CHAPTER

40

Roads to Recovery or Catastrophic Loss: How Will the Next Decade End for Wild Tigers?

Eric Wikramanayake[1], *Eric Dinerstein*[1], *Jessica Forrest*[1], *Colby Loucks*[1], *John Seidensticker*[2], *Sybille Klenzendorf*[1], *Eric W. Sanderson*[3], *Ross Simons*[4], *Andrea Heydlauff*[3], *Joshua Ginsberg*[3], *Timothy O'Brien*[3], *Peter Leimgruber*[5], *Melissa Songer*[5], *and Gosia Bryja*[3]

[1]World Wildlife Fund, US, Washington, DC, USA
[2]Smithsonian's National Zoological Park, Washington, DC, USA
[3]Wildlife Conservation Society, Bronx, New York, USA
[4]Simons and Associates, Alexandria, Virginia, USA
[5]Smithsonian's National Zoological Park, Front Royal, Virginia, USA

OUTLINE

Introduction 494
Evolution of a Landscape-Based Approach to Tiger Conservation 494
The Base Map: Tiger Conservation Units (TCU) 494
Revisiting the Base Map: Tiger Conservation Landscapes 495
Emerging and Intensifying Threats to Wild Tigers 497

Three Scenarios: Alternative Futures for Wild Tigers 497
Scenario 1. Business as Usual 498
Scenario 2. From Holding Action to Moderate Improvement: Enhanced Connectivity and Habitat Restoration 501
Scenario 3. The Road to Lasting Recovery 503
References 505

INTRODUCTION

Our efforts to save wild tigers stand at a crossroads. Over the past 150 years, the tiger's vast range has shrunk by 93% [1, 2], confined today to fragments of their former range [3]. By the mid-1980s, biologists realized that virtually all reserves were too small or degraded to hold viable populations of tigers and their prey. By the mid-1990s, numbers of tigers in captivity exceeded the estimated wild population. These gloomy statistics prompted a re-evaluation of efforts to conserve tigers and prioritization schemes to allocate the limited funding available for *in-situ* conservation.

In this chapter, we summarize the trends revealed by two range-wide analyses on the conservation potential of tigers, performed a decade apart [1, 2]. The analyses focus on managing large landscapes that harbor populations of tigers across all the ecotypes they inhabit. We then use the second range-wide assessment to present three possible future scenarios for tigers [2]. The first scenario extends the *status quo* of current rates of decline in tiger habitat and connectivity. The second projects the consequences of modest habitat restoration on landscapes and populations. The third invokes the importance of governments, NGOs, and others to make strong, lasting commitments to save tiger lands and tigers. The latter also predicts the disastrous effects of a legalized trade in farmed tigers on wild populations that will exacerbate other more regional effects such as the spread of logging into remaining habitats and the growth of the palm oil industry in the region.

EVOLUTION OF A LANDSCAPE-BASED APPROACH TO TIGER CONSERVATION

In 1995, Save The Tiger Fund (STF) supported a collaborative effort by World Wildlife Fund (WWF) and the Wildlife Conservation Society (WCS) to undertake a regional assessment of the tiger's status and to develop a road map for future conservation efforts [4–6]. This assessment challenged traditional approaches to tiger conservation by emphasizing landscape-scale conservation and conservation of the suites of adaptations by tigers to a range of ecotypes, a concept we have dubbed 'tigerness.'

The Base Map: Tiger Conservation Units (TCU)

Protected areas serve as the cornerstones of biodiversity conservation. They constitute core breeding areas for tigers and must receive high levels of protection. However, most

tiger reserves are too small to meet the needs of this area-sensitive species. We recognize that conservation has to move beyond small, protected areas to the larger landscape. For populations to expand, dispersal corridors between protected areas need to be considered as essential landscape components and emerge as a conservation target. Tiger metapopulations—populations linked by dispersal—can only occur in connected landscapes and are, in theory, more viable than isolated populations confined to individual reserves.

These principles underpinned the creation of the first map of tiger landscapes, termed Tiger Conservation Units (TCUs) [4–6] (see Fig. 40.1). The TCUs represented tiger conservation landscapes, including clusters of protected areas where tigers reside or could reside and, in many cases, were linked by dispersal corridors.

Second, we emphasized conserving 'tigerness' as an important new goal because tigers have adapted to occupy a wide variety of habitat types while exploiting a diverse array of large prey. We considered conservation of these adaptive traits, or ecotypes, as a more logical conservation target than putative subspecies. This point is best illustrated using tiger populations in TCUs from India. All wild tigers found in India belong to the subspecies *P. tigris tigris*, yet these tigers have adapted to live and hunt in diverse ecosystems ranging from the tidal Sundarbans mangroves, tropical moist forests of the south, the semi-deciduous forests of the central zone, and the elephant-grass flood plain of the Terai along the Himalayan foothills. Each ecotype must be represented in a comprehensive strategy.

Using the best data available on land cover and state of knowledge of tigers, their prey, and poaching levels, the TCU assessment ranked tiger populations starting with the most intact and productive landscapes in the different biomes, or major habitat types, in each of the three bioregions. To this end, the assessment identified 159 TCUs; 25 were considered to be of global priority and 21 of regional priority (see Fig. 40.1). Several others were assigned national importance status, while potential landscapes for which there was no information of tiger presence, their population status, or threats were flagged for immediate surveys to verify status.

REVISITING THE BASE MAP: TIGER CONSERVATION LANDSCAPES

Tigers occupy the most dynamic region of the planet, experiencing some of the most rapid human population growth, economic development, and land use change. Thus, a decade later, we asked: (1) how had tiger populations and TCUs fared? (2) did areas flagged for surveys hold tigers and their prey? and (3) which landscapes, upon survey, are empty forests [7]? These questions prompted a 2003 update of the TCU assessment[a] (see Sanderson et al., Chapter 9). It identified 76 Tiger Conservation Landscapes (TCLs) grouped into four Classes, of which the 16 Class I and 15 Class II TCLs represent the best landscapes for long-term tiger conservation (see Sanderson et al., Chapter 9).

The results were startling [1, 2]. Occupancy of the remaining tiger habitat had decreased by over 40% [8]. Some of the differences were attributable to discrepancies in the remotely sensed

[a] Save The Tiger Fund, WWF, and WCS were joined by the Smithsonian Institution's National Zoological Park, United States Fish and Wildlife Service, the United Nations Foundation, and the Zoological Society of London to reassess the status of tigerlands.

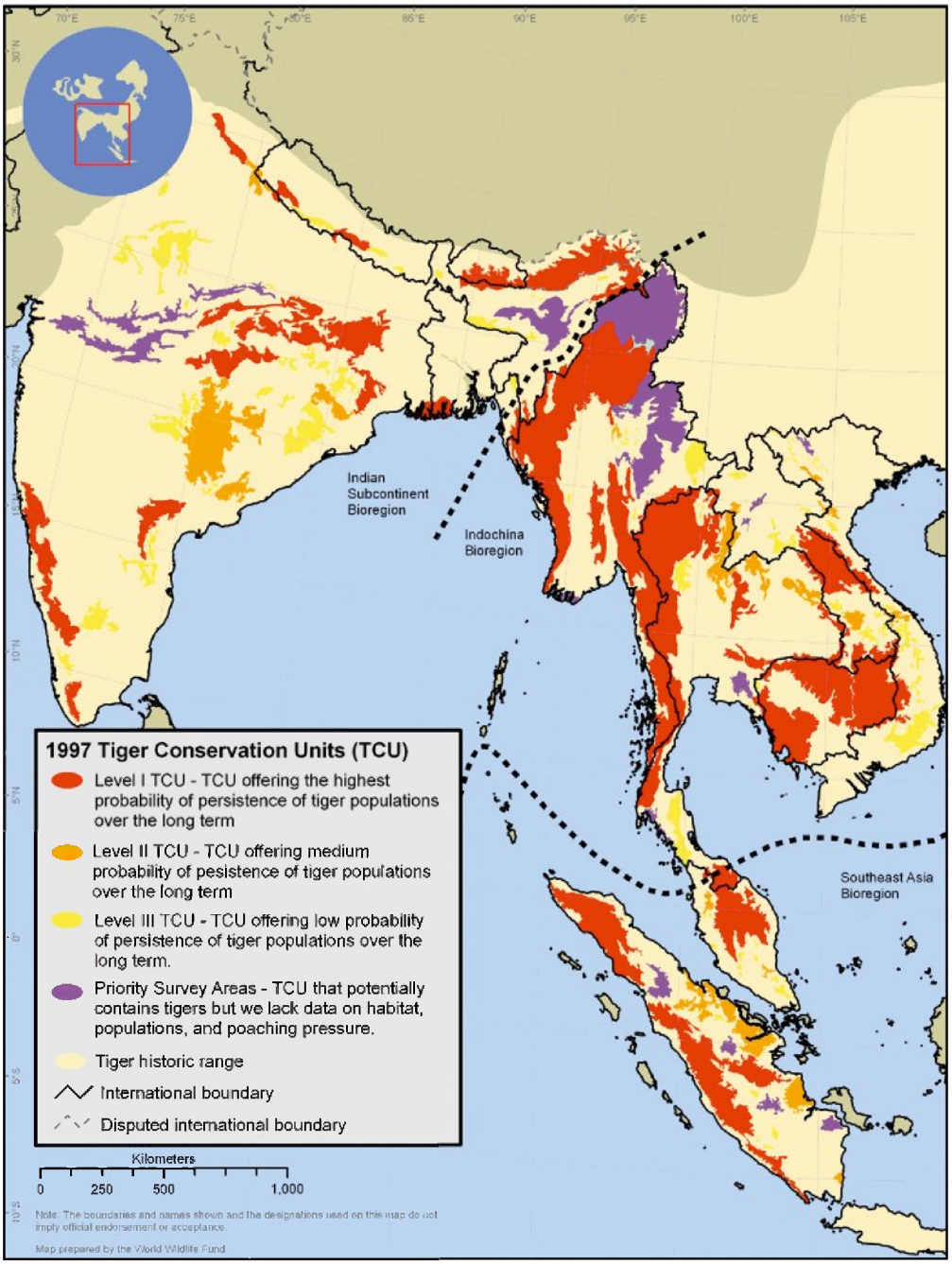

FIGURE 40.1 Tiger Conservation Units (TCUs) (adapted from Dinerstein et al. [4]).

data and better analytical methods available between the two analyses. But a change of this magnitude represented a significant loss. Upon closer inspection, we found that habitat loss and poaching had increased tremendously in some places. In Indonesia, for example, forest cover in the Bukit Barisan Selatan National Park declined from 80 to 52% between 1985 and 1999, despite its status as a protected area in Sumatra [9]. In Myanmar, forest loss declined in different areas between 5 and 33% during the period 1990–2000 [10].

Where quality habitat still exists, poaching has often decimated tiger populations, extending even into some of India's prized Tiger Reserves. The aggregate loss of habitat and habitat occupancy across the tiger's range is especially shocking since over US$31 million of NGO funding has been spent on tiger conservation projects from 1998–2003 (see Christie, Chapter 15) [11].

EMERGING AND INTENSIFYING THREATS TO WILD TIGERS

Taken together, the results of the two range-wide assessments demand that we expend much greater and better efforts to save wild tigers from extinction. These analyses suggest the need for a more careful assessment of the threats to tigers and their prey and strategic interventions that include genuine commitments pledged at the highest levels by regional governments.

One of the major causes of tiger extirpations is habitat loss and fragmentation, but the killing of tigers and their prey is another serious threat that has intensified [8]. New-found wealth in the region's 'tiger economies' enables a large emerging middle-class to afford expensive tiger parts and products [8]. This pulse in demand for tiger-based traditional medicines and aphrodisiacs, and pelts for decorations and décor, has resulted in a thriving illegal international trade that permeates the entire tiger range. It has contributed to the extirpation of tigers from high-profile Indian tiger reserves to parts of national parks in Sumatra. In 2007, the tiger population in India, long considered to be the bastion of tiger conservation, was estimated at about 1,300–1,500 animals, less than 50% of previous estimates [12]. The possibility that China will lift a domestic trade ban and permit commerce in farmed tigers and tiger parts in China could intensify the killing and laundering of wild tigers across the range because wild tigers are cheaper to poach than rear in captivity and many people reportedly prefer wild over farm-raised products [13].

THREE SCENARIOS: ALTERNATIVE FUTURES FOR WILD TIGERS

From a synthesis of these analyses and conservation efforts and achievements over the past decade, we offer three scenarios for tiger populations to the year 2020. The first scenario reflects the *status quo*. Here, we project the consequences of merely maintaining current conservation efforts against the observed trajectory of land use change, population growth, and poaching. The second scenario assumes a greater level of effort to increase connectivity among TCLs by restoring habitat. Corridors and connectivity will improve the long-term viability of tiger populations, mostly by enhancing dispersal and gene flow and

in part by reducing edge effects, including poaching. The third scenario addresses the possibility that the Chinese Government will legalize the domestic trade in farmed tiger parts. In this context, we discuss the possible effects on wild populations and the commitment from governments to ensure that wild tigers survive into the future. Other scenarios are certainly possible that could affect the trajectory of tiger populations and their habitat, but we consider China's trade ban as a critical driver because of its rangewide impact.

The 2006 TCL assessment relied on three major datasets: (1) remaining potential habitat; (2) human influence; and (3) tiger presence or absence (see Sanderson et al., Chapter 9) [2]. The TCLs represent areas of potential land cover with evidence of tigers and low human pressure, especially from poaching of tigers and prey, while meeting minimum habitat needs. The Human Influence Index (HII) [14]—a data layer that assigns a score from 1 to 72 based on human population density, land use, access, and infrastructure—served as a proxy for human impact on tigers. We excluded habitat where HII >15 without confirmed tiger presence because tiger occupancy erodes above this threshold. We retained polygons in TCLs where HII >15 but found confirmed tiger presence. The major step to create this scenario was to eliminate all habitat where HII >15, regardless of confirmed presence in 2005. In this parsimonious assessment, we assumed that continued anthropogenic influences will eventually extirpate tigers from these areas.

Scenario 2 projects the results of increasing habitat connectivity within and between TCLs through habitat restoration with cessation of poaching. In this projection, we included potentially restorable land cover types with HII ≤15 (forms of low-intensity agriculture, degraded scrub, and degraded forest) into TCLs as suitable tiger habitat. We also removed the HII threshold to simulate the effect of reduced poaching and persecution of tigers and prey, which will enable tigers to survive in these areas.

Based on the projected results, we reclassified TCLs under each scenario using the same definitions and classifications used by Sanderson et al. (see Chapter 9 and ref. [2]). Briefly, these classes are as follows:

Class I. A landscape large enough to support at least 100 tigers, scaled by habitat type. There is evidence of breeding, low threat, and moderate conservation effectiveness.

Class II. A landscape large enough to support at least 50 tigers, scaled by habitat type. Threats assessed as moderate to low.

Class III. A landscape fragment unable to meet Class I or Class II criteria due to small size or high threat.

Class IV. Insufficient data on conservation effectiveness or threat level to classify landscape.

In Scenario 3, we discuss the potentially devastating threat to wild tigers across their range if the domestic ban on trade in tiger parts is lifted by China; poachers will intensify hunting tigers in TCLs across the range to meet the increased market demand (see Nowell, Chapter 38 and 't Sas-Rolfes, Chapter 39). We describe how this policy could alter Scenarios 1 and 2 and discuss regional and global commitments required to minimize or halt the threat.

Scenario 1. Business as Usual

Today, more than half the world's human population directly impinges on the fate of the last 3,000–5,000 wild tigers. We projected current trends of habitat loss over the years to

2020, and the results predict dire consequences. Across the tiger's range, continued habitat loss from expansion of human population centers and infrastructure would cause the total TCL area to be reduced by 17% from 2006 levels, predominantly in the south and Southeast Asian bioregions (Table 40.1, Figs 40.2 and 40.3). Under this scenario, TCLs become smaller and more fragmented, resulting in an increase in the overall number of TCLs from 76 to 122 (Table 40.2). The median size is more than halved, from 2,900 km^2 in 2006 to 1,225 km^2 in 2020. Of most importance, the most suitable areas for tiger conservation, the Class I TCLs, drop from 16 to only 6 in 2020, and their area is reduced by 43% (Tables 40.1 and 40.2).

TABLE 40.1 Total TCL area under current and future scenarios by Class and Bioregion (km^2)

		South Asia	Indochina	Southeast Asia	Russian Far East	Total
All TCLs	TCL 2006	234,487	538,826	145,274	271,244	1,189,831
	Scenario 1	150,004	484,096	109,178	246,205	989,483
	Scenario 2	507,554	788,674	301,289	323,534	1,921,051
Class I	TCL 2006	133,556	402,839	84,446	269,929	890,770
	Scenario 1	69,953	159,872	55,137	220,121	505,083
	Scenario 2	273,450	628,061	293,536	323,534	1,518,581
Class II	TCL 2006	23,297	85,231	13,716	0	122,244
	Scenario 1	22,954	297,683	17,690	15,935	354,262
	Scenario 2	0	158,257	0	0	158,257
Classes III & IV	TCL 2006	77,634	50,756	47,112	1,315	176,817
	Scenario 1	57,097	26,541	36,351	10,149	130,138
	Scenario 2	234,104	2,356	7,753	0	244,213

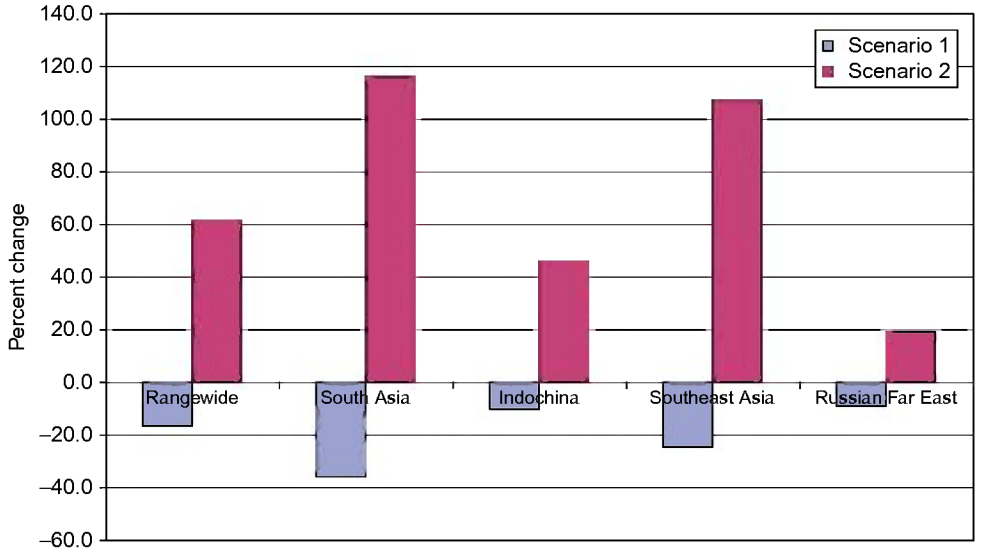

FIGURE 40.2 Percent change in total area of TCLs from 2006 to 2020 for future scenarios.

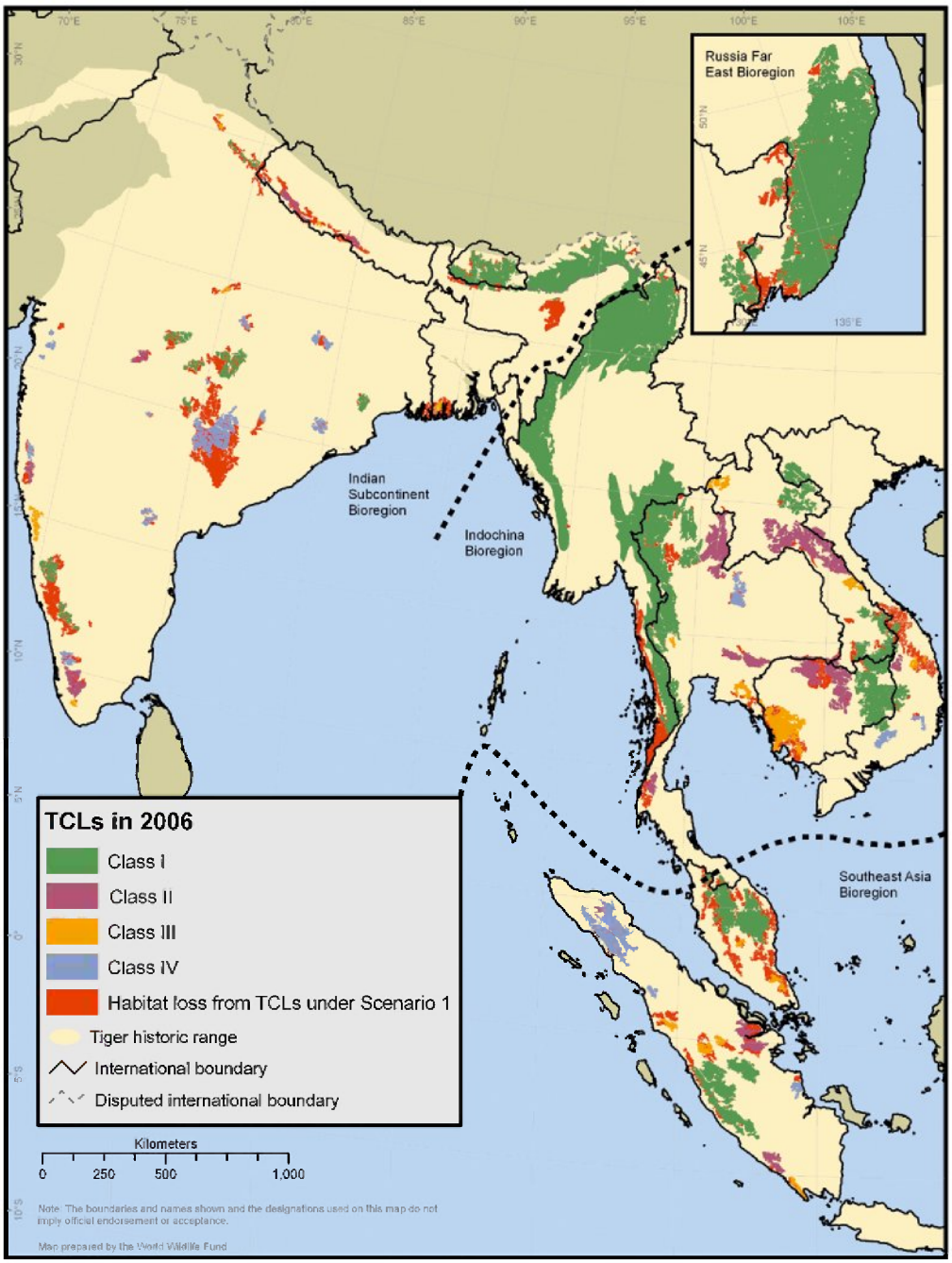

FIGURE 40.3 Habitat loss from TCLs under Scenario 1.

TABLE 40.2 Change in the number of TCLs under two future scenarios between 2006 and 2020

	Rangewide TCL count	Class I	Class II	Class III	Class IV
TCL 2006 (current)	76	16	15	23	22
Scenario 1 (habitat loss)	122	6	27	61	28
Scenario 2 (habitat restored, no poaching)	40	15	5	9	11

Tigers now occupy 7% of their historical range (circa 1850) [8]. The 16 Class 1 TCLs represent 5% of this range, but the projected loss of Class I TCLs will decrease this extent to a mere 3% by 2020 (Table 40.1).

Scenario 1 illustrates the consequences of chronic habitat degradation along existing lines of infrastructure and human population, but it ignores more profound threats that emanate from large-scale forest conversions, extensive non-native plantations, and land divestments. For example, there are plans to convert vast acreages of rainforests in Peninsular, Malaysia and Sumatra to oil palm and acacia plantations (see Maddox, Chapter 31). A finer-scale example is the predicted forest loss and degradation in the southern area of the Tesso Nilo Forest in central Sumatra, Indonesia. Here the HII is already high (Fig. 40.3), but the potential threats to the northern areas owned by logging concessions that would exacerbate conversion are not adequately reflected under this scenario. In Indochina, the complex system of economic corridors underpinned by transnational highways from Myanmar to Vietnam and Cambodia will fragment the last patches of both moist and dry forests (see Cutter and Hean, Chapter 28) [15]. The controversial Forest Rights Act of India, proposes to hand over 2.5 million hectares of forests to forest-dwelling families, including those living within protected areas. The end result would transfer 60% of forest land to tribal communities and shrink tiger habitat even more (see Sahgal and Scarlott, Chapter 23).[b] Predicting the outcome of this politically volatile issue as it pertains to tiger habitat is difficult. Upon resolution of this proposed legislation, Indian tiger experts will certainly review conservation strategies to enhance better local management of natural habitats under indigenous control and zoning of core areas.

Scenario 2. From Holding Action to Moderate Improvement: Enhanced Connectivity and Habitat Restoration

A key recommendation of Sanderson et al. [1] and Dinerstein et al. [1, 9] was that habitat and population connectivity should be improved between TCLs to facilitate dispersal and gene flow between tiger populations. Scenario 2 simulates this goal. The results are promising: improved connectivity between TCLs would increase total TCL area by 61% (Table 40.1, Figs 40.2 and 40.4). Several TCLs became joined, so the size of TCLs almost doubles from a median size of 2,900 km^2 to 4,360 km^2. Nine of these new TCLs cross international boundaries

[b] http://www.sanctuaryasia.com/takeaction/detailcampaign.php?cid = 161 (2007).

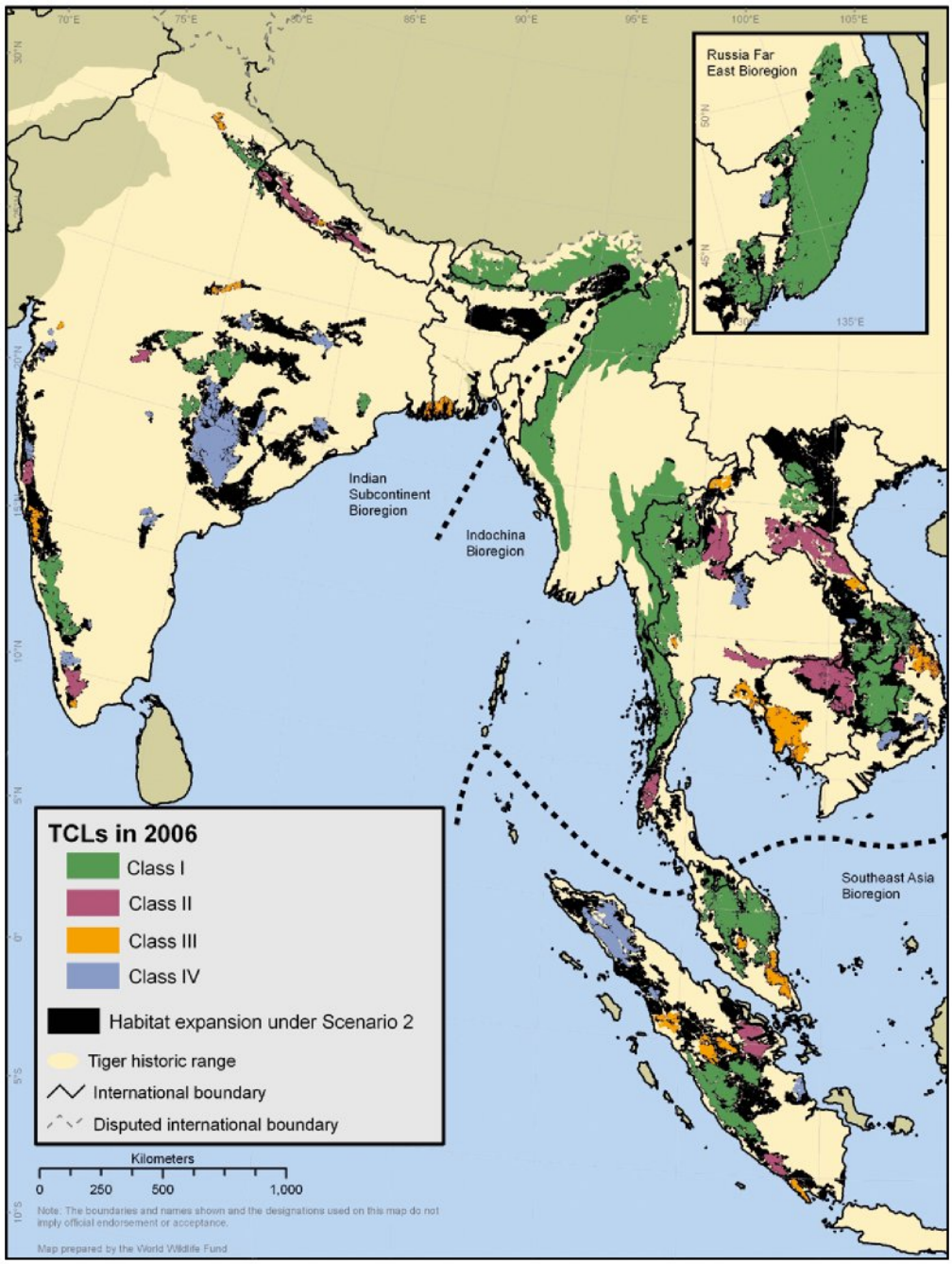

FIGURE 40.4 TCL expansion under Scenario 2.

and will require collaboration among neighboring countries for effective management, especially to maintain critical corridors.

Successful implementation of conservation activities associated with Scenario 2 could increase the total area of Class I TCLs from 891,000 km^2 in 2006 to 1,519,000 km^2 in 2020 (Table 40.1, Fig. 40.4). The latter represents 10% of the historic tiger range, a significant increase in large landscapes that can support viable tiger metapopulations. The area of Class IIs also increases from 2006 levels (Table 40.1). Comparisons with estimates of historic tiger populations suggest that with habitat restoration, the Class I and II TCLs are capable of supporting a range-wide tiger population that is more than double the current population (Fig. 40.5).

Scenario 2 represents a broad-brush analysis, so improved habitat connectivity across the tiger's range will require finer details that include: careful and strategic selection of areas for habitat restoration; effective anti-poaching activities; and land management strategies that benefit both people and wildlife. Large conservation landscapes will require careful assessment and zoning of core habitat areas, wildlife corridors, buffer zones, and high-intensity human-use areas, with the involvement of a range of stakeholders and partners (see Kawanishi et al., Chapter 29) [16]. Successful models like the Terai Arc Landscape, where partnerships and local community stewardship has helped to reconnect core habitats (see Wikramanayake et al., Chapter 10) indicate that with extra effort this goal may be achievable.

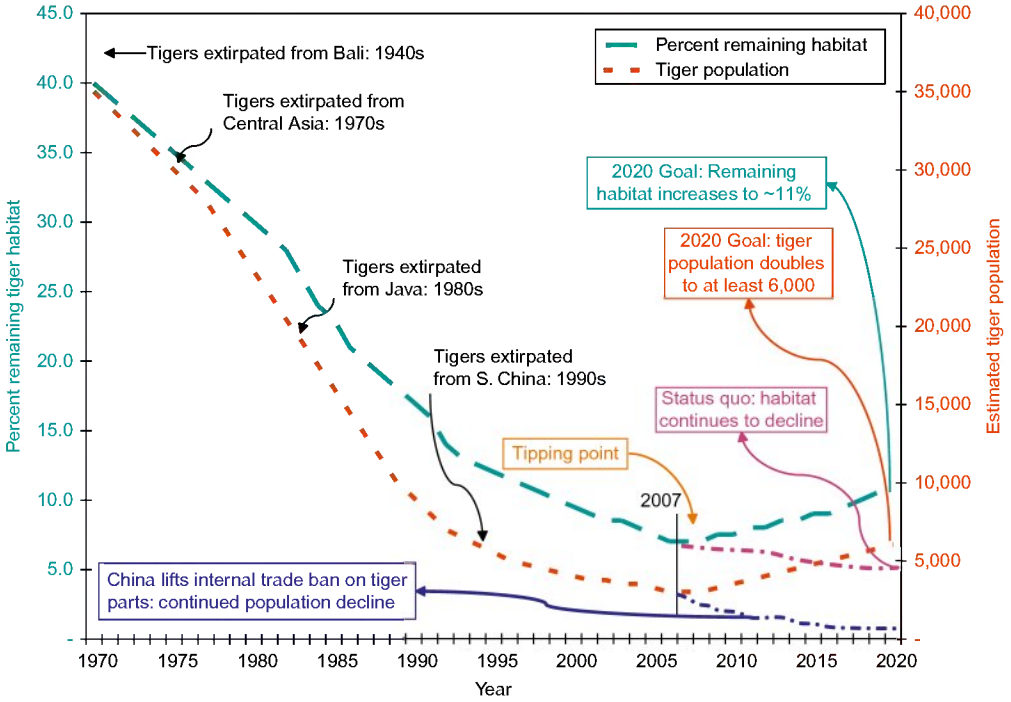

FIGURE 40.5 Graphical representation of loss of tiger habitat and population and potential trajectories based on future scenarios.

Scenario 3. The Road to Lasting Recovery

Tiger populations have plummeted since the early 1990s because of extensive poaching of tigers and their prey, and an accompanying loss of habitat (Fig. 40.5). By the early 1990s the range-wide population had dwindled to 5,000–7,000 animals [17]. In 1993 China imposed a trade ban on tiger products. But poaching continued, driven by demand for tiger parts and the illegal trade. Tiger populations continued to decline in the late 1990s, despite the ban. Therefore, merely increasing habitat area will represent only part of the solution to reverse declines. Halting poaching is imperative, especially to repopulate empty and under-populated habitats.

A potential threat affecting all three scenarios is the possibility of China rescinding the ban on use of tiger products and legalizing the trade in farmed tigers and stockpiled parts. This is a Sword of Damocles hanging over wild tiger populations. Tiger farms in China contain over 4,000 animals in 14 farms with the potential to add 800 animals per year to this captive population and to stockpiles in freezers. Opening the domestic trade of these stockpiles would allow tigers killed from the wild to be laundered, since it is 250 times more expensive to raise a farmed tiger to maturity than to kill a wild tiger in India [15]. This economic disparity and desire for wild products over farmed makes the reopening of any trade too risky, especially since the current levels of national and international law enforcement efforts are largely ineffective to counter the existing illegal cross-border trade and poaching [18, 19].

The escalation in poaching, fueled by the demand for parts and products in the Tibetan Autonomous Region, has penetrated into India's Tiger Reserves. But reopening the tiger trade in China will greatly intensify the level of poaching in TCLs across the region, and all efforts to reconnect and restore habitat will be rendered moot. Therefore, any effort to improve TCLs for tigers will have to be coupled with arresting poachers and keeping markets trading in tiger parts closed. Ultimately, given the demand for products in the world's most populous country, the fate of wild tigers across the tiger's range will rest in policy decisions made in China.

Fortunately, at the CoP of CITES in the Netherlands in June 2007, tiger range countries including India, Russia, Nepal, and Bhutan voiced strong opposition to reopening the trade; however, the need for vigilance remains because of a strong, well-funded pharmaceutical lobby pushing hard to lift the ban. If the Chinese government decides to rescind the ban and legalize the trade, the implications will resonate across the tiger's range (Table 40.3).

Because several of the Class I TCLs and the tiger trade cross national boundaries, stronger regional cooperation and action is necessary. The tiger trade has to be broached at influential

TABLE 40.3 The conditions and results of a legalized trade on tiger populations

Trade status	Scenario 1: Class I TCL area continues to decline	Scenario 2: Class I TCL areas increase
Condition: China opens tiger market	***Result:*** Wild tigers decline precipitously	***Result:*** Habitat increases but higher mortality schedule from intense poaching creates 'emptied TCLs'
Condition: China maintains ban and cooperates fully to curtail the illegal trade	***Result***: Habitat will continue to decline but tiger numbers may not because of lower mortality schedule	***Result:*** Habitat and tiger numbers increase, perhaps even triple

regional fora attended by range-state leaders who have to commit to secure tigers and their ecological needs for years to come.[c]

The 'tiger pledge' should include resources to:

- reinforce national and international enforcement of bans on trade in tiger parts, including intensified on-the-ground protection;
- finance a range of economic incentives to encourage tiger conservation through local community groups;
- integrate tiger conservation programs into development programs and trade agreements;
- develop a transparent system to monitor how finances are spent; and
- encourage public relations campaigns to promote tiger conservation at all levels, and highlight tiger conservation during the Year of the Tiger [8].

UNICEF operates a successful program where celebrities are appointed as Goodwill Ambassadors to bring attention to the needs of underprivileged children, and advocate for their well-being. Endangered tigers could also benefit from similar 'tiger ambassadors' (see Galster et al., Chapter 7). We suggest that each range state identify a tiger ambassador selected from among widely recognized celebrities who are perceived as credible, strong, and forceful advocates for tiger conservation. Potential candidates can emerge from an eclectic pool consisting of film stars, pop singers, sports stars, religious leaders, business leaders, and even credible politicians.

For tiger conservation to be truly successful, there has to be a genuine commitment and action by governments, with regional cooperation and inclusion of local communities. Like the tiger that sits at the apex of natural communities, committed government leadership capable of envisioning a system that balances conservation, economic priorities, and development goals is a necessary keystone at the apex of conservation efforts for tigers and Asia's natural heritage.

References

1. Dinerstein E, Loucks C, Heydlauff A, et al. *Setting Priorities for the Conservation and Recovery of Wild Tigers: 2005–2015. A User's Guide*. Washington, DC, New York: WWF, WCS, Smithsonian Institute, and NFWF-STF; 2006.
2. Sanderson EW, Forrest J, Loucks C, et al. *Setting Priorities for the Conservation and Recovery of Wild Tigers: 2005–2015. The Technical Assessment*. New York and Washington, DC: WCS, WWF, Smithsonian Institute, and NFWF-STF; 2006.
3. Nowell K, Jackson P. *Wild Cats: Status Survey and Conservation Action Plan*. Gland, Switzerland: IUCN; 1996.
4. Dinerstein E, Wikramanayake ED, Robinson J, et al. Part 1: A framework for identifying high priority areas for the conservation of free-ranging tigers. In: *A Framework for Identifying High Priority Areas and Actions for the Conservation of Tigers in the Wild*. Washington, DC, and New York: WWF, WCS; 1997.
5. Wikramanayake ED, Dinerstein E, Robinson JG, et al. An ecology-based method for defining priorities for large mammal conservation: the tiger as a case study. *Conserv Biol*. 1998;12:865–878.
6. Wikramanayake ED, Dinerstein E, Robinson JG, et al. Where can tigers live in the future? A framework for identifying high priority areas for conservation of tigers in the wild. In: Seidensticker J, Christie S, Jackson P, eds. *Riding the Tiger: Conservation in a Human-Dominated Landscape*. Cambridge: Cambridge University Press; 1999.
7. Redford KH. The empty forest. *BioScience*. 1992;42:412–422.

[c]Potential fora include the ASEAN (Association of Southeast Asian Nations) and SAARC (South Asian Association for Regional Cooperation) summits, which draw together most regional governments and observers from the United States and the European Union, and possibly even APEC (Asia-Pacific Economic Cooperation) which includes most of the consumer nations.

8. Dinerstein E, Loucks C, Wikramanayake E, et al. The fate of wild tigers. *Bioscience.* 2007;57:508–514.
9. Kinnaird MF, Sanderson EW, O'Brien TG, et al. Deforestation trends in a tropical landscape and implications for endangered large mammals. *Conserv Biol.* 2003;17:245–257.
10. Leimgruber P, Kelly DS, Steininger MK, et al. Forest cover change patterns in Myanmar (Burma) 1990–2000. *Environ Conserv.* 2005;32:356–364.
11. Christie S, et al. NGO investment in tiger conservation units, 1998–2003. In: Sanderson E, ed. *Setting Priorities for the Conservation and Recovery of Wild Tigers: 2005–2015. The Technical Assessment.* New York, and Washington, DC: WCS, WWF, Smithsonian Institute, and NFWF-STF; 2006.
12. Jhala YV, Gopal R, Qureshi Q, eds. *Status of Tigers, Co-predators and Prey in India.* Dehradun: National Tiger Conservation Authority and Wildlife Institute of India; 2008.
13. Bulte EH, Damania R. An economic assessment of wildlife farming and conservation. *Conserv Biol.* 2005;19:1222–1233.
14. Sanderson EW, Jaiteh M, Levy MA, et al. The human footprint and the last of the wild. *BioScience.* 2002; 52:891–904.
15. ADB. *Greater Mekong Subregion (GMS) Biodiversity Conservation Corridors Initiative: Strategic Approaches and Priorities.* Manila, Philippines: Asian Development Bank; 2005, Regional Technical Assistance 6213.
16. Dinerstein E, Rijal A, Bookbinder MP, et al. Tigers as neighbours: efforts to promote local guardianship of endangered species in lowland Nepal. In: Seidensticker J, Christie S, Jackson P, eds. *Riding the Tiger. Conservation in a Human-Dominated Landscape.* Cambridge: Cambridge University Press; 1999.
17. Seidensticker J, Christie S, Jackson P. *Riding the Tiger: Tiger Conservation in a Human-Dominated Landscape.* Cambridge: Cambridge University Press; 1999.
18. EIA. *The Tiger Skin Trail.* London: Environmental Investigation Agency; 2004.
19. Ellis R. *Tiger Bone and Rhino Horn: The Destruction of Wildlife for Traditional Chinese Medicine.* Washington, DC: Island Press; 2005.