectives. If viable targets are not identified and progress toward them tracked, it cannot be known if management succeeded, nor can management practices evolve and improve.

PRACTICUM: "MONITORING AND ADAPTIVE MANAGEMENT"

- Species approach to conservation (ex-situ conservation)
    - Active interventions, e.g., captive breeding, orphanages

- Protected Areas in Liberia
    - Process for Protected Areas establishment in Liberia
        - PA management structure and administrative units
    - Types of Protected Areas in Liberia
        - Restricted (e.g., Sapo NP, Gola Forest NP, Grebo-Krahn)
        - Multipurpose (e.g., Lake Piso MPUR)
        - Co-Managed (e.g., East Nimba NR)
        - Nature Reserves, Marine Reserves, Historical Sites
        - Traditional Protected Areas
            - Sacred groves
            - Taboos against killing certain wildlife species
    - Proposed Protected Areas
    - Community Engagement/Awareness
        - Livelihood support strategies
        - Grievance mechanisms
    - Research, Monitoring and Evaluation
        - Liberia Species Working Group
        - Liberia Forest Atlas

Protected Area categories (according to Liberia's Wildlife Law 2016, Section 5.3.1):

a) Multiple Sustainable Use Reserve
b) National Forest Reserve
c) National Parks
d) Nature Reserve
e) Strict Nature Reserve
f) Natural Monument
g) Habitat/Species Management Area
h) Protected Landscape/Seascape
i) Any other category that the Authority in collaboration with the EPA and relevant agencies deems necessary

READING:

United Nations, "Liberian Biodiversity Country Study"

Verschuren, "Conservation of tropical rain forest in Liberia"

"East Nimba Nature Reserve Management Plan 2014"

Table 10:The protected and proposed protected areas in Liberia

Protected Areas	Area (Hectares)	**Year Gazetted**
East Nimba Nature Reserve	13,569	2003
Gola Forest National Park	88,130	2016
Lake Piso Multiple Use Reserve	97,975	2011
Sapo National Park	184,406	1983
Total: **384,080**		
Proposed Protected Areas		
Grebo Forest National Park	97,136	Gazetement scheduled for 2016
Wonegizi Nature Reserve	37,979	
Foya Proposed Protected Area	164,628	Gazetement scheduled for 2017
Grand Kru River Gee PPA	135,100	
Cestos/Senkwhen Proposed PA	80,348	
Gbi PPA	88,409	Part of Proposed Protected Area Network scheduled for gazetement by 2017
Kpo Mountains (near Zelekai)	83,709	
Bong Mountains (Yoma)	24,813	
Margibi Mangroves "Marshall Islands"	23,813	
West Nimba PPA	10, 482	
Total: 746,417		

Source: FDA

Traditional Conservation

There are numerous practices of traditional conservation in Liberia, including:

- Sacred sites (Poro societies, Sande societies).
- Totem species.
- Taboos against killing of wildlife species, e.g., chimpanzees in Sapo/Zor.

READING

Fraser et al (2016), "Cultural valuation and biodiversity conservation in the Upper Guinea forest, West Africa"