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ANALYSIS ON CONSERVATION STATUS OF WILD LIFE HABITATS: A CASE STUDY OF SHWEBO AND KANBALU DISTRICT, SAGAING REGION, MYANMAR

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Abstract:

Shwebo and Kanbalu Districts which lie in the northern most part of the Dry Zone of Myanmar had once widespread distribution of wild animals. As local economies and population expand, throughout the region, forests, grasslands are being degraded or lost. Terrestrial mammals and bird population are under pressure from overexploitation. The objectives of this paper are to provide a basis for the development of wildlife conservation and protected areas; to highlight sites that are threatened or in adequately protected, so that urgent remedial measures can be taken. Arc GIS is used to show the spatial distribution of wild life habitats in conjunction with data. Conservation analysis is made by using Wikramanayake's Weighted Criteria Method. The results show that wild habitats in study areas have contracted greatly and some of these habitats will require expanded-protected areas with strong law enforcement, while others will require additional strategies based on modifying human land uses.

Keywords: Wikramanayake's Weighted Criteria Method.

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I. INTRODUCTION

Shwebo and Kanbalu Districts are located in the Central Valley of Myanmar. The two districts lie between 22° 10' and 23° 51' North latitudes and between 94°47' and 96° 1' East longitudes. The total area of the two Districts is 5,743.95 sq. miles. The width of the study area is 75 miles in the widest part from east to west and the longest length from north to south is 113 miles.

Topographically, the study area can be divided into hilly regions and plain areas or lowland regions. Hilly regions can be subdivided into western hilly regions and eastern Minwun ranges. The western hilly regions are the watershed areas of Mu and Chindwin Rivers, and they have north-south alignments. The highest peak has (726 m) in height and lies in Kyunhla Township. The eastern Minwun ranges are fringing with the west bank of the Ayeyarwady River. The highest point in the eastern ridge is Zin Taung (753 m). The northern portions of these hilly regions are covered with deciduous forests which gradually become sparse to the southern parts. Shwebo-Myitkyina road passes through in this hilly region. The flat plains are found vastly in the middle and southern part of the study area. These are the areas of Mu valley and Shwebo plain. The southern part of Mu valley is only Shwebo plain and composed of the lowland in Shwebo, Khin-U, Wetlet, Taze, Ye-U and Tabayin

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Townships. These plains lie between 150 m and 250 m above sea level.

There are the two main drainage systems in study area; these are Ayeyarwady and Mu Rivers. The Ayeyarwady River forms the eastern part of Shwebo and Kanbalu districts. It also serves as the eastern boundary of the study area with the distance of 72 miles. Mu River takes its source on Taungthonelone Taung in Bamauk Township, Katha District. It flows in a north-south direction within central part of study area. It joins with the Ayeyarwady River near Myinmu Town in Sagaing Region. In 1901, British Government built the Karboe Dam near Karboe village in Kantbalu Township. In 1994-95, the Kindat Dam was constructed near Wettoe village in Taze Township. It is 30 miles above Karboe Dam. In 2001, the Thaphanseik Dam Project was completed on the Mu River at about 9 miles distance above Kindat Dam. It lies near Thaphanseik village in Kyunhla Township.

The study area is situated in the sub-tropical and tropical climatic zone as the Tropic of Cancer passes through the north of Chatthin village in Kanbalu Township. The northern part is characterized by more annual rainfall. Therefore, the northern part of study area is wetter than the southern part. As a consequence, northern part has more species richness in biodiversity. Forest areas are about one-third of study area. Along the edge of Mu Valley and on the east of Minwun Range is covered with dense forests. These forest areas are habitats for wild animals.

Study Area

Study Area includes reserved forests and protected forests of Shwebo and Kanbalu Districts. Formerly Kanbalu District was a part of Shwebo District. But in 2015, it became the separated district by the two townships, Kanbalu and Kyunhla. Most of the reserved forests are in Kanbalu District. There are totally 846,832 acres in both reserved and protected forests.

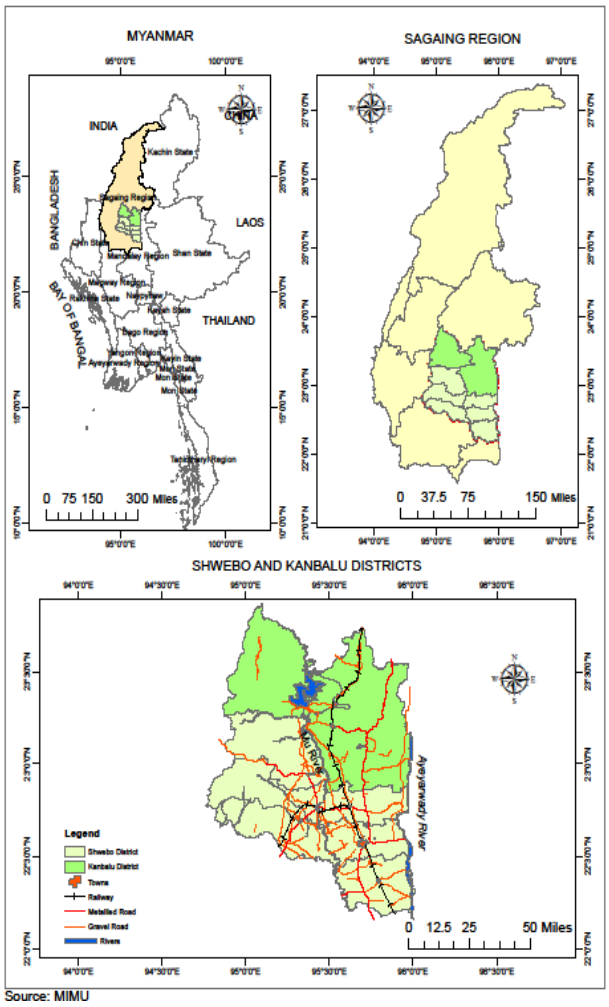


Figure (1) Location Map of Study Area

II. MATERIALS AND METHODS

ARC GIS is applied to produce the conservation status in Shwebo and Kanbalu Districts. Forest data were collected from Forest Department, Shwebo District. TM image provides for calculation of NDVI value of each reserved forest area. Since the exact data for forest cover of original and remaining could not available, TM Satellite image (2011) was used to identify this level reflects the forest covers. Mean NDVI value for each reserved forest area was also calculated by using zonal statistics function in Arc Map. NDVI value ranges between +1 and -1. The value +1 can be assumed as intact and -1 as absolutely degraded. Conservation status is analysed by

using the Eric Wikramanayake's Weighted Criteria Method.

Research Objectives

The objectives are:
- To strengthen the management of formal protected areas;
- To provide a basis for the development of conservation status and protected areas;
- To highlight sites that are threatened or inadequately protected, so that urgent remedial measures can be taken.

Literature Review

The conservation status index can be defined to measure the degree of habitat alteration and spatial patterns of the remaining natural habitat across the landscape (Eric Wikramanayake and et al, 2009). The variables to evaluate the conservation status are habitat loss, size, habitat fragmentation and degree of protection. Habitat loss is a primary factor in the loss of terrestrial species and ecosystems. Size and extent of blocks of contiguous intact habitat is second greatest weight when determining the conservation status. Large blocks of habitat can sustain larger species populations and permit a broader of species and ecosystem. The status can be assessed by using the recent forest cover, habitat and degraded area data for the region. The conservation status categorized by Wikramanayake is roughly as follows.

Extinct. No natural communities remain. Some of the original species are still present, but no opportunities to restore the original natural communities exist.

Critical. The remaining intact habitat is limited to isolated small fragment with low probabilities of persistence over the next five to ten year without immediate and intensive protection and restoration.

Endangered. The remaining intact habitat is limited to isolated fragments of varying size with medium to low probabilities of persistence over the next ten to fifteen years without immediate or continuing protection or restoration.

Vulnerable. The remaining intact habitat occurs in habitat blocks ranging from large to small; many intact clusters probably will persist over the next fifteen to twenty years.

Relatively stable. Natural communities have been altered in certain areas, causing local declines in exploited populations and disruption of ecosystem processes.

Relatively intact. Natural communities within an ecoregion are largely intact, with species, population, and ecosystem processes occurring within their natural ranges of variation.

Eric Wikramanayake and et.al (2009) stated that Shwebo and Kanbalu Districts include in Irrawaddy Moist Deciduous Forests Ecoregion and identified as *vulnerable* in conservation assessment with the above criteria. However, in this analysis as a local scale, size of habitat blocks, habitat loss (NDVI value), and habitat fragmentation (connectivity) will be used to evaluate the conservation status.

In making the comparative assessment of habitat areas, index for calculating habitat loss was described by Eric Wikramanayake as follow.

Table (1) Index for Calculating Habitat Loss

Percentage Remaining Habitat	Score for Percentage	
	Intact Habitat	Degraded Habitat
>= 90 %	40	10
50-90 %	30	8
25-49 %	20	5
10-24 %	10	3
0-9 %	0	0

Source: A Conservation Assessment: Terrestrial Ecoregion of the Indo- Pacific, (Eric Wikramanayake and et al, 2009).

Table (1) gives the index to calculate the habitat loss, using the percentage of habitat within each ecoregion. The points assigned to each ecoregion for habitat loss consists of the sum from the "Intact Habitat" and "Degraded Habitat" columns. This means if an ecoregion has 60 percent intact habitat and 20 percent degraded habitat, it will get a score of 30+3=33 points.

III. ANALYSIS ON CONSERVATION STATUS OF WILD LIFE HABITATS

Assessment of Habitat Loss

In Shwebo and Kanbalu District, most of the original vegetation of the forests has been cleared or modified by the human activities. Only about 40 percent of the original land area is still forested; the rest has been cleared away for agriculture, especially rice, sesamum, groundnut, maize, pulses and beans and sugarcane. The existing forest areas, consisting of 32 reserve covers 846,832 acres. There are 360,688 acres of protected forests outside the reserved forests. Reserved forests are mainly the habitat for wild animals. Chatthin Wildlife Sanctuary lying in northern part of the study area provides the habitat for Elbrow-antler deer and other animals. However, this park has been also subject to severe encroachment by illegal loggers and sometime illegal hunting.

Based on the Eric Wikramanayake's method, the assessment on the habitats will be made by using the NDVI data as follow.

Table (2) Index for Calculating Habitat Loss

Percentage of Habitat Area	Mean NDVI value	Score for Percentage	
		Points for Habitat Area	Points for Mean NDVI
>= 9%	>= .6	40	10
5-9 %	0.5-0.6	30	8
2.5-4.9 %	0.25-0.5	20	5
1.0-2.4 %	0.1-0.25	10	3
0.0- .9 %	0.1	0	0

Source: Calculation based on the EricWikramanayake's method

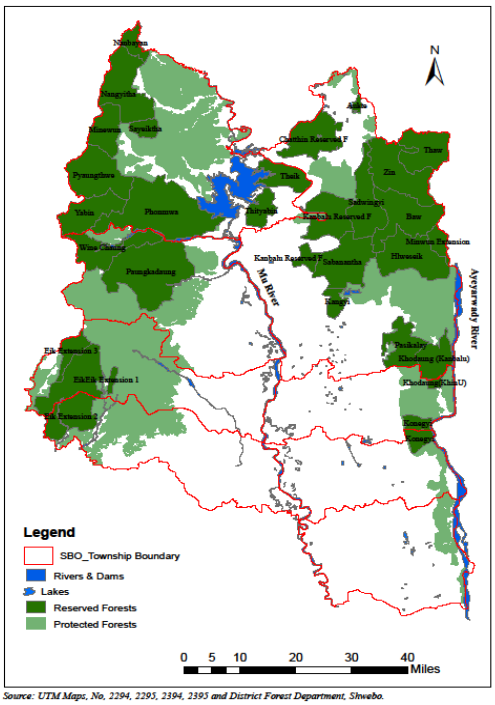


Figure (2) Reserved and Protected Publish Forests

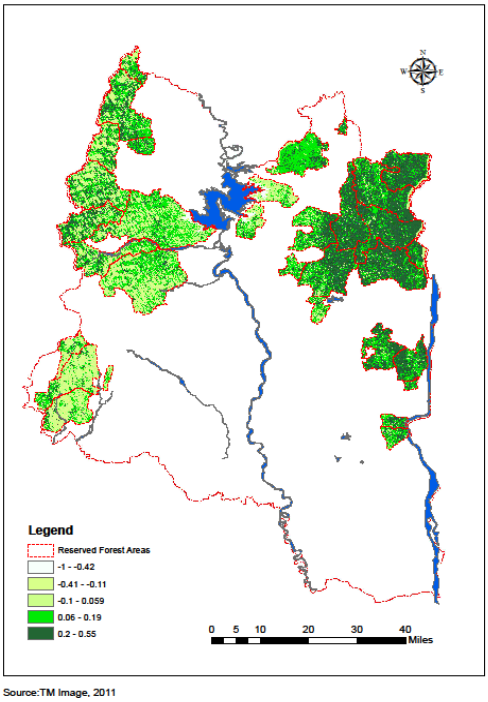


Figure (3) NDVI Map of Study Area

Table(3) Level of Habitat Loss

Sr No	Name	Are (Acre)	%	Mean NDVI	Points
1	Konegyi (Shwebo)	6842	0.81	0.09-.17	3
2	Konegyi (KhinU)	5958	0.70	.09-.17	3
3	Eik	81549	9.63	Under 0	40
4	Eik Extension 1	-	0.00	Under 0	0
5	Eik Extension 3	11661	1.38	Under 0	10
6	Wine Chaung	-	0.00	0.03 - 0.09	0
7	Eik Extension 2	17824	2.10	0.09 - 0.17	10
8	Khodaung (KhinU)	3277	0.39	0.09 - 0.17	3
9	Khodaung (Kanbalu)	23575	2.78	0.17- 0.24	23
10	Pasikalay	4401	0.52	0.17- 0.24	3
11	Hlweseik	62446	7.37	0.17- 0.24	33
12	Minwun Extension	14653	1.73	0.17- 0.24	13
13	Kangyi	9125	1.08	0.03 - 0.09	10
14	Sabanantha	53980	6.37	0.17- 0.24	33
15	Sadwingyi	41201	4.87	0.17- 0.24	23
16	Baw	39159	4.62	0.17- 0.24	23
17	Thaw	62316	7.36	0.17- 0.24	33
18	Zin	4639	0.55	0.17- 0.24	3
19	Kanbalu (R.F)	7649	0.90	0.09 - 0.17	3
20	Kanbalu (R.F)	-	0.00	0.09 - 0.17	3
21	Chatthin (R.F)	21908	2.59	0.09 - 0.17	23
22	Aukte	5249	0.62	0.09 - 0.17	3
23	Nanbayan	11117	1.31	0.09-.17	13
24	Nangyitha	52826	6.24	0.03 - 0.09	30
25	Minewun	26426	3.12	0.03 - 0.09	20
26	Sayeiktha	9610	1.13	.09-.17	13
27	Phonmwa	70000	8.27	Under 0	30
28	Yabin	36333	4.29	Under 0	20
29	Thityabin	15791	1.86	Under 0	10
30	Theik	7257	0.86	Under 0	0
31	Pyaungthwe	51654	6.10	Under 0	30
32	Paungkadaung	61600	7.27	Under 0	30
	Total	846,832			

Assessment of Fragmentation

Habitat fragmentation can be perceived as a major threat to the conservation of terrestrial species (Eric Wikramanayake and et al, 2009). Because, as fragmentation increases, the amount of unaltered core habitat area decrease, and ecosystem increasingly experience edge effect degradation from hunting pressure, fires from surrounding human activity, high levels of predation and invasion of exotic species (Lovejoy 1980; Saunders et al.1991; Skole and Tucker 1993). Eric Wikramanayake described Fragmentation Index to assess for large blocks of habitat with a value of habitat connectivity and the amount of habitat fragmentation.

The wildlife habitats are in the reserved and protected forest areas. For assessment of degree of fragmentation, these reserved and protected forest areas, designated by the Forest Department, will be considered as each habitat area for wild animals. Generally, fragments under 100 km^2 are inadequate for maintaining viable populations of large vertebrates. However, small fragments can be valuable for conserving populations of other species (Eric Wikramanayake and et al, 2009). Therefore, habitat size was neglected in this analysis. In assigning points for the habitat fragmentation criterion, only number of its contact habitat was considered for level of connectivity. For example, if one habitat has 6 contact habitats with its boundary, it will get a score of 16 points. If one habitat is isolated, it will get a score of 1 point.

Table(4) Index for calculating connectivity

No. of of Contact Habitat	Level of Connectivity	Points
7-8	Very High Connectivity	20
5-6	High Connectivity	16
3-4	Intermediate	12
1-2	Low-Connectivity	5
0	No-Connectivity	1

Source: Calculation based on the Eric Wikramanayake's method

Table (5) Level of Fragmentation

Sr,No	Name	Area (Acre)	Connectivity	Points
1	Konegyi (Shwebo)	6842	2	5
2	Konegyi (Khin U)	5958	2	5
3	Eik	81549	3	12
4	Eik Extension 1	-	1	5
5	Eik Extension 3	11661	2	5
6	Wine Chaung	-	4	12
7	Eik Extension 2	17824	2	5
8	Khodaung (KhinU)	3277	3	12
9	Khodaung (Kanbalu)	23575	5	16
10	Pasikalay	4401	3	12
11	Hlweseik	62446	4	12
12	Minwun Extension	14653	3	12
13	Kangyi	9125	2	5
14	Sabanantha	53980	7	20
15	Sadwingyi	41201	5	16
16	Baw	39159	5	16
17	Thaw	62316	2	5
18	Zin	4639	4	12
19	Kanbalu Reserved F	7649	4	12
20	Kanbalu Reserved F	-	1	5
21	Chatthin Reserved F	21908	1	5
22	Aukte	5249	1	5
23	Nanbayan	11117	3	12
24	Nangyitha	52826	4	12
25	Minewun	26426	3	12
26	Sayeiktha	9610	4	12
27	Phonmwa	70000	6	16
28	Yabin	36333	5	16
29	Thityabin	15791	1	5
30	Theik	7257	1	5
31	Pyaungthwe	51654	5	16
32	Paungka daung	61600	4	12

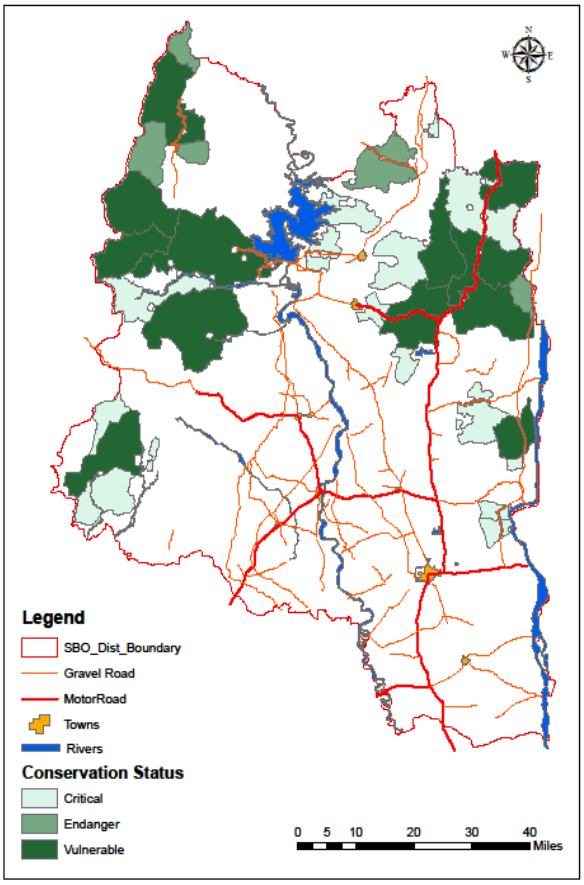
Source: Calculation based on Table (2)

Table(6) Conservation Status by Habitats

Sr ,No	Reserved Forests	Habitat Loss	Fragmentation	Total Points	Conservation Status
1	Konegyi (Shwebo)	3	5	8	Critical
2	Konegyi (Khin U)	3	5	8	Critical
3	Eik	40	12	52	Vulnerable
4	Eik Extension 1	0	5	5	Critical
5	Eik Extension 3	10	5	15	Critical
6	Wine Chaung	0	12	12	Critical
7	Eik Extension 2	10	5	15	Critical
8	Khodaung (KhinU)	3	12	15	Critical
9	Khodaung (Kanbalu)	23	16	39	Endanger
10	Pasikalay	3	12	15	Critical
11	Hlweseik	33	12	45	Vulnerable
12	Minwun Extension	13	12	25	Endanger
13	Kangyi	10	5	15	Critical
14	Sabanantha	33	20	53	Vulnerable
15	Sadwingyi	23	16	39	Endanger
16	Baw	23	16	39	Endanger
17	Thaw	33	5	38	Endanger
18	Zin	3	12	15	Critical
19	Kanbalu (R.F)	3	12	15	Critical
20	Kanbalu (R.F)	3	5	8	Critical
21	Chatthin (R.F)	23	5	28	Endanger
22	Aukte	3	5	8	Critical
23	Nanbayan	13	12	25	Endanger
24	Nangyitha	30	12	42	Vulnerable
25	Minewun	20	12	32	Endanger
26	Sayeiktha	13	12	25	Endanger
27	Phonmwa	30	16	46	Vulnerable
28	Yabin	20	16	36	Endanger
29	Thityabin	10	5	15	Critical
30	Theik	0	5	5	Critical
31	Pyaungthwe	30	16	46	Vulnerable
32	Paungkadaung	30	12	42	Vulnerable

Source: Calculation based on Table (3) and Table (5)

*Critical<20, Between 20 and 40 = Endanger, >40 = Vulnerable



Source: Table (6)
Figure(4) Conservation Status for Study Area

IV. RESULTS AND FINDING

In analysis of conservation status, Konegyi (Shwebo), Konegyi (KhinU), Eik Extension 1, Eik Extension 2, Eik Extension 3, Winechaung, Khodaung (Khin U), Pasikalay, Kangyi, Zin, Kanbalu Reserved Forests, Aukte, Thityarbin, and Thaik Reserved Forests are critical. Khodaung (Kanbalu), Minwun Extension, Sadwingyi, Baw, Thaw, Chatthin Reserved Forest, Nanbayan, Minewun, Sayeiktha, Yabin Reserved Forests are endangered. Eik, Hlweseik, Sabanantha, Nangyitha, Pyaungthwe and Paungkadaung Reserved Forests are vulnerable.

Human disturbances increased after the construction of Shwebo-Myitkyina highway and Inter-district road enable easy communication to reach the habitats of the mammals. The distribution of wild animals are greatly reduced from its original distribution. Agricultural activities convert some parts of habitats into crop lands. Similarly, other mammals lost part of their habitat. The wild animals were also hunted by the villagers from villages in and around the habitats.

V. DISCUSSION

This analysis was based on the method by Eric Wikramanayake and et al; 2009. Actually, methods for assessing the conservation status of terrestrial ecoregion are very complex. The spatial scale of this analysis precludes the evaluation of all possible threats. Anthropogenic impacts such as forest exploitation by communities for natural resources, clearing for agriculture, population density or villages in or surrounding habitats and wildlife exploitation does not considered. They however gave the four weighted criteria: Habitat loss 40 percent, Size and number of larger habitat blocks 25 percent, Habitat Fragmentation 20 percent, Degree of protection15 percent in their assessing the conservation status. This was for the terrestrial ecoregion of the Indo-Pacific region and does not fit in this local scale analysis. Therefore, some criteria to be fit local scale were used in this analysis.

VI. CONCLUSION

Forest areas occupy more than 40% of the study area now, but most forests are contracted or depleted. Improving road transports, reducing forest fragmentation and, as well as enhancing legal protection should be considered as conservation policy priorities. Rapid ongoing land-use changes (driven by human demographic growth) and economic development present significant challenges to protecting wild species. It is particularly important that all illegal hunting should be virtually banned in Study area. Because, the ranges of the studied mammal species have contracted greatly. Some of these species will require expanded protected areas with strong law enforcement, while others will require additional strategies based on modifying human land uses.

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