

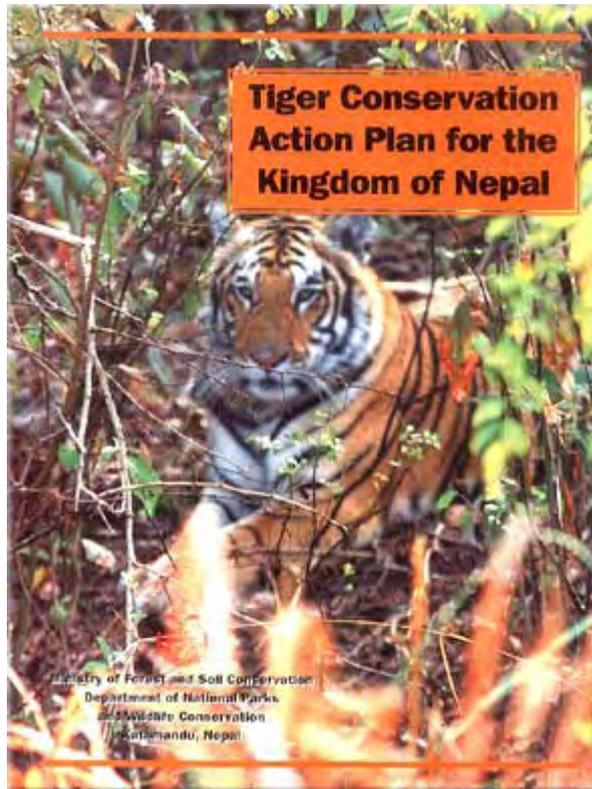
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Abstract: The goal of this Tiger Conservation Action Plan is to preserve, recognize, restore, and increase the effective land base that supports Royal Bengal tigers (*Panthera tigris tigris*) in Nepal, in order to maintain a viable tiger population. The premise of this action plan is that ecosystem management, with an emphasis on building partnerships with local people, is crucial for maintaining tiger habitats outside protected areas. An outline of tiger biology, status, historical distribution, and threats in Nepal is given. The plan contains rationales, which identify research and conservation priorities, and defines measurable outputs describing the outcome of associated activities aimed at achieving the rationales and the goal.

Notes: RefID:6258 is a revised version of this plan

Tiger Conservation Action Plan for the Kingdom of Nepal



Goal

The goal of this Tiger Conservation Action Plan is to preserve, recognize, restore, and increase the effective land base that supports Royal Bengal tigers (*Panthera tigris tigris*) in Nepal, in order to maintain a viable tiger population. His Majesty's Government of Nepal (HMG) will expand conservation efforts, beyond existing protected areas, and recognize the entire Terai and Siwalik forest areas as tiger habitat. A broad-scale, land-use approach to conservation is critical, not only for tigers, but also for the restoration and maintenance of intact ecosystems, upon which biodiversity depends, and which determine the quality of human life.

The premise of this action plan is that ecosystem management, with an emphasis on building partnerships with local people, is crucial for maintaining tiger habitats outside protected areas because:

1. the existing protected areas, by themselves, are not large enough to maintain viable tiger populations

2. there are extensive forest lands outside reserves where tigers currently occur
3. forests outside reserves are often degraded and need ecological restoration
4. the key to restoring habitat outside reserves is the inclusion of local people as stakeholders, who directly benefit through conservation actions, and contribute to management decisions.

Introduction

The tiger, one of the world's most magnificent mammals, is highly endangered and faces extinction in the near future, if the present trend of poaching and habitat loss continue. Two of the eight tiger subspecies, the Balinese and Caspian, are already extinct; and the Javan tiger is thought to have disappeared in the 1980s (Table 1). A drastic rise in tiger poaching was first noticed in 1990; by 1992, there were reports of severe poaching from across the tiger's range, strongly impacting all five remaining subspecies.

The primary consumers of tiger products are Chinese communities throughout the world, where tiger parts—in the form of tiger bone wine and tiger plasters—are used as a traditional medicine. The sale of these products has been documented in every major Chinese community that has been examined. Some conservationists believe that if the present worldwide rate of poaching continues for three to six more years, many tiger populations may be extinct before the year 2000 (Kenney et al. 1995). Additionally, habitat loss has resulted in a fragmented tiger distribution, with an estimated 150 to 200 populations. Many of these populations are currently too small to have long-term viability, unless they are managed as entire population or ecosystem units—where prime habitat includes protected areas, large tracts of adjacent forest habitats, and corridors that connect protected areas.

Extinction of the tiger—the largest and strongest of the world's cats, and an animal with the most unique and dramatic predatory power—would be a tragic loss.

Reversing this decline is crucial, not only for the tiger, but also for the ecosystems in which it occurs. The tiger acts as a surrogate for other species that share its habitat, but do not have its visibility or symbolic significance. The tiger's disappearance would likely have unforeseen cascading impacts on these species and ecosystems.

The Royal Bengal tiger (*Panthera tigris tigris*) was once widespread across south Asia. Great hunts were organized by the Rana rulers in 19th Century—to honor European royal visitors and Indian princes—where several hundred tigers were killed at a time. Despite this, there was little effect on the general tiger population: there were significant intervals between hunts; these hunts were held over large spans of high quality habitats, which contained an abundance and variety of prey species. Hence, the tiger population was able to recover rapidly, even after such losses. As human populations converted the rich alluvial plains to agricultural lands, however, tigers gradually became confined to the protected forest areas. By 1906, the tiger was exterminated in Pakistan (Roberts 1977), but there was still an estimated 40,000 tigers on the Indian subcontinent at that time (Gee 1963). The clearing of forests accelerated sharply after World War II, however, resulting in extensive loss and fragmentation of forest lands.

Furthermore, since 1990, reports from across the tiger's range indicate that there has been a sudden, drastic, Asia-wide increase in tiger poaching (Jackson 1993); an estimated 25 percent of Russian tigers have been poached since 1992 (Miquelle et al. 1993).

The Royal Bengal tiger (*Panthera tigris tigris*) now occurs only in small, isolated protected areas in India, Nepal, Bhutan, Bangladesh, and Myanmar (Figure 3) Most of these areas are not large enough to sustain long-term, viable tiger populations. To address issues—such as forest fragmentation, habitat degradation, and poaching—conservationists and resource managers must shift their scale of management, from individual parks and sanctuaries, to larger scale units that encompass entire tiger populations (Smith et al. 1998). This requires management to bridge several jurisdictions and ultimately address, not only the needs of tigers, but also the needs of local people.

There are four main threats to the tigers in Nepal. The first threat is the loss and degradation of its habitat. This is due to the conversion of forests to agricultural lands, and the resulting excessive human and livestock pressure. These, in turn, force out the prey species, resulting in low prey availability.

The second threat is the fragmentation of its habitat. This causes habitat islands, which, in turn, creates a fragmented population. The small habitat means limited dispersion of new individuals, which results in high competition for the available habitat. With this limited dispersion comes the risk of inbreeding.

The third threat involves poaching and the illegal trade of tiger parts—including its bones and its skin—for traditional Chinese medicine (TCM).

The fourth threat is a direct result of the first: tiger-human conflicts. Because human intervention has destroyed, degraded, and reduced prime tiger habitat, the prey species have left the areas. The opportunistic tigers turn to livestock, to feed themselves and their young, which results in livestock depredation. The angry villagers retaliate, by poisoning the carcasses of their dead livestock, in the hope of killing the wayward tiger. Sometimes, tigers become so desperate for food that they become man-eaters. This, of course, results in the tiger's death.

The Status of the Tiger (*Panthera tigris*) in the World

Tiger Sub-species	Range Countries	Population
Royal Bengal Tiger	Bangladesh	3,176 - 4,556
Panthera tigris tigris	Bhutan*	62 - 362
	India	67 - 81 (adults)
	Myanmar, Western	2500 - 3750
	Nepal*	124 - 231
Caspian Tiger	Formerly:	93 - 97 (adults)
P. tigris virgata	Afghanistan	Extinct 1970s
	Iran	
	Chinese Turkestan	
	Russian Turkestan	
Amur Tiger	Turkey	
<i>P. tigris altaica</i>		360 - 406

	China	30 - 35
Javan Tiger	Korea (North)	<10
P. tigris sondaica	Russia*	330 - 371 (adults)
South China Tiger		Extinct 1980s
P. tigris amoyensis	Java, Indonesia	20 - 30
Bali Tiger	China	
P. tigris balica		Extinct 1940s
Sumatran Tiger	Bali, Indonesia	400 - 500
P. tigris sumatrae	Sumatra, Indonesia	
Indo-Chinese Tiger	Cambodia	
P. tigris corbetti	China	1,227 - 1,785
	Laos	150 - 300
	Malaysia	30 - 40
	Myanmar, Eastern	present
	Thailand	491 - 510
	Vietnam	106 - 234
Totals		250 - 501
Rounded Totals		200 - 200
		5,183 - 7,277
		5,200 - 7,300

Note: Most estimates are educated guesses, based on the reports from range countries. Estimates for Bhutan, Nepal, and Russia provided more reliable numbers.

* Figures for Bhutan, Nepal, and Russia are for the adult breeding tigers counted. Tiger specialists consider such figures more realistic, because many cubs are unlikely to survive to maturity.

Source: WWF-World Wide Fund for Nature 1999

Background

In Nepal, tiger habitat has been protected since 1846, when the first Rana Prime Minister ordered that the rhinoceros and its habitats, primarily in the Rapti and Reu Valleys of Chitwan, be saved (Caughley 1969, Shrestha 1998). Early in the 19th Century, the government of Nepal discouraged settlement and agriculture in the lowlands, or the Terai, in order to form a buffer of malarial forests, as a defense for invading armies (Gurung 1983, Mishra and Jefferies 1991). Human disturbance was minimal; the few settlements primarily consisted of small patches of jungle, cleared by the Tharu people—the oldest inhabitants of Chitwan, who were believed to have developed immunity against malaria (Philips 1925). With the collapse of the Rana regime in 1951, however, much of the wildlife habitat in Chitwan suffered heavy destruction (Talbot 1959, Gee 1959, Spillet and Tamang 1967).

In the 1950s, the government enacted a malaria eradication campaign and a resettlement program, which dramatically altered Chitwan's human population distribution and density, and profoundly impacted land use patterns (Gurung 1983). Although resettlement programs were intended to provide land for people with no land holdings, many individuals (of varied economic statuses and ethnic backgrounds) moved into the Chitwan Valley, from the middle hill districts of central Nepal. Population in the Chitwan District increased—from 42,800 in 1954 to 194,000 in 1971—and dramatically altered forest cover (Gurung 1983). Between 1961 and 1977, 65 percent of the forests in Chitwan were destroyed, and the land was converted to cultivation (Gurung 1983, Mishra and Jefferies 1991).

Most of the immigrants to the Chitwan Valley settled along the Rapti River, destroying tall grasslands and riverine forests, home to a variety of wildlife. In 1964, the late King Mahendra declared the southern part of the valley, across the Rapti River, as the

"Mahendra National Park (Mahendra Mriga Kunja)"; more than 22,000 people were moved out of the park (Willan 1965, Upreti 1973, Shrestha 1998). In 1973, to protect the remaining forest lands and wildlife from further degradation, the government enacted the National Parks and Wildlife Conservation Act, 2029; and the park was declared to be the Royal Chitwan National Park (RCNP), the first national park formally established in Nepal.

Parallel to the establishment of RCNP, the Tiger Ecology Project was initiated in the early 1970s—as a joint venture of the Government of Nepal, the Smithsonian Institution, and World Wildlife Fund—to conduct research on the tiger. Scientists, from Nepal and the United States, studied various aspects of tiger ecology and behavior. Later studies were broadened to include the tiger's prey species, such as the spotted deer and hog deer. Based on the recommendations of these studies, the park boundaries were extended in 1977, to its current size of 932 km² (Mishra and Jefferies 1991, Shrestha 1998). Furthermore, as an extension to RCNP, the Parsa Wildlife Reserve (PRW) was established, to maintain the continuity of habitats, based on the ecosystem management approach.

Concurrently, a network of parks and wildlife reserves was established throughout the country (Figure 1). The establishment of parks and reserves undoubtedly protected important wildlife habitat. It also initiated conflict, however, between park authorities and local people, because they were denied easy access to protected areas, where they attained basic needs such as fodder, firewood, and thatch grass. In response to the public outcry, the government decided to open parks and reserves in the Terai, for two weeks in February, to let villagers collect thatch grass. (Thatch grass and grass reeds are used as local roofing and building materials.) In the Himalayan parks, local people are allowed to graze their livestock and collect fodder and firewood, under the supervision of the park wardens.

Nepal is one of the pioneers, in terms of combining conservation goals with the needs of the local people. Community participation, in forestry resources management, is widely practiced in Nepal. Such indigenous systems now form the basis for users' group management of the forests and watersheds; these systems also support wildlife conservation. The King Mahendra Trust for Nature Conservation (KMTNC) launched the Annapurna Conservation Area Project (ACAP) in line with this policy.

This policy was a revolutionary step in the concept of protected areas, because it allowed local people to practice their traditions within the conservation area. The mission of ACAP was to involve local people as stakeholders, in developing and managing conservation programs at the grassroots level. Success in ACAP shifted the model of conservation—from strict governmental protection, to the community management of areas for multiple use—by mobilizing local people as partners. Makalu Barun National Park and Conservation Area, in the eastern part of the country, followed the same pattern.

TYPICAL CHARACTERISTICS

- Tigers are one of the largest living cats; great range in size between sub-species and sexes.
- Male can be 3 meters long and weigh around 200 kg.
- Tigers are normally solitary, except for females with cubs.
- Tigers are territorial and occupy relatively large habitats: size usually depends on the prey density.

Lifespan of tigers in the wild is not well known, but some have lived up to 17 years.

Breeding Habits

- Mating takes place all year round.
- Gestation is around 103 days and an average litter is two or three cubs.
- Cubs reach independence between 18 and 28 months.
- Females begin breeding at age 3 and continue until age 9 or 10.
- They usually reproduce every two years.

Males start to breed when they are four or five years old.

Prey

- Tigers feed predominately on large deer species and wild boar.
- Occasionally, they will kill larger species such as wild cattle, elephant and rhino calves.

- They are also opportunistic and will kill monkeys, birds, reptiles and fish as well as more unusual prey such as crocodiles and leopards.

Males have been known to kill cubs fathered by other tigers.

Current Opportunities for Tiger Conservation

The advent of community forestry, in the mid-seventies, paved the way for the local peoples' participation in the forestry sector. In the late 1990s, the issuance of forestry sector policy, with an emphasis on community forestry, brought a change in land ethics across the lowlands of Nepal. Community user groups formed the basis for the local people's participation in forestry, wildlife, and watershed management.

Agroforestry increased on privately owned lands; and local user groups began to establish more community forests on degraded public lands.

KMTNC's Nepal Conservation Research and Training Center (NCRTC)—near RCNP—expanded a community forestry project, from a 1 hectare tree nursery to a 2400 hectare community forestry project, in only eight years. This effort involved participation of more than 15 user groups, and led to the restoration of 15 km² of natural forest. Tigers and rhinos now occur in the restored habitat; and local villagers have begun to market elephant rides and overnight stays to visitors in these areas.

As this new land ethic was emerging, DNPWC gradually shifted its management efforts to address parks-and-people issues. The experience of department staff clearly showed that the concept of parks—as isolated, heavily guarded units—simply did not work; efforts to enforce such a model only increased the resentment towards conservation. To bridge the gap, between protected areas and the people living around them, DNPWC, with funding from UNDP, implemented the Park and People Project, in the early 1990s.

In 1993, an amendment, embracing buffer zone management, was added to the National Parks and Wildlife Conservation Act 2029. This amendment allocates 30-50 percent of the park revenues. Returned to the buffer zone communities—to be used for their development activities. Implementation of this amendment is facilitated by the Buffer Zone Management Regulations, 2053.

Community activities in the Terai reserves, such as the Park-People Project, are laying the foundation for establishing partnerships with the local people. DNPWC has formed user groups and buffer zone councils in RCNP and Royal Bardia National Park (RBNP). These institutions are already in operation. User groups and councils are being formed in other protected areas. The management authorities are creating a precise plan, which describes the biodiversity and human dimensional goals for these areas.

The goals of this Tiger Conservation Action Plan are (a) to identify those areas that are most important for maintaining the largest, least fragmented, land base for tigers; and (b) to develop conservation strategies that include and benefit local communities.

Current Status and Distribution

Historically, tigers were distributed continuously across the lowland Himalayan forests. Surveys, between 1987-97, documented that only three isolated tiger populations remain in Nepal (Smith et al. 1998) (Figure 1). The Chitwan population occupies the largest area (2543 km²); 75 percent of the population lives within the protected areas, while the remaining 25 percent lives in land outside the reserves. The Bardia population, 180 km west of Chitwan, occupies a land base of 1840 km²; RBNP encompasses 51 percent of this land base. Between 1987 and 1997, tigers west of the Karnali River became increasingly isolated from the core of the Bardia population. Without habitat restoration, this area is currently too small, and does not have the prey density to support a separate, viable tiger population. The third population resides in Shuklaphanta in western Nepal. The land base is only 320 km², but the prey density is high. The Shuklaphanta population was formerly connected to tiger habitat in India, but is now becoming isolated. The tiger census of 1995 - 1996, in the protected areas of Chitwan, Bardia and Shukla-phanta, estimated tiger populations to be 48-49, 30-32, and 15-16 breeding animals, respectively.

Of the three populations, only the one in Chitwan has been studied in detail. In Bardia, a project has been initiated to study the food base for tigers. The population in Shuklaphanta needs immediate attention, because the tiger habitat there is shrinking, due to development activities and increased human pressure. There is a proposal to extend the Royal Shuklaphanta Wildlife Reserve. This will add prime habitat to the existing reserve area, for both ungulates and tigers.

Nepal's Tiger Conservation Action Plan Outline

There are several factors that hinder a landscape approach to tiger conservation. First, a lack of detailed information—as to the location of tigers and other animals—makes it difficult to identify the areas where conservation action is needed. Second, conservation efforts have focused on establishing and managing protected area systems. Unfortunately, in Nepal and across most of the tiger’s range, national parks, by themselves, are not large enough to support viable tiger populations. Additionally, forested and wild areas, outside the parks, are often not administered and managed for wildlife conservation.

Therefore, it is important to shift management from protected areas to ecosystem or landscape management (Grumbine 1994), so that entire tiger populations are treated as a single management unit (Dinerstein, et al. 1996). This large-scale perspective will identify the areas where habitat restoration will achieve the greatest positive effect.

Survey and Monitor the Status of Tigers and their Habitats

Rationale

Field assessment of tigers is necessary to understand the effects of habitat degradation and fragmentation, prey depletion, and poaching on tiger population demographics.

- Home range size, movements, and social organization may change with prey availability and space.
- Satellite data on forest quality might not accurately indicate the quality of tiger habitat, if there is poaching of either prey or predator.
- Regular monitoring of tiger populations will indicate any changes in the size of tiger populations. This will lead to the actions necessary to alleviate the situation.

Output 1: A GIS* map and database—showing tiger presence and absence, relative abundance of prey species, and quality of habitat, throughout the tiger’s range in Nepal—which can be continuously updated and modified to monitor tiger status.

Activities for Output 1

- 1.1 Define potential tiger habitat, based on previous studies and knowledge of local inhabitants.

Develop a GIS map, by digitizing potential habitats; use available satellite maps and /or aerial photos.

1.3 Choose representative samples from the potential habitats, to survey for presence and absence of tigers.

1.4 Look for tiger signs, such as pugmarks, scrapes, kills, etc.; interview local people, especially those who use forests regularly, to confirm tiger presence.

1.5 Establish whether an area is breeding or dispersal habitat, once tiger presence is confirmed.

1.6 Collect geographic coordinates for every tiger sign; map tiger distribution.

1.7 Estimate relative abundance of each prey species.

1.8 Use remote sensing and GIS data to detect changes in habitat quality and availability.

Identify Priority Tiger Habitats

Rationale

Human pressure has accelerated forest degradation in the lowlands of Nepal; contiguity of habitats is necessary for tiger dispersal, and for maintaining a healthy gene flow among tiger populations. The present trend of forest degradation and fragmentation is creating major barriers against the dispersal and gene flow among tiger populations.

- Restoration of the entire lowland forest is beyond the scope of this plan.
- Thus, potential tiger habitats that are under immediate threat must be identified and prioritized for restoration.

Output 2: A map that identifies priority areas for habitat restoration, based on a GIS analysis of tiger habitats in the lowlands of Nepal.

Activities for Output 2

2.1 Develop GIS coverage, from tiger and prey species surveys.

2.2 Digitize landuse and develop forest quality coverage from available satellite maps and /or aerial photos.

2.3 Conduct extensive ground verification to validate data obtained.

2.4 Conduct socio-economic surveys in villages, in or near tiger habitat; generate data layers.

2.5 Gather information on current and future forestry plans and issues: interview field personnel and district forest officers in the lowlands; interview officers of the Department of Forests, Regional Directorate, and Ministry of Forest and Soil Conservation.

2.6 Conduct a GIS analysis, utilizing the above information, to identify priority areas for tiger habitat restoration.

Restoration and Improvement of Priority Tiger Habitats

Rationale

A landscape approach to conservation is essential for the long-term sustenance of viable tiger populations. Conservation initiatives must go beyond the boundaries of parks and reserves, in order to encompass the entire tiger population. Restoration of priority tiger habitats, including those lying outside protected areas, are critical for increasing the land base for tigers. Connectivity and corridors, between protected areas, are critical for the safe movement of dispersing tigers. Equally important are management interventions for habitat improvement in protected areas.

- Restoration of areas outside the boundary of RCNP, in collaboration with local communities, has been very successful. Such restored areas have become new habitats for wild animals, including tigers. These new habitats are also beneficial to local communities, in meeting their resource needs, and in raising funds for community development.
- Similar types of restoration programs, in cooperation with local communities, can be duplicated in other areas.

- Habitat management and interventions, in protected areas—to increase the prey base—will maintain a healthy tiger population and improve tiger-human relationships.

Output 3: Increased land base for tiger conservation and improvement in tiger-human relationships.

Activities for Output 3

3.1 Meet with local communities, and form community user groups (CUGs) to participate in restoration programs.

3.2 Arrange study tours, of communities and CUGs, to successfully restored areas, such as RCNP, and other community forests, elsewhere.

3.3 Plant open areas or implement the enrichment plantation of degraded forest areas.

3.4 Prepare operational plans for such restored areas; these will be managed in partnership with local communities.

3.5 Manage the habitat of grassland and waterholes, to maintain a healthy population of ungulates.

3.6 Establish control measures, for livestock grazing and fire, to improve tiger habitats.

Continue Long Term Study of

Tiger Biology

Rationale

Long-term studies are necessary—to provide accurate descriptions of tiger behavior, population structure, and other crucial information—for developing long-term conservation strategies.

- Our current knowledge is limited to the Chitwan population.
- New techniques are evolving and producing better tools to explore basic ecological questions.

- Tiger conservation goals should be developed within a framework of ecosystem management.
- Information is needed on the survival rate of dispersing tigers, and the extent of inbreeding within populations.

Output 4: Enhanced knowledge of tiger populations in Nepal, which will strengthen our ability to educate the general public, and influence decision makers to move towards landscape-level management.

Activities for Output 4

4.1 Continue tiger projects initiated in RBNP; expand them to cover the entire Banke-Bardia Tiger Conservation Unit (TCU).

4.2 Develop a project in Chitwan—to enhance understanding of dispersal corridors and the survival of dispersing tigers, outside protected areas—using modern tools such as satellite and GPS* * collars.

4.3 Conduct a study, of the genetic relatedness of tigers in the Chitwan population, to verify the behaviorally observed inbreeding. Collect specimens from animals darted for other reasons—such as during the handling of problem animals, or in dealing with naturally dead animals.

4.4 Conduct studies on the population dynamics of the tiger prey species.

4.5 Develop studies to monitor the habitat quality for prey species—such as maintaining short grasslands, or controlling various stages of vegetational succession—to maintain suitable prey habitats.

4.6 Develop small research projects—in Royal Shuklaphanta Wildlife Reserve, Parsa Wildlife Reserve, and Koshi Tappu Wildlife Reserve—to increase the knowledge of tiger populations in Nepal.

Educate the Public about the

Importance of Tiger Conservation

Rationale

Tiger conservation will likely fail, unless local people, at the grassroots level, become the custodians of their environment; and truly understand the importance of maintaining biodiversity.

- Tiger conservation efforts—that local people understand and participate in—will have a much higher chance of gaining support and achieving success.

Output 5: Increased support from local people, for tiger conservation and the restoration of necessary habitats.

Activities for Output 5

5.1 Develop audiovisual programs, for local people, that focus on tiger biology; they should be entertaining, as well as educational.

5.2 Develop information centers, where problems faced by tigers are publicized; information should be in the form of photos or display cards in local languages.

5.3 Develop a curriculum for school children, which portrays tigers as part of the ecosystem, rather than as an object for human exploitation.

5.4 Conduct seminars and interactive programs, to emphasize the co-dependency of humans and the Terai ecosystems; i.e., the health of such ecosystems are important, not only for biodiversity, but also for sustaining the ecosystem processes, upon which local people and development depend.

5.5 Publicize the fact that a strong economic link, between tourism and biodiversity, benefits both local people and conservation efforts.

Improve Tiger-Human Relationships
through Community Development Activities

Rationale

Strong community support is fundamental to successful tiger conservation activities in local communities. Yet, if people in a community are unable to meet even their most basic needs, or are prevented from doing so, how can the needs of tigers and biodiversity conservation be addressed? Thus, the needs of local people must first be met, and community activities must enhance their lives.

- Community development activities, which enhance local people's lives, will gain support for tiger conservation.
- Community development activities will decrease resentment towards tigers and wildlife conservation, and reduce human-wildlife conflicts.

Output 6: Increased villager cooperation, and an enhanced quality of life, in the villages around tiger habitats. These will increase the chances for successful tiger conservation.

Activities for Output 6

6.1 Develop community plantations, by mobilizing local resources and labor, so that local people need not collect their fodder and firewood from tiger habitats.

6.2 Establish community funds for the families of tiger victims.

6.3 Collaborate with other institutions, working at the grassroots level, to develop and implement additional income-generation programs, to uplift local economies.

6.4 Provide initial subsidies, to encourage local participation in establishing safe drinking water systems, human and veterinary health clinics, and schools.

6.5 Encourage people, at the community level, to develop and manage sewage and irrigation canals.

Strengthen Anti-poaching Efforts

Rationale

Poaching poses a significant threat to tigers and their prey. No amount of habitat restoration will result in successful tiger conservation, if high poaching levels continue. Efforts to prevent poaching must be made on a landscape scale, to protect tigers, both inside and outside reserves.

- Army patrolling is limited to protected areas and is very expensive.
- Villagers can easily identify suspicious activities like poaching; past experience shows that local undercover informants are very effective in helping to identify and apprehend poachers.

Output 7: A reduction in wildlife poaching, and an improved likelihood for maintaining viable tiger populations.

Activities for Output 7

7.1 Increase personnel and facilities for patrolling. For example, provide vehicles—fixed with mobile, wireless, communication systems—for each protected area in the Terai.

7.2 Coordinate anti-poaching efforts among jurisdictions.

7.3 Expand the reward system for informants.

7.4 Educate key individuals and/or civil servants—such as customs officials, postal workers, police, etc.—regarding threats to tigers, illegal trade, and the identification of tiger parts.

7.5 Modify current laws, to impose stronger penalties on poachers.

Strengthen Institutional Development

Rationale

Success of any conservation program depends upon the skills of the personnel involved in its implementation.

- Game scouts, forest guards, rangers, wardens, and forest officers are trained in different areas.

- Hence, they may lack some, or all, of the skills necessary to monitor tigers, their prey, or their habitat requirements.

Output 8: Trained personnel in DNPWC, and in the Department of Forests, that can implement tiger and biodiversity conservation programs.

Activities for Output 8

8.1 Conduct nature conservation workshops and seminars, to provide basic knowledge; increase awareness—for game scouts, forest guards, rangers, and officers—of their role in tiger and biodiversity conservation.

8.2 Use existing resources and training programs in NCRTC, to improve the skills of game scouts, forest guards, rangers, and officers; so they can distinguish tiger signs, ungulate pellets, deer browse, etc.

8.3 Train rangers and officers to read compasses, maps, and aerial photos; and to use GPS equipment.

8.4 Set up a GIS lab in DNPWC. Train and hire personnel to use it; appoint a regular staff to manage the lab.

8.5 Involve rangers and officers in further study and long-term, management-oriented research.

Coordinate Trans-boundary Tiger Conservation Actions

Rationale

Tiger habitats are connected between India and Nepal, either through protected areas or national forest lands; thus, tiger management units may extend across international borders.

- In order to maintain viable tiger populations, cooperation between neighboring countries is necessary.

Output 9: Increased cooperation between India and Nepal, to maintain tiger habitat and to reduce poaching.

Activities for Output 9

9.1 Enhance communication among conservation authorities, in the adjacent tiger reserves in India and Nepal; conduct joint/complementary patrols.

9.2 Formalize and strengthen trans-boundary communications with India (initiated by DNPWC), for managing tiger habitats that are contiguous between the two countries.

9.3 Develop strategies for monitoring illegal wildlife trade activities, along the borders of the two countries.

9.4 Share information about poachers and tigers, residing in the trans-boundary areas.

Develop a Proposal to Implement

The Tiger Action Plan

Rationale

Nepal, one of the least developed countries in the world, faces a difficult challenge, in attempting to meet the basic needs of its people, and in conserving its rich biodiversity.

- The Nepalese government does not have the funds to implement conservation activities on a large scale.
- The present governmental structure does not allow DNPWC, or other governmental agencies, to accept foreign funds, without first passing through bureaucratic hurdles.
- Nepal is eligible to receive funds from the Global Environment Facility (GEF), a funding agency that regards the conservation of biodiversity as one of its four main focal points.

Output 10: A proposal to implement Nepal's Tiger Conservation Action Plan.

Activities for Output 10

10.1 A proposal has been submitted to the National Fish and Wildlife Foundation, to fund Objectives 1 & 2 of the Tiger Conservation Action Plan.

10.2 This plan, outside protected areas, will be incorporated and implemented through district forestry management plans. Biodiversity areas, wetlands, habitats of endangered species—including Siwaliks and river banks—are to be categorized as sensitive areas; therefore, they will be excluded from production forestry.

10.3 Based on the information obtained through Objectives 1 & 2, develop a GEF proposal to fund Objectives 3 – 9. The GEF proposal will include: (a) information on critical management issues throughout the tiger's range in Nepal; and (b) successful community forestry projects, as models for restoring key habitats—such as those with corridors, important edges, etc. It will also coordinate tiger conservation with other biodiversity objectives—such as those of Nepal's Biodiversity Action Plan, and other buffer zone restoration programs—throughout the Terai ecosystems.

Develop Stronger HMG Collaboration with National and International Agencies, Development Organizations, and Research Institutions

Rationale

Tiger conservation is ultimately a global issue, one that requires support from both local and international agencies and research institutions.

- NGOs can contribute to conservation through fund raising, and are more flexible than HMG.
- Partnerships, with international donors and research institutions, could result in large contributions to tiger conservation in Nepal, and worldwide.

Output 11: Commitment—among governmental, non-governmental, and international organizations—for conservation of the tiger and biodiversity in Nepal.

Activities for Output 11

11.1 Formalize the tiger surveys currently done by DNPWC, in collaboration with NCRTC and the International Trust for Nature Conservation (ITNC).

11.2 Strengthen the Memorandum of Understandings—established by the Ministry of Forest and Soil Conservation—with Oregon and Auburn Universities; explore the possibilities of developing a similar program with the University of Minnesota.

11.3 Enhance long-term collaboration of the Nepalese government and NGOs, such as the partnership that exists among KMTNC, WWF-US, the Smithsonian Institution, and NORAD.***

11.4 Develop programs to attract researchers, to monitor and inventory Nepal's biodiversity.

Appendix:

Natural History

of the Tiger

Distribution

Tigers have existed on the Asian sub-continent since prehistoric times. Various records and descriptions about tigers are found in century-old literature and monuments. The tiger is revered in many cultures and religions of the world. It is the carrier of the Goddess Durga in the Hindu religion. Beautiful murals depicting tigers are found in many, century-old Hindu temples and Buddhist monasteries.

Of the eight tiger subspecies found in the world, the Royal Bengal Tiger (*Panthera tigris tigris*) is found on the Indian sub-continent—i.e., the countries of Bangladesh, Bhutan, India, Western Myanmar, and Nepal (Table 1). This subspecies accounts for

approximately 60 percent of all the subspecies remaining in the world today; it, therefore, has the best chance of long-term survival.

Until the 1950s, tigers were found all along the forests of lowland Nepal, south of the Himalayan Range. Tiger distribution, in Nepal, is not documented for elevations higher than the Churia Hills (Siwalik)—i.e., approximately 1500 m.; although its presence is recorded above 4000 m. in Bhutan (McDougal and Tshering 1998).

Absence of the tiger, in Nepal, from higher elevations, may be attributed to: (1) the loss and fragmentation of its habitat, (2) high human density and its resulting pressure on the forest, and (3) depletion of the natural prey base.

Currently, the tiger distribution is more or less restricted to the protected areas, and the adjoining forests. There are still some forest areas, outside parks and reserves, however, where tigers still occur. Conservation of these forests is important for maintaining the available land base for tigers, and for maintaining the corridors between habitats for their dispersal.

When tiger census surveys are conducted, local people are interviewed to verify field results. Confusion sometimes occurs because, in many places in Nepal, both tigers and leopards are called by the same word, *bagh*. These animals can be differentiated easily, however, based on their body size and coat pattern. The tiger has black stripes on its body and face, against a pale, yellowish coat. Stripe patterns are distinctive in every tiger. The leopard is smaller than the tiger, and has spots on its coat, which is also a pale, yellowish color.

Size

The tiger, the largest of the cats, is the ultimate land predator. It is capable of killing animals several times its own size. The average size of a male Bengal tiger is slightly less than three meters; that of a female is about 2.5 m. The average weight of a male tiger is 180-230 kg., rarely exceeding 250 kg.; whereas, the female weighs about 135-185 kg. (Prater 1971).

Habitat

The tiger is a territorial animal. It occupies a relatively large habitat, depending on the availability of the prey species. Its ideal habitat includes forests, with tall alluvial grasslands that have water. Prime habitat provides sufficient cover for concealment, for stalking its prey, and for hiding its kills.

The tiger is the top predator in the food pyramid of an ecosystem. As such, it is also an indicator of the health of that ecosystem. The tiger is an opportunistic hunter,

preying upon animals of all sizes, ranging from the adult Gaur bison (*Bos gaurus*), to the Langur (*Presbytis entellus*), to birds. To be more economical, however, it normally preys upon large ungulates, weighing on average between 50 - 100 kg. (McDougal and Tshering 1998, WWF 1998). The tiger will occasionally kill elephant and rhino calves. (Males have been known to kill cubs sired by other male tigers, to ensure their territorial superiority and genetic inheritance.) A tiger makes 40 to 50 kills a year, representing approximately 3,000 kg. of prey (McDougal and Tshering 1998). In Nepal, specifically, the tiger preys upon a wide variety of prey species, including the Sambar deer (*Cervus unicolor*), swamp deer (*C. duvaucelli*), spotted deer (*Axis axis*), hog deer (*Axis porcinus*), barking deer (*Muntiacus muntjac*), and wild pig (*Sus scrofa*). The Sambar deer is the most preferred prey species (Seidensticker and McDougal 1993).

Domestic livestock are also preyed upon, if they are found in the tiger habitat. In sub-optimal habitat, where natural prey is limited, tigers can survive, occasionally, by preying upon domestic livestock, as a supplement to their diet of natural prey. Tigers eventually disappear from areas where natural prey is depleted, even though livestock is available as an alternative prey.

Tigers rarely approach human settlements. A normal tiger always avoids contact with human beings. They do not constitute a part of the tiger's natural prey. Hunger, though, is the most likely factor that overrides the tiger's aversion to man (McDougal 1987). There are certain circumstances when a tiger will kill human beings. The incidence of man-eating cases has been associated with: an incapacitated tiger; the escalation of competition among males; a disturbance in the natural predator-prey balance, due to increased human interference; tigers pushed to a marginal habitat; and dispersing individuals. There are many man-eating cases that are without any clear explanations.

Social Dynamics

The tiger is a solitary animal. The most frequent social interaction is between a female and her young. An adult male and female are associated briefly, for 2-3 days, for mating. This association fades, once the cubs are born. Adults of the same sex rarely associate.

Female tigers compete for resources, whereas males compete for females. Females establish and maintain resource-based territories, large enough to maintain themselves and to raise their offspring. Both tiger density and the home-range size

are directly related to the habitat quality (availability of prey and cover). In prime habitat, which contains an abundance and variety of ungulates—such as the alluvial grasslands of RCNP, RBNP, and RSWR—the home range of a female tiger may be only 20 km², or even less (Smith 1993). In the Russian Far East, however, a female requires 450 km² (McDougal and Tshering 1998).

The territorial size for female tigers is also influenced by the territorial-turnover rate. When an old female dies, its vacant territory is often occupied by a young female. Otherwise, females holding the territory in the adjoining area, may expand their territory to include the vacant area. The female maintains a mutually exclusive, non-overlapping territory; whereas, a male tiger's home range may encompass the home ranges of two to seven adult females.

Tigers may defend their territories from intruders by fighting and chasing them away. In general, they defend their territories by spraying urine (scent) on trees and bushes; and by marking their travelling route (by making scrapes on the ground), while patrolling. Tigers mark more heavily at their territorial boundaries, rather than in the interior of their territories. Spraying and scraping are used interchangeably, depending on the habitat types. Scrapes are common in the grasslands, where there are very few trees for urine spray; whereas, in a forested area, urine spray on a tree stump is more common (Smith et al. 1989).

Population Dynamics

Tigers have a polygamous mating system. Mating takes place all year round; many tigers prefer, however, to mate after the rains. The gestation period is short, only 102-105 days (i.e., 15-16 weeks). The litter size is normally three. Cubs are generally born between the months of February and May. A female with small cubs keeps a low profile; the cubs spend most of their time in and around the lair. When the cubs are about 6 months old, they start accompanying their mother on her hunting trips. Cub mortality, during that first year, reaches almost 34 percent; whereas, during the second year, the mortality lowers to 17 percent (Smith and McDougal 1991).

Consequently, when females with cubs are recorded in the wild, generally, there are just two cubs accompanying their mother.

Male tigers attain maturity at the age of four years, while females start breeding at three years of age. In prime habitat, a tigress may give birth to cubs every two years, until she is ten years old. The average reproductive life of a female is just about six

years; whereas, that of male is less than three years. The life span of a tiger in the wild is estimated to be less than 20 years (WWF 1998).

Dispersal

Cubs become independent of their mother, between 19 and 28 months (Smith 1993). At this age, these cubs, or sub-adults, leave their natal area and attempt to seek areas for establishing their own territories. This is the most critical and dangerous period for their survival. The mortality rate for dispersing sub-adult males is 40 percent in RCNP.

Generally, male sub-adults travel long distances from their natal areas. Females, on the other hand, settle adjacent to their mother; the latter often shifting her territory slightly, to accommodate her daughters. Even if territory is not available near their mother, female tigers disperse shorter distances than males, and rarely settle in marginal habitat.

The shrinkage of habitat limits the dispersal opportunities for tigers. Many of the parks and reserves in the Terai have already reached saturation, with a high density of residents. This situation causes intense competition for areas that contain the best breeding habitat. Consequently, frequent fights erupt between individuals of the same sex, particularly males. Hence, the turn-over rate becomes very rapid, shortening the breeding lives in a population (McDougal and Tshering 1998).

While seeking a place to settle, dispersing male sub-adults must pass through areas already occupied by territorial males, and are often pushed to marginal habitat on the periphery of the parks. Due to this high competition among males, and the unavailability of suitable habitat, these dispersing male sub-adults are likely to kill livestock, as part of their diet. This increases livestock depredation, which in turn, puts the tiger in direct conflict with the local people. The resulting villager retaliation may eventually lead to the poisoning of the livestock carcass, causing the death of the tiger.

Legal Status

Considering its endangered status, the tiger is listed in Appendix I of CITES (Convention on International Trade of Endangered Flora and Fauna), which bans international trade of the tiger or its parts. The tiger is also protected by Nepal's National Parks and Wildlife Conservation Act 2029, and is listed in its Appendix I. According to the Act, the penalty for a person—involved in the poaching of a tiger, or in the trading of its parts—is a fine of Rs. 50,000 - 100,000, or imprisonment of 5 - 15

years, or both. Despite such stringent penalties, some poaching and trade in tiger parts is still taking place, because of the high demand for tiger parts in the international market.

The bones of an adult male tiger may weigh up to 15 kg., and those of a female about 10 kg. In an international market in the Far East, tiger bones may fetch a thousand dollars a kilogram (McDougal and Tshering 1998). All parts of the tiger—such as its bone and skin; and some of its organs, such as its penis, canine teeth, and claws—have a market, due to certain traditional beliefs that have no scientific evidence. It is difficult to track down a tiger-poaching case in the field, because nearly all of the parts are taken by the poachers; whatever remains can be disposed of easily.

The establishment of anti-poaching units (APUs) in parks and reserves, with the cooperation of local people and various organizations, have curtailed the rate of poaching and trade in tiger parts. The provision of a reward to informants—whose information leads to the apprehension of culprits involved in such illegal activities—has been effective. The APUs in Nepal are supported by the International Trust for Nature Conservation (ITNC) and the WWF Nepal Program.

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