

**TABIN WILDLIFE RESERVE SUMATRAN RHINOCEROS
GENERAL SURVEY-2007**

**Organized by
SABAH WILDLIFE DEPARTMENT AND SOSRHINO
JOINTLY WITH
WWF-MALAYSIA AND UMS**

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TABLE OF CONTENTS

1.	INTRODUCTION	
	1.1. Background to this survey	4
	1.2 Tabin Wildlife Reserve	6
	1.3 Problems of estimating Sumatran rhinoceros numbers	6
	1.4 Previous surveys on Sumatran rhinoceros in TWR 1980s-2000	8
	1.5 Previous surveys on Sumatran rhinoceros in TWR 2000-2004.....	9
	1.6 TWR rhinoceros survey-2007	10
2.	SURVEY METHODS	
	2.1 Organization and Teams	10
	2.2 Training	10
	2.3 Rhino Survey Briefing	11
	2.4 Data recording	11
3.	RESULTS	
	3.1 Estimate of minimum number of rhinos and evidence of breeding	11
	3.2 Human encroachment	13
	3.3 Mineral sources	13
	3.4 Other wildlife records	13
4.	DISCUSSION	
	4.1 Rhinoceros	14
	4.2 Survey methods	15
	4.3 Human encroachment	16
	4.4 The key issue	16
5.	CONCLUSIONS	
6.	RECOMMENDATIONS	
	6.1 Status of rhino in Tabin Wildlife Reserve	18
	6.2 Rhino survey work	18
	6.3 Reduction of unauthorized human entry and encroachment into TWR	19
7.	REFERENCES	
8.	APPENDIX	

GLOSSARY

Cm	centimeters
ha	hectares
km	kilometers
PERHILITAN	Department of Wildlife and National Parks, Peninsular Malaysia
SF	Sabah Foundation (= Yayasan Sabah)
SFD	Sabah Forestry Department
SOSR	Save Our Sumatran Rhinoceros organization
SOSRB	Save Our Sumatran Rhinoceros Borneo
SWD	Sabah Wildlife Department
TWR	Tabin Wildlife Reserve
UMS	Universiti Malaysia Sabah
WWF	World Wildlife Fund

1. INTRODUCTION

1.1 Background to this survey

The presence of Sumatran rhinoceros (*Dicerorhinus sumatrensis*) in and around the Tabin River catchment, eastern Sabah, has been known formally within Sabah government and conservation circles since 1980. The 120,000 ha Tabin Wildlife Reserve (TWR) was established in 1984.

Since 2000, the Save Our Sumatran Rhinoceros organization (SOSR) has spent a considerable amount on sponsoring activities for the conservation of the Sumatran rhinoceros in Sabah, with emphasis on TWR. Among others, conservation activities were done to promote stronger protection of TWR including education, research and surveys and increasing public awareness. Although awareness of the endangered status of the Sumatran rhino amongst the Sabah public has improved significantly over last few years, some parties express doubts about the viability of the Tabin rhino population. Evidence of a viable population is a critical component of SOSR's assessment of the success of this investment and for setting future goals.

Results of surveys in TWR over a twenty-five year period since the early 1980s do not provide any indication that the Tabin rhinoceros population has increased in size or extent over the years. The various surveys are not truly comparable, however, because of variation in survey parameters and effort including the number of people and teams; team composition and size; periods of time spent seeking rhinos; and extent and location of specific areas covered. However even with consistent survey methodology, significant random variation occurs due to very small numbers of elusive, scattered and solitary animals in large areas, the size of Tabin.

To gain a more comprehensive assessment of the Tabin's rhino population, we have conducted two different methods in a period of three years starting from 2005 and ending 2007 covering similar areas within TWR. One involving transects helped to identify the location of possible rhino areas and numbers and additionally to produce experienced rangers that could conduct reliable surveys. This method overstates numbers due to problem with overlapping. The other survey method "simultaneous teams" determined numbers of rhinos simultaneously in the areas designated which reduced the chance of overlap and thus over estimation, but incurs problems with underestimation of numbers since chances of finding signs with such brief inspections is reduced

The "simultaneous teams" survey of this report was conducted in TWR covering as much of the area as possible using experienced rhino trackers. The survey involved many government agencies and organizations particularly the Sabah Wildlife Department (SWD), The Worldwide Fund for Nature Malaysia (WWF), Universiti Malaysia Sabah (UMS) and other invited national and international agencies. This survey's goal was to determine a minimum number of rhinos in Tabin.

The surveys constitute a major investment and focus on the estimation of rhino numbers in Tabin. This effort provides the most thorough assessment to date on this population, which can be used to determine appropriate recommendations for the conservation of this rhino in Tabin.

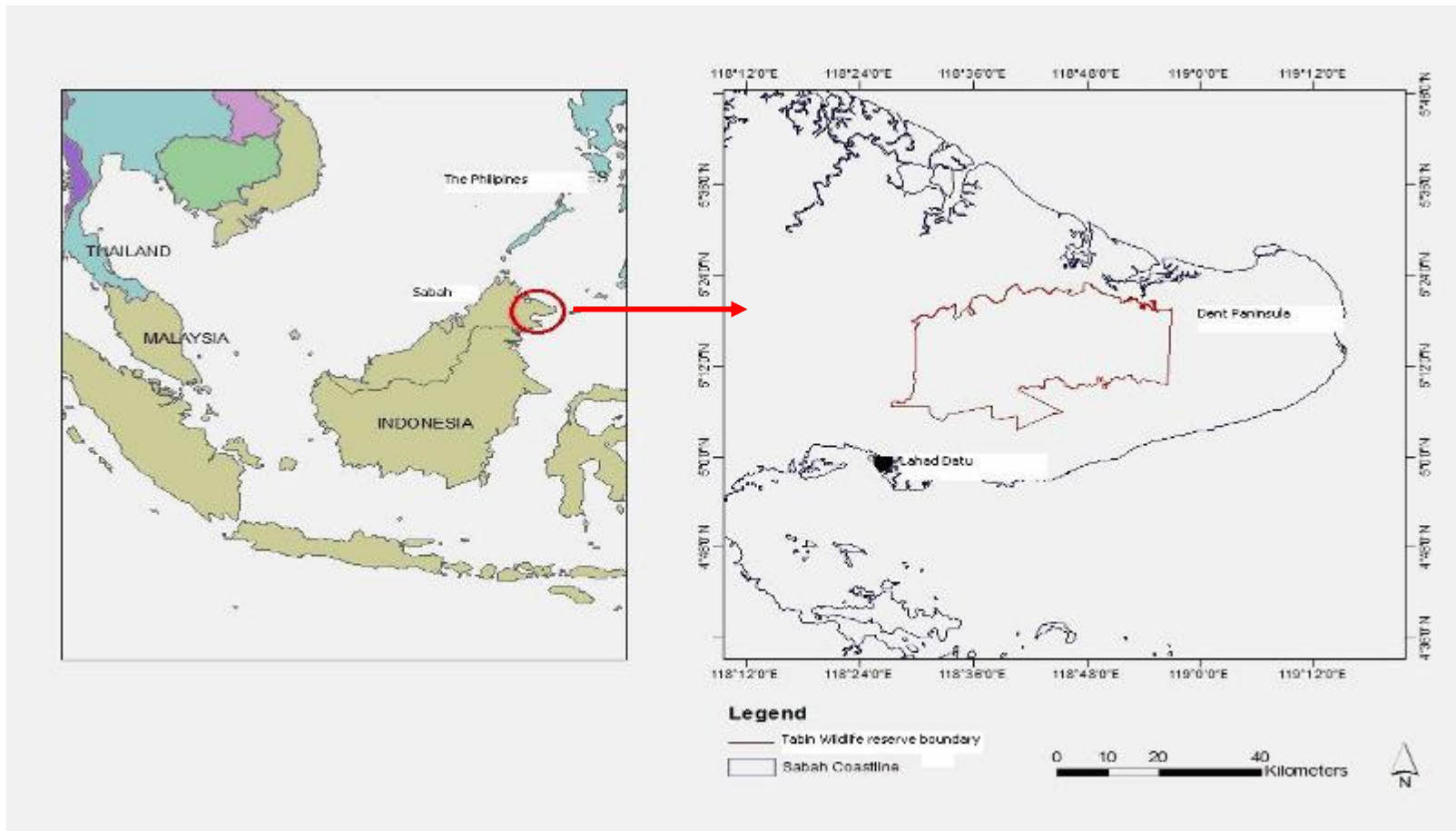


Figure 1: Location of Tabin Wildlife Reserve

1.2 Tabin Wildlife Reserve

Tabin Wildlife Reserve (TWR) is located in the centre of the Dent Peninsula, eastern Sabah, to the south of the lower reaches of the Segama River (Figure 1), about 50 km to the north-east of Lahad Datu town. Tabin, previously parts of Silabukan and Lumerau Commercial Forest Reserves, was gazetted as a Wildlife Reserve in March 1984 (Maryati *et al.*, 1999), for the main purpose of securing habitat for a Sumatran rhino population. Currently, the size of TWR is 111,971 ha, but this forest is contiguous with and encloses Mount Hatton Protection Forest Reserve (8,550 ha; formerly known as the “core area” of Tabin), as well as Dagat Virgin Jungle Reserve (VJR; 169 ha), Tabin VJRs (394 ha) and two of the 8 Silabukan VJRs (about 200 ha). Thus, the total area of forest in the Tabin block is about 121,284 ha. Details can be found at www.forest.sabah.gov.my/caims. In this report, the term TWR is used to refer to the entire Tabin forest block of 121,284 ha.

TWR is legislated under the Forests (Amendment) Enactment, 1984, and Sabah Forestry Department (SFD) has ultimate legal authority over TWR. Tabin Wildlife Management Committee, chaired by the Director of SFD, was established to obtain advice from the main relevant stakeholders. Sabah Wildlife Department (SWD) is authorised to manage wildlife in TWR.

Most of the forest in TWR comprises logged Dipterocarp forest, with some unlogged forest, secondary forest, riverine forest, freshwater swamp forest and nipah swamp forest (Malim & Maryati, 1999). Apart from Tabin, main rivers within TWR include Tagas-tagas Besar, Lipad, Urit, Maruap, Lumerau and Lumpungan. There are seven known “mud volcanoes” in Tabin forest block (Dalimin & Ahmad, 1999; mud volcanoes consist of outpourings of kaolin-rich, grey-coloured mud. As the water in the mud is highly saline, many wild animals frequent these sites).

The mean daily temperature recorded in TWR is in the range 28°C- 32°C (Payne, 1987). In general, there is a rainfall gradient from northeast to southwest, whereby the north receives around 2,500 mm, the central part 2,000 mm, and the southern portions 1,500 mm rainfall per year (Sale, 1994). The wettest time of the year is usually from late November to early January and relatively dry from August to November.

1.3 Problems of estimating Sumatran rhinoceros numbers

All methods used to estimate the numbers of Sumatran rhinos in a particular area suffer from the inherent limitations imposed by surveying very small numbers of elusive, scattered and solitary animals in large areas of forest on rough terrain. Evidence of the presence of rhinos has to be based on signs of rhino, since they are hardly ever seen. Therefore the appropriate detection and processing of rhino sign is the first hurdle in conducting meaningful surveys. The fact that there are so few of these signs compounds the perfecting of processing procedures. Rhinos make vocalizations rarely and the sound does not carry more than a few tens of meters. Faeces are often dropped in streams, rather than on dry land, so even the possibility of distinguishing individuals by faecal DNA is problematic due to the tests need for fresh dry samples. As rhinos do not live in groups and are all similar in appearance and size

when mature, distinguishing between individuals on the basis of footprints and any other signs also has limitations. Nevertheless, use of footprint measurements has always been the mainstay of surveying Sumatran rhinos and estimating their numbers in the rain forests of Malaysia and Indonesia. Strien (1985) used plaster casts, but that technique takes up enormous amounts of effort and time, as only fresh, clear footprints can be used, and there are practical difficulties associated with transporting, using and drying plaster of Paris in humid rain forests.

Further, the assigning of various rhino sign to numbers of rhino has been historically subjective. Boonratna, (1997) attempted to address this problem by qualifying sign detection and dividing it into the following categories. This helped maximize the value of any data collected.

- a) Known – Based on minimum number of clearly distinguishable, identifiable tracks.
- b) Probable – Based on number of track sets and recent presence of other types of evidence
- c) Possible – Based on presence and location of others type of evidence.

A further significant problem associated with estimating rhino numbers is that the number of rhinos signs encountered cannot be related to coverage of a specific size of forest area. When using line transects for wild mammal surveys, data (e.g. sightings of monkeys, elephant dung piles or orang-utan nests) can be linked to area in hectares through detection probability and, for signs of the animals, to rate of decay of that sign. This approach is (arguably) not possible with rhinos because footprints are so rare that they have to be found by searching for signs wherever they can be found (not on straight line transects) and because rate of decay of tracks cannot be estimated with sufficient reliability past a few days or if rain fall has been heavy. Currently, therefore, records of footprints or signs cannot be reliably linked to actual area surveyed.

However rhino survey reports that provide estimates of numbers of rhinos within the “area surveyed” remain highly subjective assumptions that all rhinos can be detected within an arbitrary distance of the routes walked during the surveys, and not on any probability detection function.

Identifying individuals would alleviate much of the subjective assuming. Plaster casting was an initial option. More recently new techniques, FIT and camera trapping, were pursued. Digital photographs taken of footprints and downloaded to a computer for processing for distinguishing details (FIT) is non-invasive to the animal and cost-effective in comparison with many other monitoring methods. But practically it is very difficult to get good footprints of the digital images in the low light and shifting substrate of the rainy forest floor and stopping to take pictures is extremely time consuming.

Camera trapping has improved immensely in functionality since we began using them in 2000. However, several are needed to cover an area sufficiently, which is expensive and some technical expertise is required of the personnel to operate and maintain them in such a wet environment. They are left to function for a period and then retrieved. They are useful for small area revolving surveys. Effectiveness in distinguishing rhinos is still to be determined.

Although we have continued to develop methods that could provide more information on status of rhino in the forest, footprint measurements remain the mainstay of surveying and estimating the numbers Sumatran rhinos due to ease of use.

1.4 Previous surveys on Sumatran rhinoceros in TWR 1980- 2000

The difficulty in successfully processing sign has been coupled with a lack of systematic record keeping of survey routes, time and data collected. Surveys, where based on impressions of certain areas. The initial surveys, which formally reported the existence of breeding rhinos in the Tabin area, found a male, female and sub-adult present in March 1980 (Payne, 1980). In 1981, a young juvenile rhino died in a noose trap in the same part of the upper Tabin River. Rhino footprints were found commonly in many of the central parts of what is now TWR during the period 1981-83 while intensive logging operations were proceeding (J. Payne, pers. comm.). Six teams (from Sabah Forestry Department, Sabah Parks, Sabah Foundation, PERHILITAN and WWF-Malaysia) surveyed remaining unlogged forest in the central parts of what is now TWR, 8 – 20 August 1982. Together, they found evidence of a minimum of seven rhinos, two of which were immature, along about 250 km of survey routes within in an area of 24,000 ha in and around the present Core Area. Additional evidence from *ad hoc* field work conducted prior to this survey suggested the presence of about 14 rhinos in the same area, with an additional four rhinos in surrounding logged forest (Payne, 1982). Five teams (SFD, SF and WWF-Malaysia) who surveyed within about 18,500 ha of logged forest in the northern and eastern parts of what is now TWR, 27 October – 7 November 1983, found evidence of a minimum of five rhinos in those areas, outside the core area, including one immature individual (Payne, 1983).

There was evidence that at least 11 rhinos were poached in Sabah between 1980-84, with three cases being in what is now TWR (Anon., 1985). In June 1986, about 157 km was covered on the ground by three teams within 11,700 ha of Tabin core area forest (SFD, Sabah Rhino & Wildlife Conservation Committee and WWF-Malaysia). A minimum of six rhinos were using the core area at that time, of which one was immature (Payne, 1986). The survey report noted that this result indicated a higher population density of rhinos in the core area in 1986 than in 1982, but that this was most probably due to the rhinos avoiding surrounding logging operations.

A wildlife survey conducted by the Sabah Wildlife Department (SWD) in 1995 reported the existence of an estimated population between 9-20 rhinoceros in the TWR area (Ambu, 1995). In 1997, rhinoceros survey was conducted to estimate the population in TWR. It covered a nominal area of 21,000 ha (17.5% of the total area of TWR), based on the survey results there were three known, five probable and nine possible rhinoceroses in TWR (Boonratana, 1997). An expedition conducted in 1999 by Universiti Malaysia Sabah in TWR found evidence of at least three rhinoceros residing in the Tabin “Core Area” (8,550 ha; now known as Mount Hatton Protection Forest Reserve) and surrounding forest at that time (Jomitin, 1999).

No consistent logistics or methodologies were developed out of these surveys for continued use; therefore, future surveys continued to be inconsistent, presumptive and irreproducible. Different areas were surveyed for different numbers of days. Various surveys were separated by long periods of time and used different measures for

evidence of rhino and different expertise. Some areas were never covered. Therefore, to gain any useful impression of the numbers of rhinos in Tabin some standards had to be established.

1.5 TWR rhinoceros survey SOSRB -2000 - 2004

Starting in 2000, SOSRB began to develop more systematic surveys of Tabin. Consistent surveying and data collection performed by consistent expertise had to be developed. Personnel had been trained on identification technologies as well as tracking procedures. The transect survey method was instituted to provide a regular framework for training rangers and developing techniques. It also provided information on the occurrence of rhinos in unexplored areas as well as areas known to have rhinos.

Transect Survey periods encompass the completion of the survey of the 8 established transects within TWR. An earlier transect period conducted between 2001-2002 established protocols and experience among rangers. Two periods were completed in one and half years between 2005 and 2007. The reference transect is the existing road from the Tabin wildlife office in the west to the “Core Area”, a distance of 22 km; it is extended to 42 km to the east using a line transect. From this 42-km reference transect, eight linear transects were made: north and south transects at KM7, KM22, KM32 and KM42. Along these transects, small base camps were established at five km intervals. From each of these base camps, the teams made four temporary transects, one in each compass direction, of approximately 5 km per transect. The survey results are attached in Appendix-5. In the one and half year time period we conducted 30 random transect surveys in TWR. From these transect surveys 16 incidents identified rhinoceros footprints in different places. During the transect survey rhino footprints were frequently found at the Core Area (km 32), the valley of the rugged hill and the southern area of km 3-7. The km 3-7 is the area where the RPU consistently find clear tracks of the rhino with other signs such as rhino dung and feeding signs. One of the tracks was believed to be that of a young rhino with adult. Sungai Burung is also recognized as one of the active areas for the rhinos.

Bosi *et al.*, (2005), analysis of results from 2001 to 2002 transect surveys of an area of 55,000 ha of TWR estimated the presence of 6 rhinos, with 16 probable and 32 possible individuals. Similar surveys conducted from 2004 to 2006 revealed that there were 12 known rhinos presence in TWR.

A more focused transect study covering 48 sq km during June 2004 to January 2005 (Thayaparan.s, 2006) found nine sets of fresh (Less than to weeks) rhinoceros footprints. This study on footprint evidence combined with other signs indicated a possibility of 15-25 rhinos in TWR.

These transect surveys covered areas of Tabin repeatedly, which provided evidence for rhino areas assuming they maintain their territorial locations. However, the long periods of time in which they were conducted resulted in increasing the chance of counting rhinos in overlapping territories and thus the chance of recounting of animals. This problem was addressed by surveying for rhino at the same time with “many people in the forest at once” surveys of as much area as possible presumably

far enough apart to avoid recounting of animals. SOSRB conducted two of this type of survey after 2000 one in 2002 and the other of this report.

1.6 TWR rhinoceros survey SOSRB - 2007

We had planned to perform this survey in October of 2006 to have it occur as close to the other surveys of 2006, but early occurrence of the rainy season postpone the effort.

The survey was postponed to 1 - 12th March 2007, with the following objectives:

- a) ___To estimate the current population size of Sumatran rhinos in TWR.
- b) ___To identify if there are signs of breeding in the Tabin rhino population

2. SURVEY METHODS

2.1 Organization and Teams

An organizing committee for the Tabin 2007 rhino survey was formed in 2006 and chaired by SWD, with S.Thaya as secretariat of SOSRB and J. Payne of WWF-Malaysia as coordinator; detailed preparations were done in February 2007 (Appendix 1). TWR was divided into 12 survey blocks, chosen to cover all areas where rhino signs had been found in the past, as well as parts of TWR where rhinos have not been previously located. The block one, two, three, four, five, eight, and nine had been identified previous rhino areas and the blocks six, 10 and 11 had never been identified with rhinos previously. One team of five persons was assigned at random to cover each of the blocks (Appendix 2). Forest entry and exit points were determined in advance for each block. The survey was conducted 1 - 12th March 2007, including time for arrival of all teams to the SOSR headquarters, training, survey days, return to headquarters, and debriefing. The dates were chosen based on the expectation of suitable weather conditions (moderate rainfall) and to allow participation of the all interested individuals and institutions.

2.2 Training

In view of the large numbers of participants of differing experience and institutions, two forms of training were held prior to the survey.

1. Rhinoceros survey briefing
2. Protocols : a. Data sheet recording, b. GPS recording training, c. Foot print identification technique, and d. First Aid training

2.3 Rhino Survey Briefing

Participants with prior experience of rhinoceros field work gave briefings to all survey participants on 1st March at Tabin SOSRB HQ. Issues covered included:

Identification of signs of rhinos (footprints, rub marks on tree trunks, faeces, signs of browsing, and wallows); the need to follow any fresh rhinoceros tracks was emphasized; protocols for recording locations and sizes of footprints

The freshness of rhinoceros tracks was to be recorded using the following principles:

- a) Fresh: a few hours old; wet mud smears, fresh browse and clean prints having very few or no leaves in them.
- b) One week or less: Footprint is still clear but dry, and the sides cracked. Foot prints are usually partially seen due to recent fall of dead leaves.

The maximum width between inner and outer toe varies between about 16 cm (juvenile rhino) to 19 cm (roughly one to two years old) to 21-23 cm (mature rhino). All animals with a median track width of left foot hind less than 17.0 cm are to be considered as dependent young. Other animals were assumed to be either sub-adults or adults (Van Strien, 1986, Flynn & Abdullah, 1983).

2.4 Data recording

Standard sheets were provided for recording data on rhinoceros signs, illegal hunting activities and other wildlife signs (Appendix 3). In addition, routes walked in the forest were drawn daily on to photocopies of 1:50,000 scale topographical maps and descriptive notes written in note books.

3. RESULTS

3.1 Estimate of minimum number of rhinos and evidence of breeding

Based on the data (Table 1 and 2), the following assumptions can be made : minimum of two rhinos in block 12; minimum of one rhino in block 3; minimum of one rhino in block 5; minimum of one rhino in block 1. These are all considered to be different rhinos, based on the wide spacing between the records. The twisted sapling found in block 7 was very old and may have been made by a rhino from a different block. This gives a minimum of five rhinos in Tabin Wildlife Reserve. Footprints of rhinos in blocks 12 and 3 were rather small, suggesting an immature rhino at each site.

Table 1. Summary of records of rhinoceros foot prints in Tabin Wildlife Reserve, 2 – 9 March 2007

Block No.	Date	Rhino footprint width (cm)	GPS location	Team No.	Conclusion and notes
3	3/03	17-18 19-20 19-21	E 118° 39' 07.1" N 05° 20' 07.6" E 118° 39' 25.1 N 05° 19' 25.3" 50 m away from the previous location	5	3 locations of foot-prints found; 1 -2 week-old & 2 day- old prints, probably a single rhinoceros; signs of feeding on <i>Aglaia</i> and <i>Ficus</i> , and urine spray; based on footprint width measurements, possibly immature rhino
5	9/03	20.6	E 118° 46' 54.4" N 05° 19' 25.5"	12	No age estimate, but presumed more than 1 week
12	3/03	20.5, 18.4, 20.0, 20.8, 22.5, 19.5, 18.8, 19.0, 21.4	1 hour's walk before camp at E 118° 32' 976" N 05° 09' 646"	2	Ridge top at 1,200 feet above sea level; estimated age not recorded, but presumed more than 1 week; based on footprint width measurements, possibly mother and immature rhino
12	4/03	21	E 118° 34' 177" N 05° 08' 464"	2	Estimated age not recorded, but presumed more than 1 week

Table 2. Other rhino signs of rhinoceros in Tabin Wildlife Reserve, 2 – 9 March 2007

Block	Date	GPS location	Team	Rhino signs
1	4/03	E 118° 33' 33.0" N 05° 16' 38.7"	10	Feeding signs and twisted saplings; age not estimated, but old
7	9/03	E 118° 42' 08" N 05° 11' 28"	6	2.5 m tall <i>Pternandra</i> treelet, snapped over and twisted at 1.5 m, between stream and old road; many months old, no other rhino signs
12	4/03	E 118° 32' 673" N 05° 09' 901"	2	“Twisted” (no other details)

3.2 Human encroachment

Clear signs of human encroachment were reported in six blocks (Table 3). Together, they suggest continuing, frequent encroachment in many parts of TWR.

Table 3. Signs of unauthorized human activities in Tabin Wildlife Reserve, 2-9 March 2007

Block	Team No.	Forms of activity/ encroachment
2	1	4 March : cut trails, about 2 weeks old along upper Urit river. 7 March : fresh human footprints; gun shot heard at night, to the east, inside TWR 8 March : cut trails, judged to be frequently used, along Tagas-Tagas River
4	4	3 March : abandoned camp containing cooking utensils and uncooked rice stock (E 118° 42' 50" N 05° 19' 52") 4 March : fresh carcass of sambar deer killed by humans (E 118° 42' 45 N 05° 19' 32") 8 March : fresh human foot prints at E118° 40' 19" N 05° 18' 03"
6	8	2 March : signs of poachers (discarded batteries, plastic bags) along stream bed 5 March : poachers tents and abandoned camp near Tabin river (photo) 7 March : signs of poachers
8	11	2 March : boundary stone, marked 659/753, uprooted and moved (E 118o 44' 01.5 N 05o 10' 19.1"; photo) 3 March : fresh prints of "Adidas kampong" shoes (E 118o 43' 37.7") 4 March : many new and old shoes prints (E 118o 43' 7" N 05o 11' 19.7")
10	9	Date: 4 March : "villagers" three men with fishing lines and bags of fish (2-3 kg). 5 km from TWR boundary; claimed they "came in to do fishing" 5 march : 6 old gun cartridges, 2 old batteries (D size) 6 March : heard gun shot at 03.17 hours, location inside TWR, about 5 km from the TWR boundary
11	7	4 March : Signs of about 2-4 persons present two days ago (E 118° 53' 28.3" N 05° 11' 58.1")

3.3 Mineral sources

A salt water spring was found in block 2 at E 118° 36' 4.1" N 5° 15' 37.8". The location suggests that this is the same one as visited in February 1980 by J. Payne, Saimon Ambi, Rashid Saburi and Pirian Mat Salleh; at that time no signs of large mammals were found nearby (J. Payne, pers. comm.).

3.4 Other wildlife records

Records of large mammal species obtained during the survey 2-9 March, are summarized in Appendix 3.

4. DISCUSSION

4.1 Rhinoceros

The results show a minimum number of five rhinos in TWR in March 2007 that are widely scattered. Two of these in blocks 3 and 12 appear to be immature. Surveys conducted in TWR by SOS-Rhino during the preceding year suggested the presence of 16 rhinos. The rhinoceros GPS location map attached in Appendix-5 for 2005 and 2006 survey conducted for rhino estimation. The small number and old age of the rhino signs found during the March 2007 survey do not permit a truly fair estimate to be made of the minimum number of rhinos remaining in TWR (See Discussion below).

When compared to survey effort and results from TWR during the 1980s, however, the March 2007 results suggest that rhino numbers are lower than existed 20-25 years ago in the same area

As noted above (Previous surveys on Sumatran rhinoceros in TWR), “rhino footprints were found commonly in many of the central parts of what is now TWR during the period 1981-83”; “a survey similar to that conducted in March 2007, done in August 1982 by only six teams within a total area of 24,000 ha, found evidence of a minimum of seven rhinos, two of which were immature, along about 250 km of survey routes in and around the present core area. Additional evidence from *ad hoc* field work conducted prior to this survey suggested the presence of about 14 rhinos in the same area, with an additional four rhinos in surrounding logged forest”; “five teams who surveyed within about 18,500 ha of logged forest in the northern and eastern parts of what is now TWR, 27 October – 7 November 1983, found evidence of a minimum of five rhinos outside the Core Area, including one immature individual”; “in June 1986, about 157 km was covered on the ground by three teams within 11,700 ha of Tabin core area forest a minimum of six rhinos were using the core area at that time, of which one was immature”. All this was in spite of the fact that “there was evidence that at least 11 rhinos were poached in Sabah between 1980-84, with three cases being in what is now TWR”. In contrast, the greater survey effort in March 2007, by more teams over a wider **area ? km covered within ??? ha**, found evidence of only five rhinos.

There have been no reports of poaching of rhinos in TWR over the past fifteen years and since 2000, SOS-Rhino has continuously assisted the government authorities in monitoring and protecting of TWR and its rhino population. These observations suggest that, despite the evidence of illegal human activities in TWR, major incidences of poaching have probably not occurred since the 1980s, but number are so low and area so large individuals could be missed. Their loss would represent a significant drain on the TWR rhino population

Breeding success of Sumatran rhinos in Cincinnati Zoo, USA, with three births since 2001, indicates a birth interval of about 22 months. This rate is higher than observed in the wild for Asian elephants and orang-utans. The elephant population in lower Kinabatangan, for example, appears to have increased from around 100 to over 150 over the past decade (unpublished observations by Kinabatangan Orang-utan

Conservation Project/HUTAN and WWF-Malaysia), despite increased habitat fragmentation and an overall decline in the size of habitat.

In contrast, the amount of habitat available in TWR has been stable since the 1980s. Perhaps habitat quality has declined. To date, there is no evidence that primary old growth forest is a better habitat for Sumatran rhinos than is logged forest. Although many parts of TWR were heavily logged during the 1980s and early 90s, and regeneration is very poor in terms of timber trees, there seems to be an abundance of rhino food plants throughout most of TWR. It would seem highly unlikely that food is in any way a limiting factor for rhinos in TWR. An observation by many observers over many decades suggests that the Sumatran rhino is a species of closed canopy forest, rarely venturing into open spaces. It is likely that this is linked to the rhino's need to behave in ways that allow it to remain as cool as possible at all times (e.g. wallowing, resting on ridges and in shady gullies, staying away from direct exposure to the sun), rather than to a preference for closed canopy forest plants.

The implications are that, in spite of protection measures and adequate habitat, the TWR rhino population has not increased over the past 25 years, and may have declined in numbers. These observations pose a great concern. Why might the TWR rhino population have stagnated or declined? One contributory factor might be stress from human encroachment and undetected poaching incidences (see below). However, factors at this point that put this particular population at risk are: (a) the number of potentially breeding individuals is very, very small, and (b) they are so scattered that even fertile individuals may not get to meet.

4.2 Survey methods

It is not clear that the type of survey done in March 2007 (similar to those done in the same area in the 1980s, 90s and 2002) is really an optimum method to obtain an estimate of the minimum number of rhinos present. Findings from this type of survey “many teams walking through simultaneously” approach depend a great deal on luck, since chances of missing rhino with a one line pass particularly in large areas are great. For instance, a similarly – arranged survey in 2002 found no evidence of rhino in Tabin at all. In fact, surveys that spend more time in the forest pick up more rhinos such as the SOSRB transect surveys (2005-2006) and survey by [\(Thayaparan.s,2006\)](#) in a smaller area in Tabin. As indicated by Strien (1985), without extended survey periods, surveys of rhinos tend to yield only a rough estimate of the minimum number of rhinos present, and may significantly under-estimate the actual number of rhinos.

Despite the training done immediately prior to these surveys, and the fact that experienced people were chosen to be involved in the March 2007 survey, few teams provided a clear and detailed map of their entire survey route, with annotations of camp sites, rhino records and human encroachment records. There was too much reliance on data sheets and on GPS sets as a means to capture data, and insufficient descriptive and analytical narrative in notebooks. Team leaders were expected to be responsible for writing a short summary in their field notebook of what their data

means in terms of rhinos. The variability in the quality of reports and data sheets compromised interpretation of the results of the survey.

4.3 Human encroachment

The signs found in blocks two and four indicate access by poachers from the Tomanggong oil palm plantations; similarly, the signs in block six, eight, 10 and 11 indicate access from several oil palm plantations on the south side of TWR. The fact that gunshots were heard within blocks two and 10 during the survey period, several kilometers inside TWR should be cause for concern. It is clear that there is minimal control of human access into TWR.

The claim by persons found in rhino survey block 10, several kilometers inside TWR, to be “fishing” is implausible. The occurrence of gun shots in that block and in block two, far in from the Reserve boundary, suggests that groups enter TWR to seek and kill rhinos. It would seem highly unlikely that people would travel so far just to obtain meat. Most likely, these groups have mixed motivations, a combination of recreation, fishing, and hunting for meat – and the added thrill and potential lucrative bonus of bagging a rhino.

Although it has been argued (above) that poaching of rhinos in TWR may have been very rare in recent years, this observation may be relative to the small population of rhinos in such a large area. Loss of a single rhino at this point would be a major drain on the population. The extent and boldness of human entry into TWR, with guns, is alarming. Minimizing such entry must be considered as a high and permanent priority if there is to be any hope that a healthy rhino population will return to Tabin

The efforts of SWD assisted by SOSRB with significant financial outlay are evidently insufficient to have adequate impact on levels of human encroachment. Presently the rhinos in Tabin cannot be secured. TWR is a Forest Reserve, in which access is governed by the Forest Enactment 1968, yet efforts to control access and unlawful use are being overwhelmed. Additional or new measures will have to be considered if there is to be hope for the Tabin animals. Two possible unexplored opportunities may be: (a) armed guards (e.g. from the Malaysian armed forces) charged with the job of keeping people out of the forest and/or (b) close and constant liaison with *all* plantation managers operating around the entire TWR perimeter, seeking their help to keep people using the plantations as a means of access into TWR, combined with a need to find legal means to penalize the managers or plantation owners if their workers are found inside TWR. Continuing with the present system would be financially and logistically pointless.

4.4 The key issue

The most endangered wildlife species in Sabah is the Sumatran rhinoceros. There is a high risk that it may become extinct within just a few more years. It is far more endangered than the elephant, orang-utan, sun bear, clouded leopard or tembdau,

all of which, barring unexpected natural disasters, can be expected to survive for at least another few centuries at least.

The Borneo rhino must become and remain the highest species conservation priority for the Government of Sabah. All possible threats must be reduced, and all possible means to boost the species' chance of survival must be considered, decided by the relevant authorities, and the decisions acted upon.

The Borneo rhino is the only genetic resource left to the world population of Sumatran rhino. Sabah must make contributing to the gene pool their highest priority. Sabah must secure this rhino's future as well as the species as a whole

5. CONCLUSIONS

The March 2007 survey shows a minimum number of five rhinos in TWR, widely scattered, with two of those five possibly not fully adult individuals.

The actual number of rhinos remaining in TWR is believed to be significantly higher from the records from SOSRB previous surveys.

There is doubt as to whether the “many teams walking through simultaneously” approach to estimating numbers of rhinos is the best approach. Information from this survey suggested that luck, as well as the composition of teams, and differences in survey methods used between teams, combined to yield variable and unreliable results. Reviewing information from all surveys suggests deployment of a small number of the same, highly dedicated people moving from one site to another over a period of weeks or months may produce better results.

Comparison of recent surveys and the March 2007 with results from TWR during the 1980s, reveal that rhino numbers are lower than existed 20-25 years ago in the same area.

The amount of habitat available in TWR has been stable since the 1980s. Habitat quality probably has not declined for rhinos. These observations suggest that the apparent stagnation in breeding amongst the TWR rhinos may in large part be due to the simple fact that the number of potentially breeding rhinos in TWR is so very small, and that they are so scattered, that even fertile individuals may not get to meet. Because we can not sex them there may not be enough fertile individuals

Despite effort by SWD and SOSRB human encroachment is still significant and out of control. Such frequent human disturbance is likely to cause further stress to the rhinos. Even if not, the more unauthorized people there are in TWR, the greater the risk is that one of them will succeed in killing a rhino. Poaching incidents have not been reported since the 80s; however, poaching of a single animal with numbers this low could be over looked and would be a significant drain on the population. Reducing such entry must be considered as a high and permanent priority in order to help ensure the survival of the present and future TWR rhino population.

6. RECOMMENDATIONS

6.1 Status of Rhino in Tabin

Overall, despite the differences in exact survey routes, distances covered and personnel involved, there is no evidence that the number of rhinos in Tabin has increased and some indication that the numbers are declining, particularly with respect to surveys initially done 15-20 years ago. Given the population is not growing and in consideration of the life span of this species, this population could be crashing. More information on the status of the animal would be helpful and securing the animal would be vital, but both of these conditions would have to be instituted immediately and take considerable more time and expense than even the significant amount of effort that has already been spent. Finding a way to secure these animals is paramount. The fate of the Tabin rhinos will depend on securing the land. Increasing populations of rhinowill need secured land. Securing Tabin must begin now.

6.2 Rhino survey work

The numbers and breeding success of rhinos in TWR remains unclear. Before any decisions are taken regarding conservation measures for the TWR rhinos, better information must be acquired and assessed with in the next year or rhinos must be removed to a safe environment.

Out of the surveys performed to date, the following methods and guidelines for performing surveys have been compiled. These should be used for future surveys for rhinos in Sabah.

- Divide a 1:50,000 scale topographical maps of TWR into blocks, the main criterion for choosing block boundaries being areas where signs of rhinos have been found in the past and where they have never or very rarely ever been found (based on all available data collected since 1980). The alignment of blocks should not be that chosen for the March 2007 survey, which was based on the convenience of teams and access routes for a short survey period.
- Employ a small team of highly competent and dedicated people to diligently inspect TWR for rhino signs, block by block, repeatedly. This should be a full-time team, with proven competence and interest in the job, whose sole job is to look for rhino signs. Part of the competence must include an ability to truly understand topographical maps, so that the team always knows where it is within about 150 meters of error, whether or not they have a functioning GPS set.
- The team should repeatedly survey blocks where rhinos are known to occur, and not waste time looking in other blocks where rhinos never or very seldom have been found. The team should always look for rhino signs where they think such signs might be found, and not waste time on pseudo-objective or pseudo-systematic designs.

- After years of recording precise measurements of rhino footprints, the value of such data remains unclear. The possible use of faecal DNA for determining individual rhinos must now be explored. This means that survey effort must be directed to seeking fresh rhino faeces, and collecting good samples of all faeces found.
- The team should cease relying too much on GPS sets, and ensure that every single rhino sign is marked and described, using a pen, on to photocopies of 1:50,000 topographical maps as and when the signs are found. Rain and other factors cannot be an excuse for not employing this method. This will help stop the unfortunate trend observed since the introduction of GPS sets, whereby no-one knows or can remember the location and details of rhino signs after the team has left the forest, unless someone has kept an annotated GPS record. GPS must be used as an aid in survey work, not an excuse for failure to record useful data.

These methods and guidelines are also recommended for units conducting translocation efforts.

6.3 Reduction of unauthorized human entry and encroachment into TWR

1) As mentioned above the high frequency and nature (use of guns) of unauthorized human entry into TWR poses a major threat to the continued existence or future presence of this species in Tabin. The population can be presently effected significantly by a single incident of poaching. Given that Tabin has been under the Forests Enactment 1968, Wildlife Conservation Enactment 1997, Firearms (Increased Penalties) Act 1971, but they have not helped to adequately reduce the threat indicates that more effective approaches are needed. We recommend that the laws be strengthened and attitudes of the judicial community and publi be changed. A strongly supported campaign of commitment and a statement must be delivered from the Ministry to create a sense of extreme risk if encroachment into Tabin occurs. This deterrence must be pursued or protetion of Tabin will remain a costly endeavor. This will be vital if the rhino is to have a future in TWR or Sabah.

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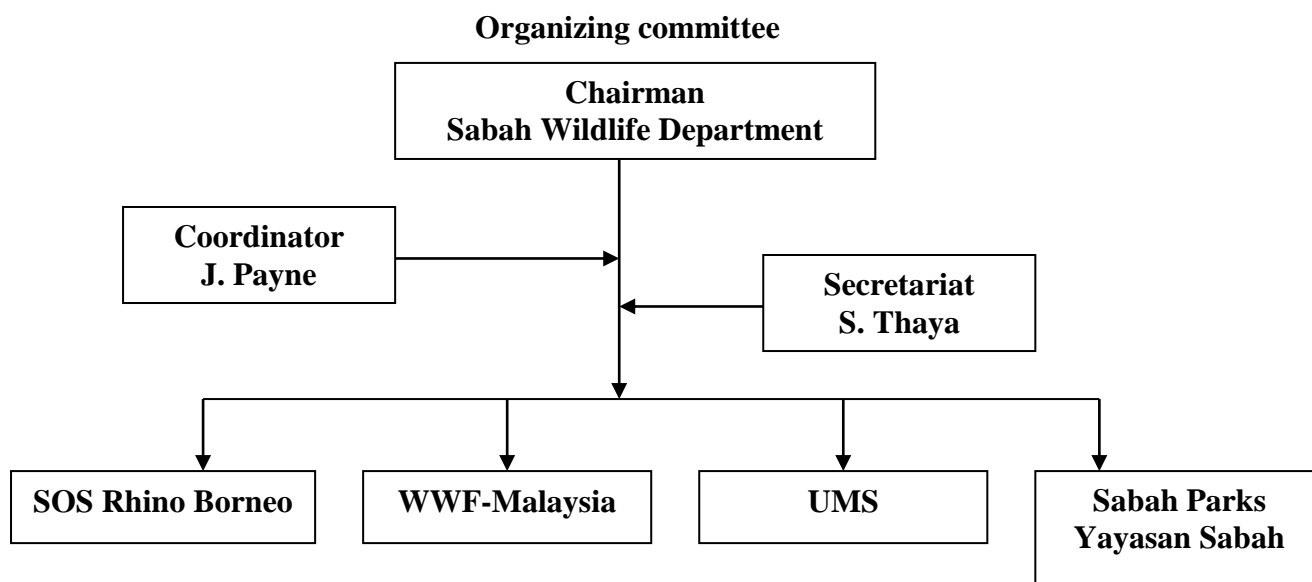
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8. APPENDIX

Appendix 1.

Tabin 2007 rhino survey organization chart and timeline



Activity	Place	Dates
First detailed planning meeting	WWF-Malaysia office	1/02/2007
Letter of invitation to all participants through SWD prepared by SOSRB	SWD and SOS HQ	5/02/2007
Final Meeting with all organizers	SWD HQ	12/02/2007
Meeting all team leaders final discussion	SWD HQ	21/02/2007
Establishment of Tabin camp in Tabin SOSRB HQ	TWR SOS HQ	25/02/2007
Purchasing of field supplies and Packing	Lahad Datu and Kota Kinabalu	25/02/2007
Rhino expedition	TWR	1-12/ 03/2007

Appendix 2.

Tabin 2007 rhino survey team composition & block

	Dept/Org	NAMES	MAIN RESPONSIBILITIES	Survey Block
Team 10				1
1	WWF	Rayner Bili	Team Leader	
2	SWD	Zulkifly Asiman	Assistant/ Data recorder	
3	SOSRB	James Sandiyang	Photographer	
4	SFD	Nelson Lintikan	GPS Recorder	
5	Sarawak FD	Sundai Silang	First Aid	
Team 1				2
1	SWD	Augustine Tuuga	Team Leader	
2	YS	Welly Frederik Tukin	Assistant/ Data recorder	
3	SOSRB	Dexvan Nuvin	Photographer	
4	SWD	Joseph Fabian Sipaut	GPS Recorder	
5	WWF	Jaini Impin	First Aid	
Team 5				3
1	SOSRB	Dr.Thayaparan	Team Leader	
2	SOSRB	France Bianus	Assistant/ Data recorder	
3	WWF	John Japil	Photographer	
4	SOSRB	Sarinos Anyong	GPS Recorder	
5	SP	Safrie Hatimin	First Aid	
Team 4				4
1	IRP	Arief Rubianto	Team Leader	
2	SWD	Muin Anson	Assistant/ Data recorder	
3	WWF	William Joseph	Photographer	
4	SOSRB	Marikus Suyat	GPS Recorder	
5	YS	Jamil Kasmin	First Aid	
Team 12				5
1	SOSRB	Amit Pilik	Team Leader	
2	SOSRB	Wilfred Yuya	Assistant/ Data recorder	
3	SWD	Remicks Jenner Meek Ron Hakim	Photographer	
4	SWD	Aidee Jamali	GPS Recorder	
5	SOSRB	Tinrus Tindok	First Aid	
Team 8				6
1	WWF	Joseph Gasis	Team Leader	
2	SWD	Madius Balandi	Assistant/ Data recorder	
3	SOSRB	Justine Segunting	Photographer	
4	SWD	Jaikim Kubis	GPS Recorder	
5	SOSRB	Medrus Kandor Suyat	First Aid	
Team 6				7
1	WWF	Junaidi Payne	Team Leader	
2	SWD	Mohd Aznandy Mohd Yakub	Assistant/ Data recorder	

3	SOSRB	Andrew Ginsos	Photographer	
4	WWF	Middle Seen Kapis	GPS Recorder	
5	SWD	Ibrahim Awang Ali	First Aid	
Team 11				8
1	YS	Jikos Gidiman	Team Leader	
2	SWD	Zul Azhan Awang	Assistant/ Data recorder	
3	YS	Mohd. Jusman Tarman	Photographer	
4	SOSRB	Erman Tara	GPS Recorder	
5	WWF	Richard Sanggul	First Aid	
Team 3				
1	SWD	Mohd. Soffian Abu Bakar	Team Leader	9
2	SOSRB	Yusri Madiun	Assistant/ Data recorder	
3	WWF	Gudil Gihud	Photographer	
4	SWD	Jefri Ebrahim	GPS Recorder	
5	SOSRB	Lukas Julius	First Aid	
Team 9				10
1	UMS	Dr. Abdul Hamid Ahmad	Team Leader	
2	SWD	Beddy Tuin	Assistant/ Data recorder	
3	SWD	Zulkarnian Hashim	Photographer	
4	SOSRB	Lusry Basri	GPS Recorder	
5	WWF	Patrick Sading	First Aid	
Team 7				11
1	IRP	Miskun	Team Leader	
2	SOSRB	Suhairin Putrah	Assistant/ Data recorder	
3	SOSRB	Milton Sat	Photographer	
4	SWD	Joe Fred Lansau	GPS Recorder	
5	YS	Edward Alimin	First Aid	
Team 2				12
1	SWD	Herman Stawin	Team Leader	
2	SOSRB	Suzali Jaya	Assistant/ Data recorder	
3	SFD	Geungnong Ah Jing	Photographer	
4	WWF	Albert Stawin	GPS Recorder	
5	YS	Ng Han Lee	First Aid	

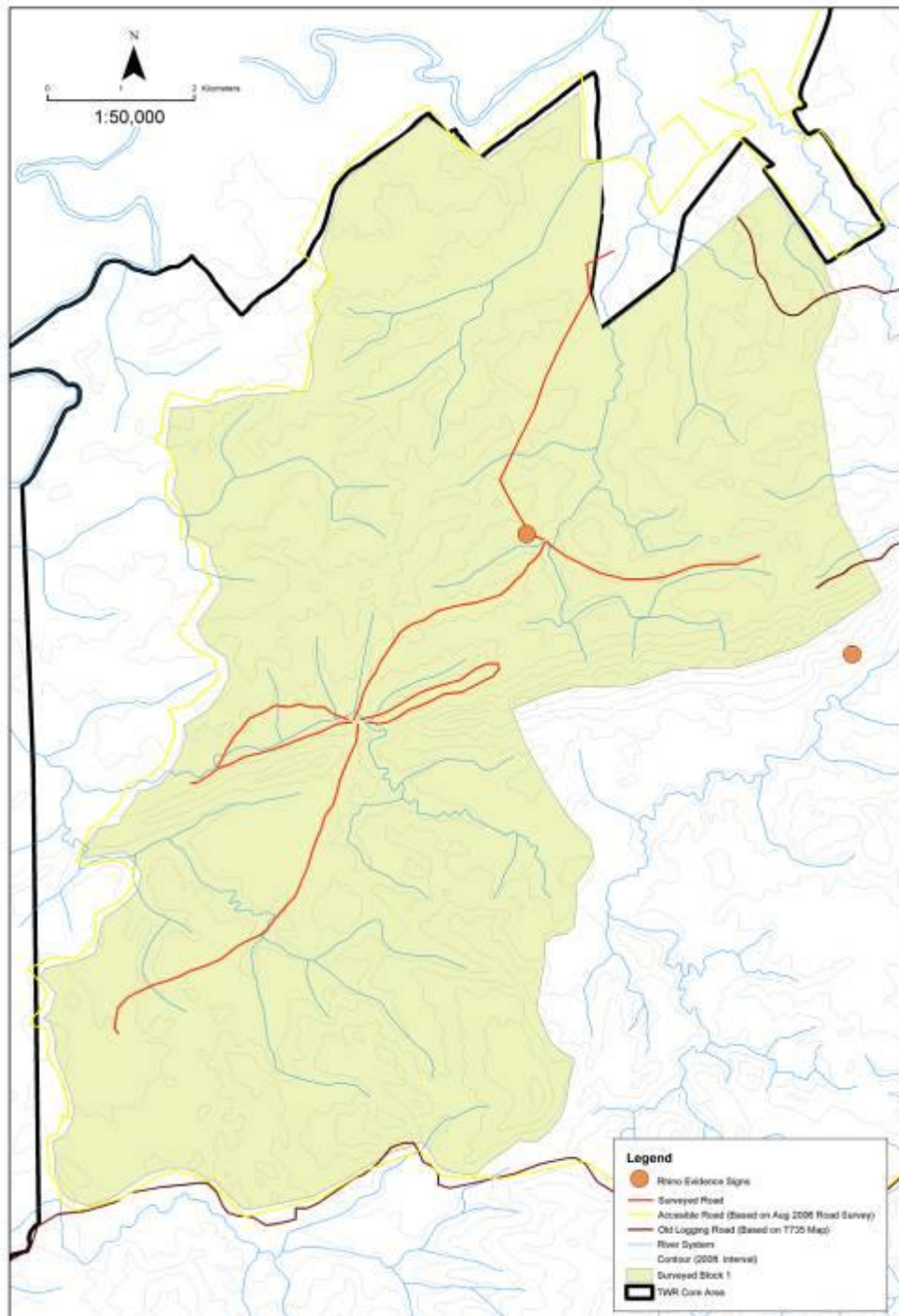
Appendix 3.

Mammals species recorded during the 2007 TWR rhino survey

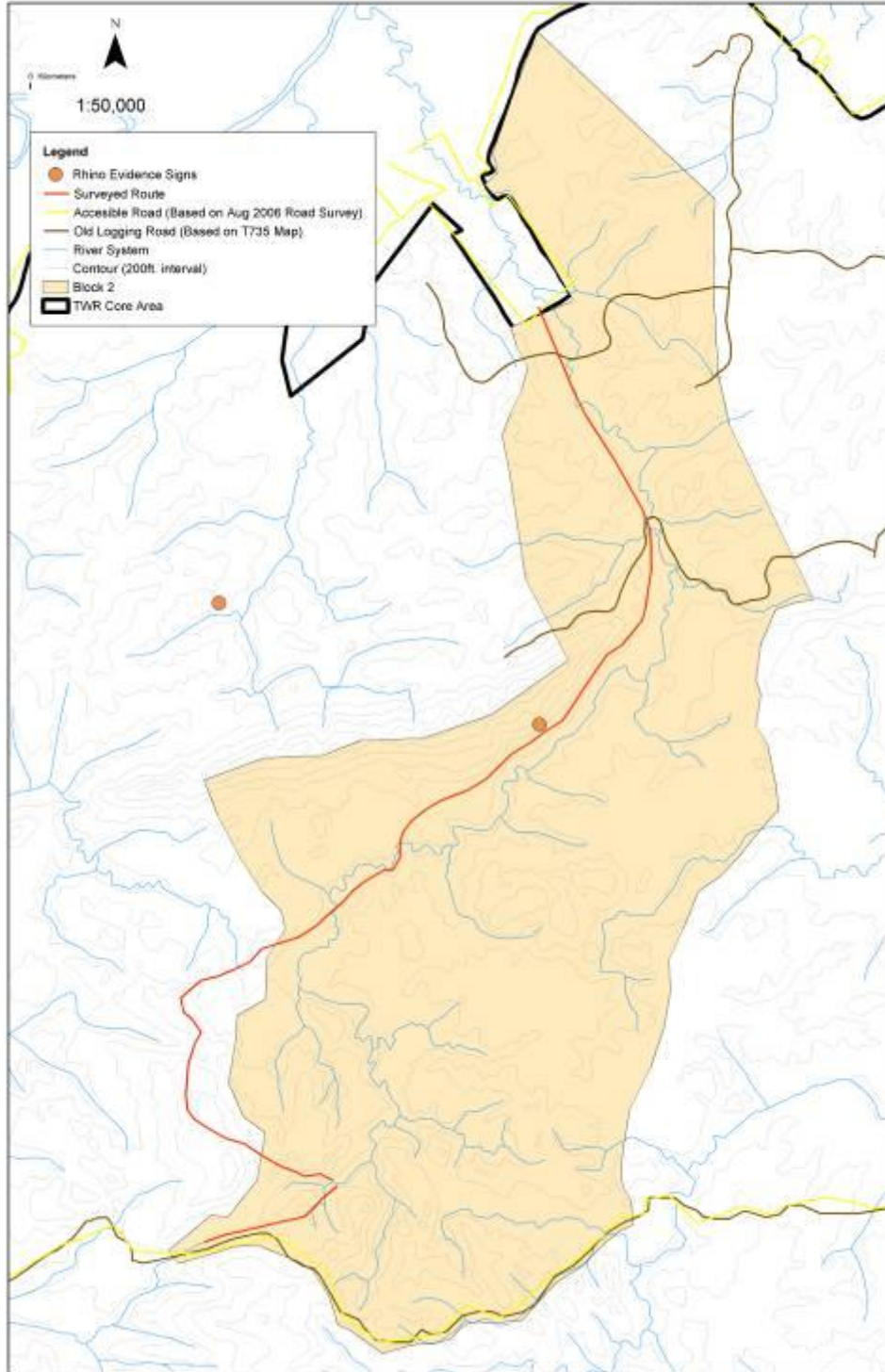
Species	Block No.											
	1	2	3	4	5	6	7	8	9	10	11	12
Asian Elephant <i>Elephas maximus</i>	X	X	X	X	X	X	X	X		X	X	X
Sumatran rhinoceros <i>Dicerorhinus sumatrensis</i>	X		X		X		X					X
Bearded pig <i>Sus barbatus</i>	X	X	X	X	X	X	X				X	X
Banteng <i>Bos javanicus</i>	X	X	X	X	X	X					X	X
Sun bear <i>Helarctos malayanus</i>			X				X	X				X
Clouded Leopard <i>Neofelis nebulosa</i>	X											
Sambar Deer <i>Cervus unicolor</i>	X	X	X	X		X	X			X	X	X
Muntjac <i>Muntiacus species</i>	X		X									
Lesser Mouse Deer <i>Tragulus javanicus</i>	X		X									X
Greater Mouse Deer <i>Tragulus napu</i>	X		X									X
Orang-utan <i>Pongo pygmaeus</i>					X	X	X	X		X	X	X
Borneon Gibbon <i>Hylobates muelleri</i>		X										
Pig Tailed Macaque <i>Macaca nemestrina</i>												X
Grey Leaf Monkey <i>Presbytis rubicunda</i>							X			X		
Red Leaf Monkey <i>Presbytis hosei</i>			X	X			X					

APPENDIX-4

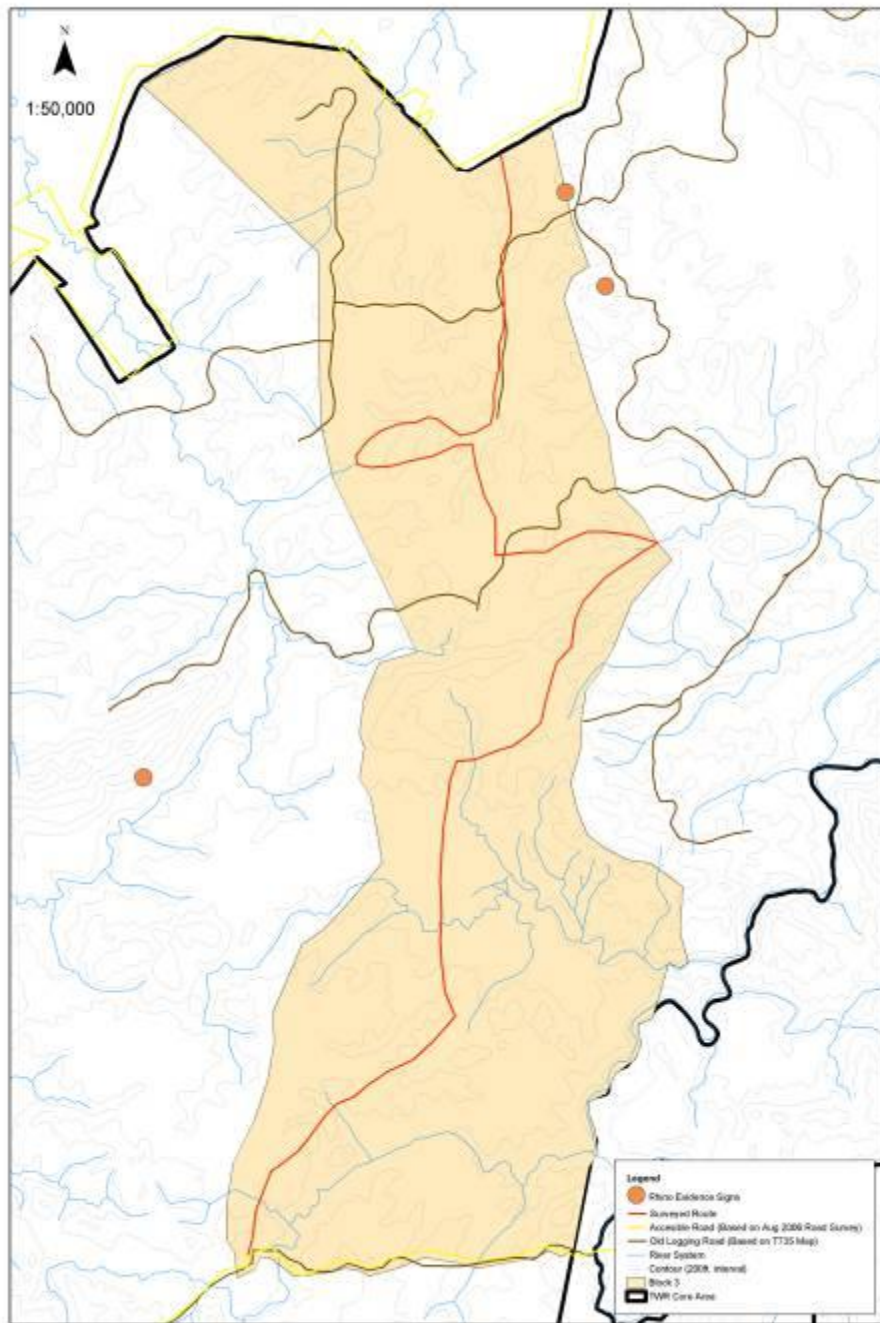
MAPS OF RHINOCEROS SURVEY- MARCH 2007



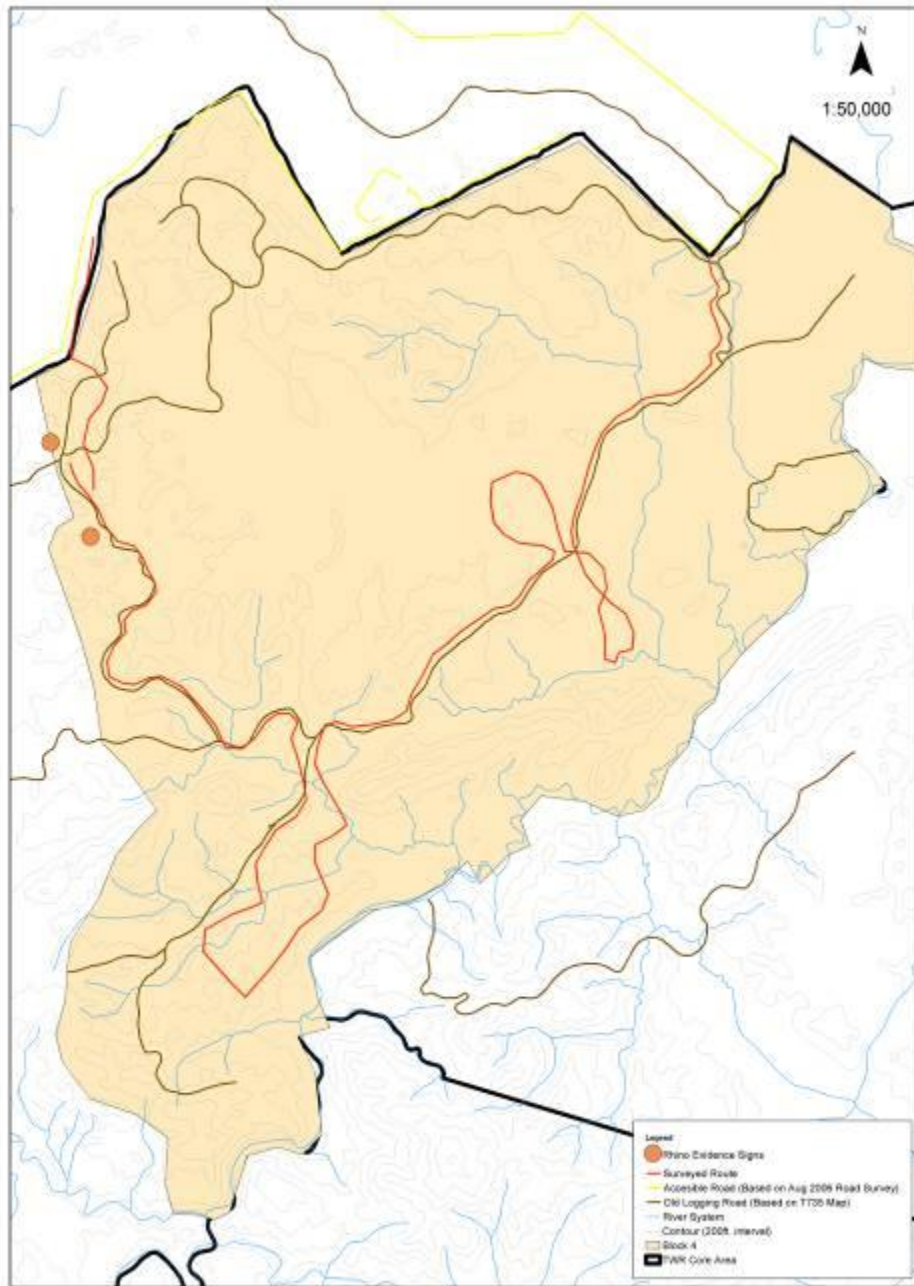
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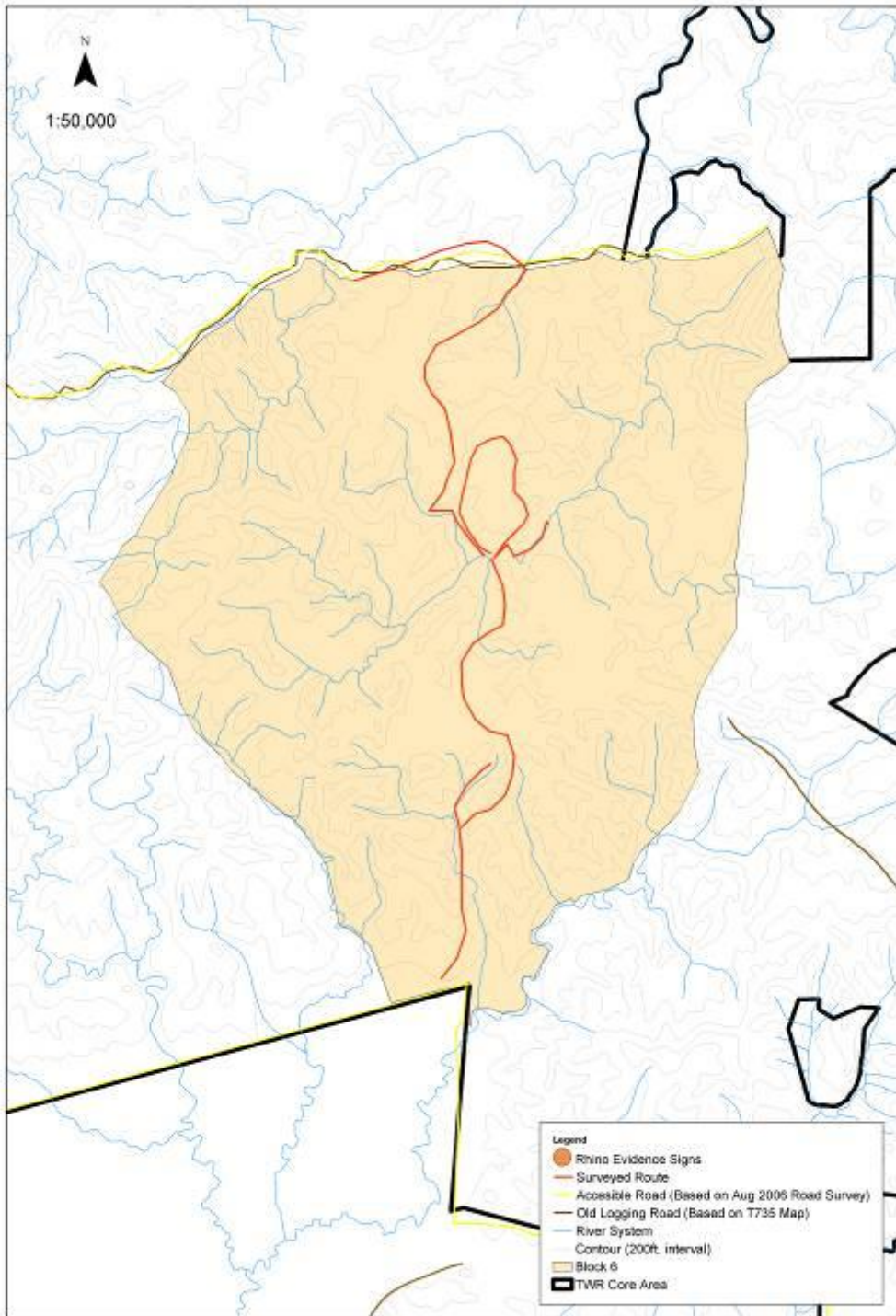
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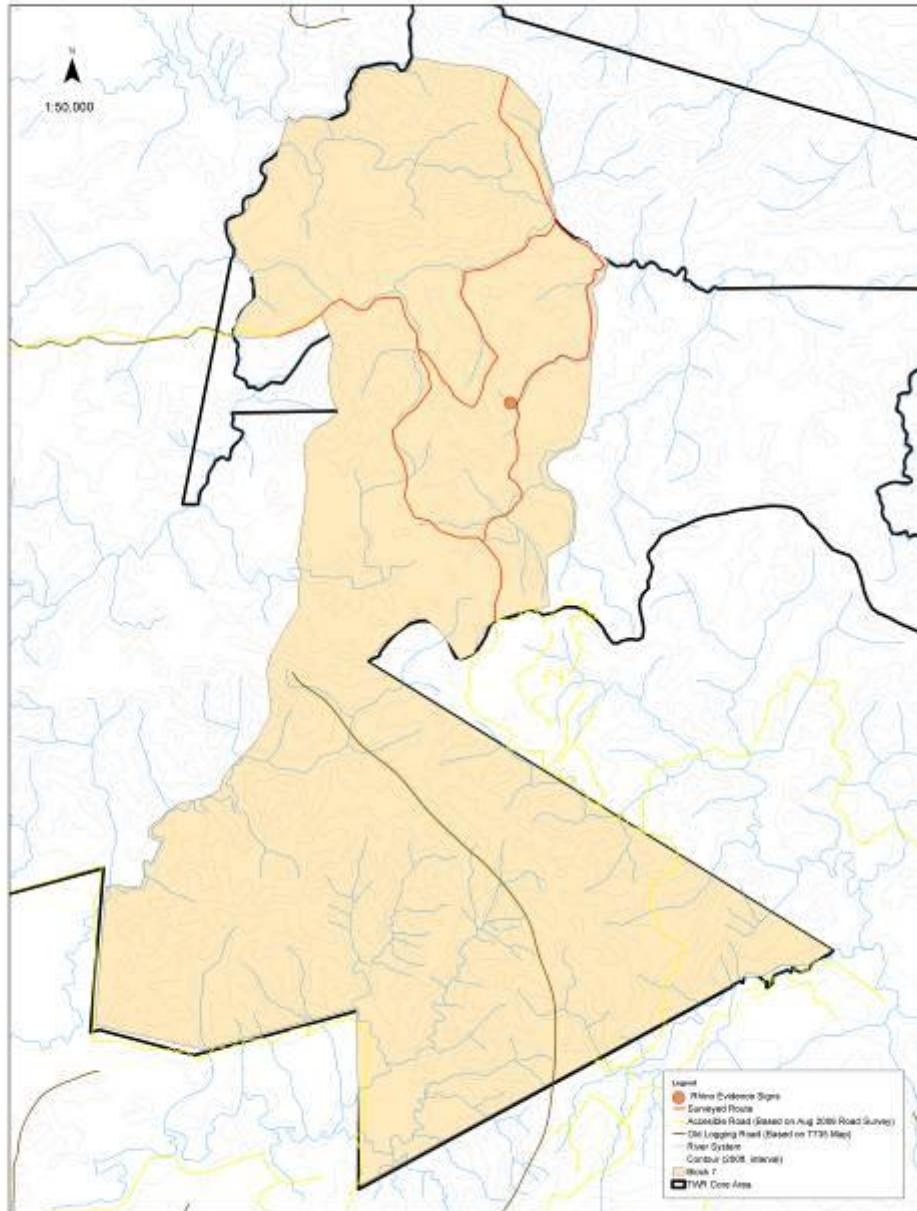
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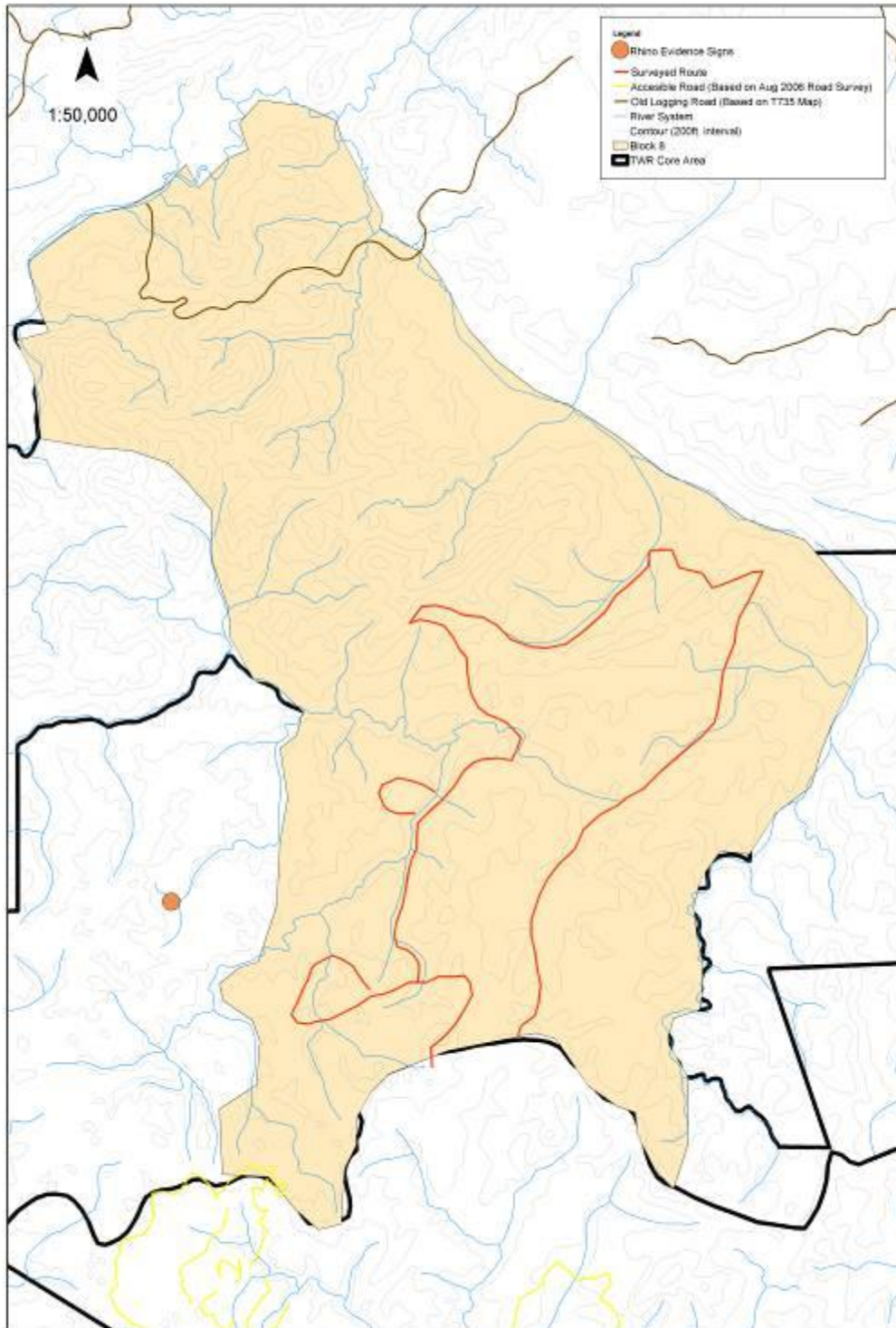
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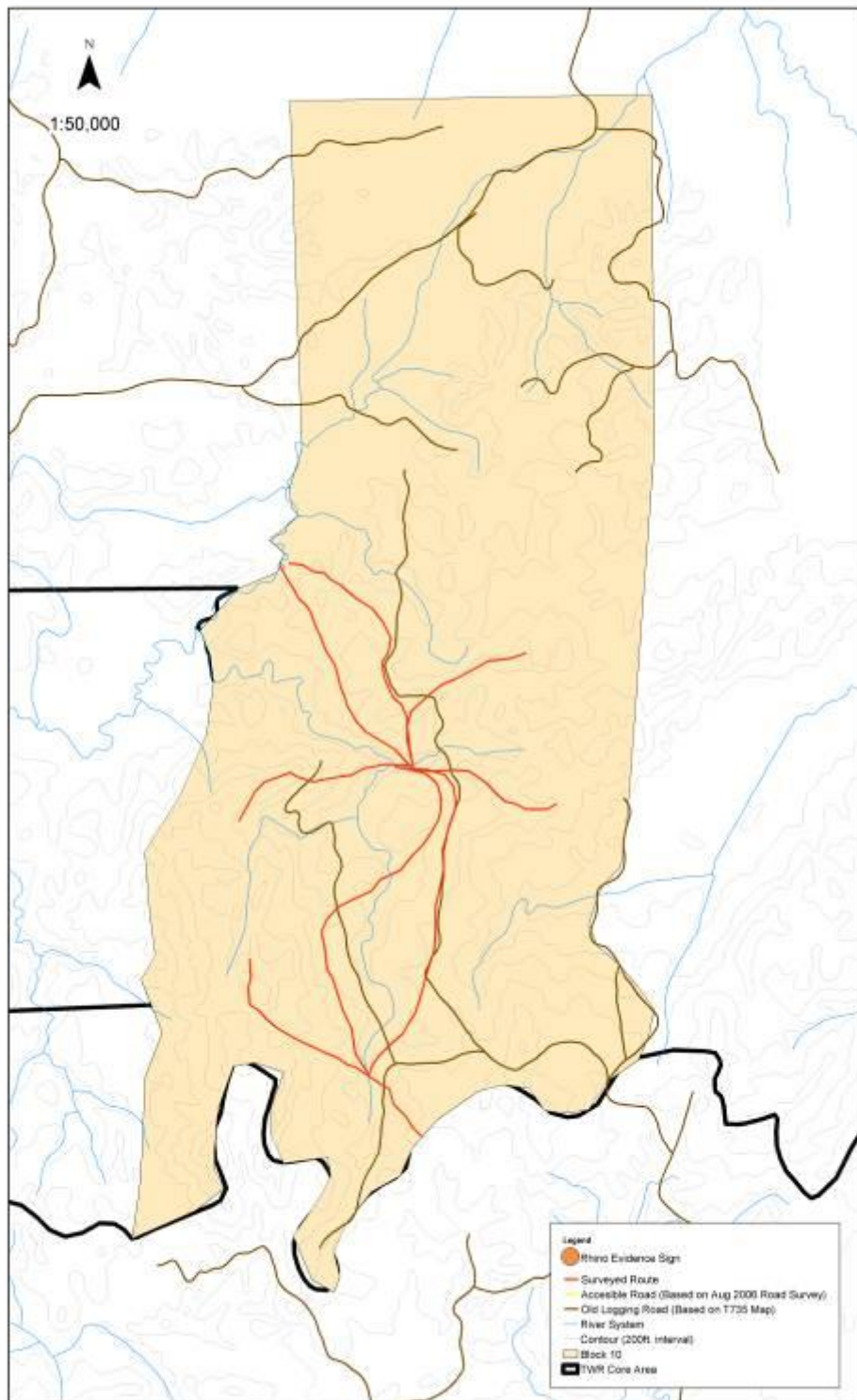
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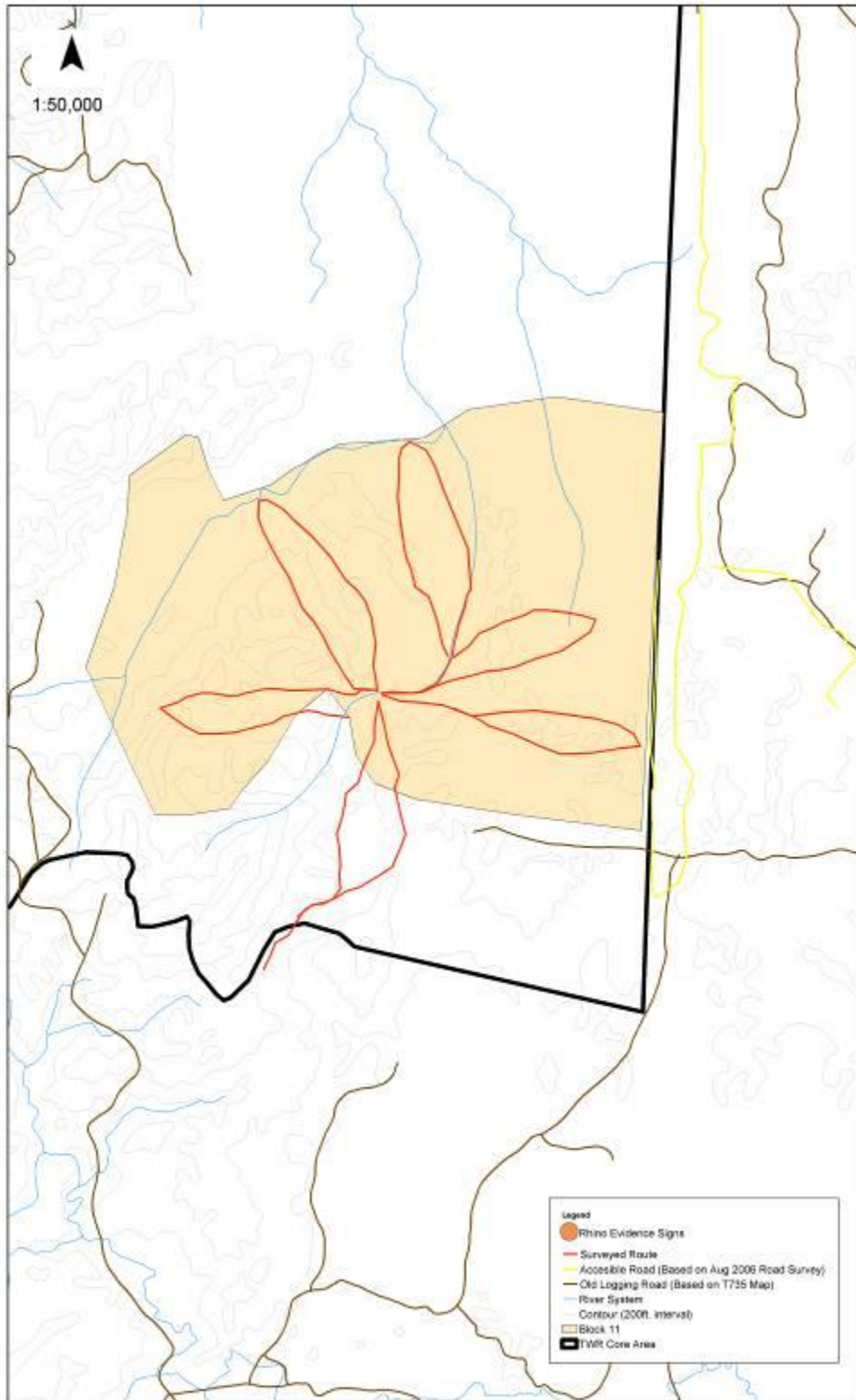
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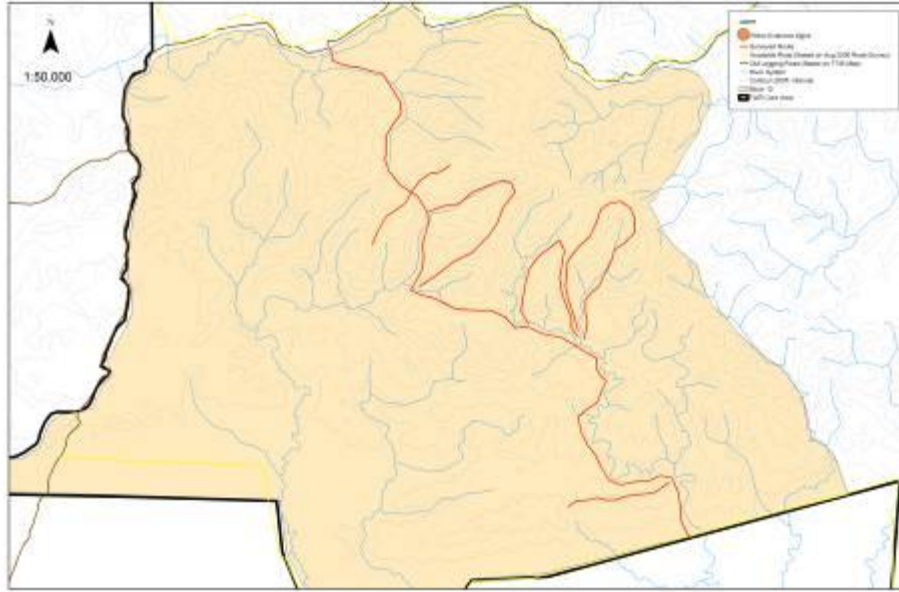
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Block-10

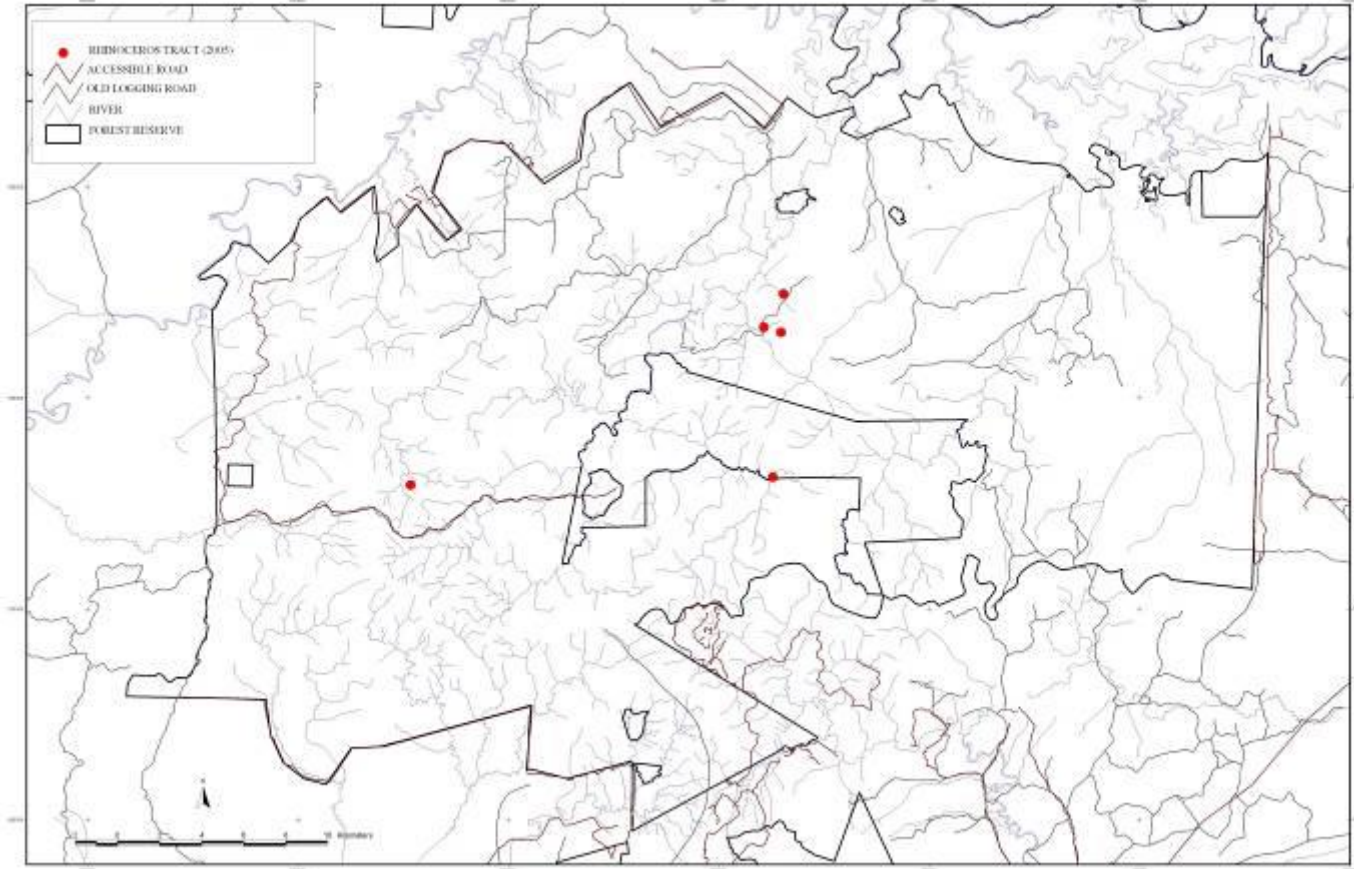


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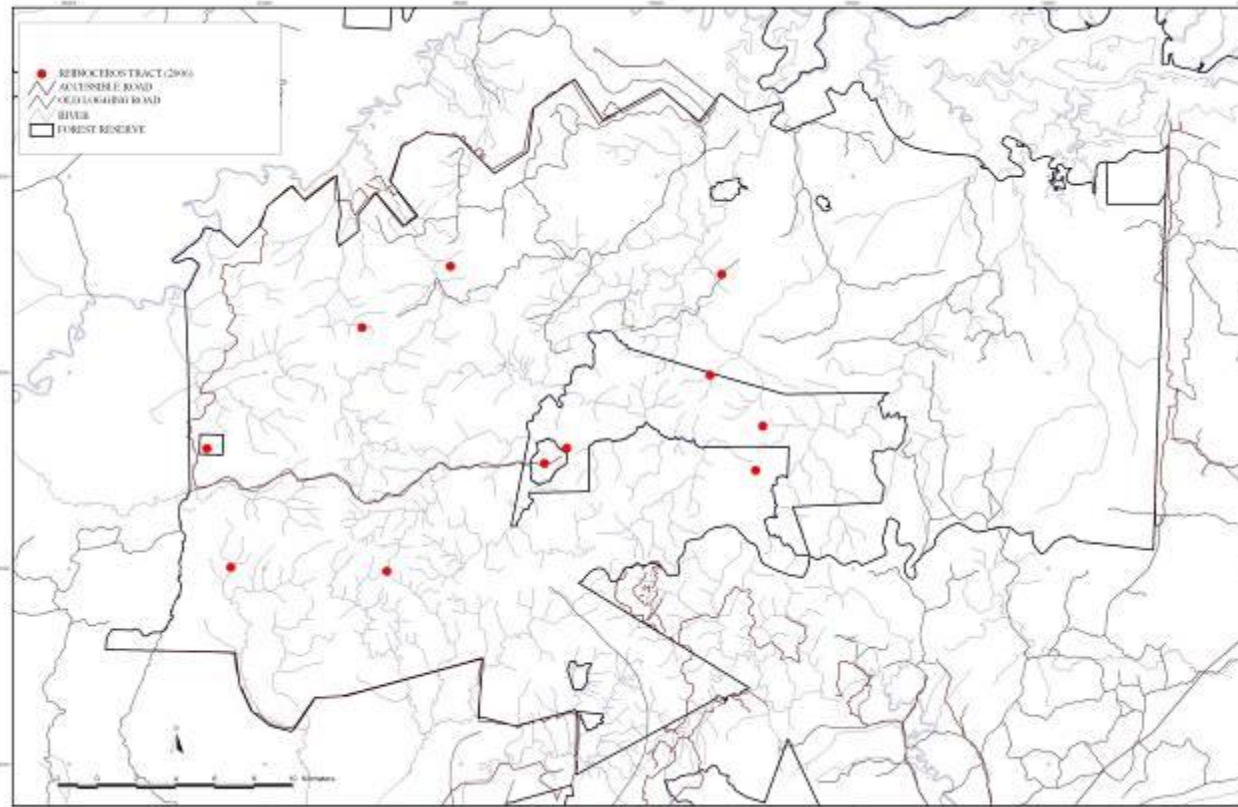


Block-12

Appendix-5 -Year-2005 rhino records



Year-2006 rhinoceros records



APPENDIX-6

PHOTOGRAPHS OF RHINOCEROS SIGNS AND ENCORACHEMNT SIGNS



Photo illustrating the first set of rhino foot print discovered in Area -12



Fresh active wallow used by rhino in Area-12



Horn marks made by rhinoceros in area-12



Second set of rhino footprint in Area-12



Twisted and broken tree eaten by rhinoceros in Area-12



Abandoned materials left behind the intruders in Area-4



Empty gun cartridge and cigarette in Area-4



Fresh Tembadau dung in Area-4



Empty cartridge found in Area-4



The first set of rhinoceros footprint found in Area-3



The second set of rhinoceros footprint found in Area-3



The active wallow used by rhinoceros in Area-3



Broken tree trunk by Sumatran rhinoceros in Area-3



Rhinoceros urine splashes on the leaves in Area-3



Abandoned camp by intruders in Area-6