Characteristics Of Sumatran Elephant Habitats (Elephas Maximus Sumatranus Temminck) On Tesso Nilo National Park And Its Surroundings On Riau Province

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Abstract: This study aims to determine the characteristics of elephant habitat found in Tesso Nilo National Park Pelalawan Regency, Riau Province. This research used survey method by conducting systematic sampling with random start in four locations elephant habitat are secondary forest, scrub, oil palm and acacia stands in Tesso Nilo National Park Pelalawan Regency, Riau Province. From the observation of elephant habitat, elephant habitat characteristics found in Tesso Nilo National Park are as follows: a) Habitat topography is relatively flat to gentle slope, b) There are feed sources from seedlings and saplings as well as herbs scattered in four habitat types , c) habitats close to water sources, d) habitats far from community settlements , e) habitats that have shade in the form of secondary forests and primary forests. Four habitat types ranging from secondary forests, shrubs, oil palm plantations and acacia stands are used by elephants as their habitat. The habitat is used by elephants as a location to find food, a place to rest and an elephant cruising track found in Tesso Nilo National Park, Pelalawan Regency, Riau Province.

Keywords: habitat, Sumatran elephant, Tesso Nilo National Park, elephant food.

1 INTRODUCTION

Sumatran elephants (Elephas maximus sumatranus) are a type of Asian elephant (Elephas maximus). Sumatran elephants are the largest terrestrial herbivores that still live on the island of Sumatra , Indonesia. With a great body Sumatran elephant have different habitat requirements with other animals.[1] states that the constituent physical components of the habitat consist of water, air, climate, topography, land and space, while the biotic components include vegetation, micro-fauna and macro-fauna and humans are unity and interact with one another to form a particular habitat. [2] also states that habitat is an area that has various components (physical and biotic) which are one unit and are used as a place to live and breed for wildlife. Sumatran elephants have extensive roaming space and different food needs from other animals. Sumatran elephants do a lot of movement in large ranges so often use more than one habitat type Habitat is used by Sumatran elephants to carry out their lives in the form of eating, breeding, and resting. Elephant habitat has its own characteristics that are different from other wildlife habitats such as food availability, water needs, to the type of forest where the elephant lives. Some types of forests used by elephants as the swamp forest, primary forest, secondary forest, lowland forests and tropical rainforests. These habitat types affect the movement of elephants from one location to another location. Movement elephant in home range - his often influenced by season (alternation season). On rainy season, elephant more like rain forest or primary forest. this because of food in it already enough for needs his life. While in the dry season, elephant hordes will head to secondary forests, especially in lowland forests and swamp forests. This is because in the area food and water sources are found when other places experience drought [3]. One of the habitat types that is the pocket of an elephant is Tesso Nilo National Park in Riau Province. Tesso Nilo is a national park area that is designated as one of the natural habitat of elephants in Sumatra in Riau Province, Indonesia. Based on research conducted by [4] Tesso Nilo National Park (TNNP) is considered to be an ideal area for elephant habitat. However, the TNTN area has changed a lot, with increasing encroachment and illegal logging as well as the conversion of forests to plantation land that occurred in the TNNP area, resulting in reduced habitat for elephants.[5] Reduced elephant habitat will affect the decline of the Sumatran elephant population.[6][7] The significance of the elephant population in Sumatra is thought to be caused by damage and a decrease in habitat area. Damage and reduction of sumatran elephant habitat, will have an impact on the availability of feed elephants. Meanwhile, the sumatran elephant require a lot of food intake in order to meet the energy needs according to its large size. When high food needs are no longer fulfilled by the habitat in TNNP, it will encourage elephants to get out of their natural habitat to utilize food resources available in the cultivation area. This has led to a shift in home range and habitat from the beginning in natural forests to other regions.[8][9] To prevent elephants from escaping from their natural habitat, it is necessary to conduct research on the characteristics of elephant habitat in the TNNP area and its surroundings so that it can be used as a basis for improving elephant habitat in the TNNP area of Pelalawan Regency, Riau Province. [10][11][12]

2. METHODOLOGY

A. Location and Time of Research

The study was conducted at the site of secondary forest, oil palm plantations, shrub and stands of acacia in Tesso Nilo National Park and surrounding areas in Pelalawan, Riau Province, Indonesia. These four habitat types are elephant habitat found in the region. The study was conducted for 8 (eight) months starting from data collection to the report of the research results.

B. Stage of Research

This research was carried out for 8 months in three stages, namely: the first stage was to determine the location of the elephant cruising line. The second stage determines the location of the elephant habitat and the third stage identifies the characteristics of the location that is the habitat of

Sumatran elephants inside the TNNP area of Pelalawan Regency, Riau Province.

C.Data Collection Method

Data collection is done by combining survey methods, interviews, and secondary data collection. Surveys for clicking etahui the characteristics of Sumatran elephant habitat are carried out using the systematic transect line method (Systematic sampling with random start). Based on the overlay map between topographic maps, elephant distribution maps, land use maps, and human-elephant conflict data, vegetation analysis of vegetation communities is an elephant habitat. The type of vegetation carried out by observation consisted of four, namely secondary forest, shrubs, oil palm plantations and acacia stands. In each type of vegetation community, a track / transect plot is made with the number of transects determined according to field conditions in each vegetation type 500 m - 1 km length and 20 m width. Each habitat type is measured by climatic, topographic parameters and the availability of elephant's needs for salt and water.

D. Identification of Elephant Habitats

1. Position of Elephant

Elephant position can be identified by using direct and indirect methods. The direct method is meeting directly with elephants while the indirect method can be the discovery of traces left by elephants in the form of former elephant faults, feces, body friction and elephant footprints. The position of the elephant can also be seen through interviews with the community. Interviews were conducted with local people who knew the existence of elephants. If an elephant or elephant trail is found, a point is taken using GPS.

2. Land Cover and Habitat Characteristics.

Land cover data is obtained through Land Cover Maps from the Forestry Planning Agency, to be able to see the distribution of vegetation cover and acceleration of changes and patterns of land cover changes that occur. Based on topographic maps, it can be seen the topography of the area, such as: the altitude of the place and slope of the research location. Determination of habitat characteristics is carried out systematic sampling with random start that is by exploring the locations that become home range of Sumatran elephants (Elephas maximus sumatranus), which are observed are the types of habitats used by elephants and habitat factors that are often visited by Sumatran elephants. Determination of habitat used by elephants based on signs of the presence of elephants such as body scrub marks, footprints, and abandoned feces.

3. Determination of Composition of Elephant Habitat Vegetation.

Identification of the composition of the vegetation that is the habitat of elephants is carried out using a plots made at the location of the elephant habitat. Combinations of plots with path transects (grid lines) are placed using the purposive sampling method (information on elephant handlers). Pathway transect is a method of observing elephant habitat that is on a wildlife pathway through sampling with an example unit in the form of an observation track. Based on secondary data and interviews obtained from the management and the community stated that the number of vegetation types in the Pelalawan sector around Tesso Nilo National Park are 4 types, namely secondary forest, shrubs, acacia stands and oil palm plantations. Because it is in the form of an observation track, the number of routes needed is 1 lane with each lane having a width of 20 m and a length of 1000 m so that the sample area is 8 ha. Vegetation data collection is carried out around Tesso Nilo National Park. Vegetation data measured to determine the structure and composition of vegetation are: species, number of individuals , diameter and height of trees and data on feed vegetation (type and density). Based on the transect lines that have been made, vegetation analysis is carried out using the grided method (Kusmana, 1997).

4. Water Source and Mineral Salts (Salt Licks)

The availability of water sources in elephant habitat is known by using maps of the distribution of rivers, swamps and grooves, while supporting data in the form of rainfall data obtained from the Meteorology and Geophysics Agency. Water conditions are observed through field observations, by collecting data: a). Types of water sources: rivers, creeks, swamps, grooves, and other water bodies. b). The source of water used by elephants for bathing, drinking. Data on water sources used by elephants are known based on traces left by elephants and interviews with the community; then the coordinates are recorded via GPS. In addition, the pH and salinity are also noted. The distribution of sources of mineral salts (salt licks) can be known by combining two methods, namely collecting information from the community and observing (exploration) at locations that are assumed to contain a lot of mineral salts and are often visited by elephants (from signs). The location in question is river shoals and forest floors located on the slopes of hills (valleys) and licks.

3. Result and Discussion

A. Composition of Types of Elephant Habitat Vegetation

Identify the composition of tree species found in Natural forests are carried out in forested areas, shrub vegetation areas, oil palm plantations and acacia stands around the Tesso Nilo National Park (TNNP) area. Identification of the composition of tree species is carried out on elephant habitat and cruising. The following are the types of vegetation found in each location with INP and the amount per hectare. Based on Table 1 it can be seen that in 4 types of elephant habitat there are many types of open vegetation found with a relatively rare amount of vegetation. This is characterized by the types of seedlings found in secondary forests and pioneer vegetation types. In addition there are many types of feed found in oil palm plantations and acacia stands. This has an indication that elephants like open forest areas where the type of feed is abundant and does not hinder the movement of elephants. This is in line with the opinion of Zahrah (2014) where suitable and highly suitable locations for elephant habitat are found in grasslands and shrubs with rare to moderate canopy cover and secondary forest. The function of secondary and primary forests is also determined by the time of elephant activity where elephants use more forests more densely during the day than at night to protect elephants from the sun.

Table 1.*Vegetation composition, INP, amount per hectare and number of elephant species in several types of elephant habitat.*

No.	Location	Growth rate	Type	INP (%)	Amount (N / ha)	Amount of elephant feed type (N)
1	Secondary forest	Seedling	*Eugenia odorata*	27.50	26700	17
			Callophyllum sp	20.46		
			Syzygium sp	20.01		
		Stake	*Eugenia odorata*	23.99	2064	17
			Eugenia ridleyi	18.31		
			Garcinia xantochymus	8.38		
		Pole	*Eugenia ridleyi*	23.85	142	4
			Shorea Parvifolia	23.85		
			Litsea sp	23,53		
		Tree	*Stemonorus scorpioides Bacc.*	21.23	125	7
			Performation on motleyii	19,58		
			Shorea Parvifolia	15.82		
2	Shrubs	Seedling	*Gleichenia linearis*	49.39	136500	19
			Alshophila cuspidata	19.79		
			Stenochlaena palustris	15,54		
		Stake	*Macaranga triloba*	30.83	2224	9
			Acacia mangium	25.53		
			Macaranga gigantea	20,24		
		Pole	*Acacia mangium*	100	4	1
		Tree	Not found	0	0	0
3	Palm oil	Seedling	*Dicranopteris linearis*	37,57	83100	17
			Centrocema pubescens	24.44		
			Diplazium esculentum	18,18		
		Stake	Not found	0	0	0
		Pole	Not found	0	0	0
		Tree	Not found	0	0	0
4	Acacia stand	Seedling	*Diplazium esculentum*	35.03	91000	20
			Alshophila cuspidata	29,13		
			Malabathricum melastoma	22,77		
		Stake	*Acasia mangium*	59.33	1648	8
			Ficus alba	32,19		
			Macaranga gigantea	22.75		
		Pole	Not found	0	0	0
		Tree	Not found	0	0	0

B. Physical Conditions of Elephant Habitats

1. Elephant Drinking Water Conditions

Water is a vital requirement for living things including elephants. Based on the results of the survey found one location elephant drinking at river Supplies with coordinates 00 ° 12 617 'S and 101 ° 57 315' E. River Water Supplies has characteristics pure colored water with a depth of ± 2 m, a length of ± 6 km and a width of ± 5 m. The results of the analysis of river water supply quality can be seen as follows.

Table 2. *Results of Quality Analysis of River Water Supplies.*

No.	Parameter	Unit	Value	Classification	Limits
First Sample Analysis Results					
1	Temperature	(◦ C)	27	Normal	Dev. 3 ◦ C
2	TDS	ppm	10	Freshwater	<1000 ppm
3	EC	µS / cm	18	Freshwater	<1500 µS / cm
4	Salinity	◦ / ‰	0.5	Freshwater	0-1 ◦ / ‰
5	pH	-	5.39	Acid	<7 acid> base
Second Sample Analysis Results					
1	Temperature	(◦ C)	28	Normal	Dev. 3 ◦ C
2	TDS	ppm	10	Freshwater	<1000 ppm
3	EC	µS / cm	20	Freshwater	<1500 µS / cm
4	Salinity	◦ / ‰	0.5	Freshwater	0-1 ◦ / ‰
5	pH	-	5.43	Acid	<7 acid> base
Third Sample Analysis Results					
1	Temperature	(◦ C)	25	Normal	Dev. 3 ◦ C
2	TDS	ppm	9	Freshwater	<1000 ppm
3	EC	µS / cm	18	Freshwater	<1500 µS / cm
4	Salinity	◦ / ‰	0	Freshwater	0-1 ◦ / ‰
5	pH	-	5.43	Acid	<7 acid> base

Based on the table 2 it can be seen that the condition and amount of water are in accordance with the needs of the elephant. Elephant drinking water in Perbekalan River has a normal pH and in flowing conditions so it is included in the category of fresh water. Changes in water conditions both in quantity and quality make elephants move from one water source to another. This agrees with the statement of Abdullah et al (2009) who conducted a study in Tesso Nilo National Park that estimates of the availability of water in habitats in 10 rivers of varying lengths showed that there was a reduction in river water in the dry season of 7884.96 m3 and shrinkage river length 2.24 km. Reduction of water in habitat during the dry season causes elephants to move to other areas where there is water for drinking and wallowing Based on the results of interviews with mahout about how to drink elephants, where is the description obtained non stop 10-15 minutes to drink water and more time to wallow. The results of the suitability of water requirements at the location of drinking elephants both in quality and quantity have met the needs of elephants. This result is based on the calculation of the volume of water in the grazing location so that the need to drink elephants is in accordance with the criteria in nature and can still accommodate 1400 days. According to Eisenberg (1981), a Sumatran elephant needs drinking water as much as 20-50 liters or day. Based on information from mahout and water quality analysis states that the Supplies River is always filled with water and meets the needs of drinking elephants. Water requirements at elephant habitat locations at the time of observation in good condition, because the activities of drinking and bathing elephants are very fulfilled for these needs. Elephants will move the location of drinking if the river water used for drinking is shrinking or does not meet the requirements for drinking.

2. Conditions location of salt activity

Salt activity is usually carried out during drinking and bathing, to take soil containing salt. Sumatran elephants carry out salty activities when their bodies need mineral salts as the body's metabolic processes and facilitate the digestion process of food. The elephant salting activity is carried out on the land around the river where drinking and wallowing with coordinates 00 ° 11.164 'S and 101 ° 57,833' E. The following are the results of analysis of soil samples used for salt by elephants.

Table 3. *Analysis of Mineral Salt Location of Elephant Scratching.*

No.	Sample	Ca (me / 100g)	K (me / 100g)	Mg (me / 100g)	Na (me / 100g)	Total
1	1	0.1525	0.0224	0.0133	0.063	0.2512
2	2	0.2630	0.0218	0.0192	0.022	0.3260
Average		0.20775	0.0221	0.01625	0.0425	0.2886

Salty behavior carried out by elephants aims to fulfill the adequacy of elephant mineral salt intake. Mineral salt is used to keep elephant bones strong and teeth and ivory growth. Salting techniques carried out by elephants are usually carried out on the banks of rivers or in locations that have salt availability which is relatively sufficient to meet the needs of elephants. Elephants usually dig land or river cliffs using ivory to get the salt content in the land. If the soil has a high salt content, the elephant will eat the land by scavenging it with its trunk. According to Abdillah (2010), Sumatran elephants obtain mineral salts by eating lumps of soil containing salt. Based on the results of interviews with mahout that the Sumatran elephant salts during a bath in the afternoon. Results of laboratory analysis showed that the needs become salty

mineral salts at the site in accordance with the needs of both the type and amount elephants. The salt location located on the river bank is still in good condition so that it can meet the needs of elephants. The distribution of salt locations is in swamps, river cliffs, muddy soil and grasslands. This is in accordance with Riba'i's opinion (2011) which states that the source of salt is found on river cliffs, swamps, puddles and grasslands. According to Widowati (1985), the location of frequent salting was found in the association section of the yellow red podzol soil with yellow brown podzole and the alluvial hodmort type on the river. This is according to BTNWK (2011) which states that swamps are the source of salt most often taken and eaten by the land when Sumatran elephants carry out salt behavior. These animals choose the source of salt whose soil contains a lot of salt. The level of frequency of an elephant visiting a salt location is determined by the amount and type of mineral salt. H is in line according Riba'i al (2011), Sumatran elephant activity produce salt with high intensity when the type of soil has a high mineral salt content and vice versa. Criteria for the minimum amount of salt content needed by Sumatran elephants have not been specifically studied. This can be observed by looking at the behavior of Sumatran elephants in finding salt in the soil, feed plants, and water (Mahanani et al , 2012).

3. Conditions of Elephant Shade

During observations in the field about shade, elephants usually use shade as a place to shelter and rest during the day to stabilize their body temperature. Tree canopy closure was grouped into three classes, namely (1) tree canopy closure> 75%, (2) 50–75% and (3) <50% (Mueller Dombois and Ellenberg, 1974). The shade conditions of elephants in the observation area can be seen in Table 4.

Table 4. *Shade Percentage elephants grazing at the site.*

No.	Plant type	High (m)	Head width (m)	Diameter (cm)	% Percent
1.	Kuras	7	8	53	> 75%
2.	Meranti bunga	7	6	30	> 75%
3.	Acacia	6	5	32	50 - 75%
4.	Pelajau	6	4	45	50 - 75%
5.	Lalan	6	7	50	> 75%

Shade conditions at the time of observation found at the habitat location were in accordance with the needs of the elephant. Trees that fit the needs of elephant shade are found in trees that have a canopy closure > 75%. Crown cover> 75% contained in the drain tree (Dryobalanops oblongifolia), Lalan (Santiria laevigata) and meranti (Shorea sp). Based on observations made on habitat conditions there is a poor shade suitability of 50% - 75% in the shade of acacia (Acacia sp) and pelajau (Pentaspodon motleyi). From the closing of the canopy it can be seen that the close canopy closure is used for shelter by elephants while the canopy is rarely used for foraging. This condition is identical to primary forest and secondary forest where primary forest with a dense canopy is used for shelter by elephants while open secondary forest is used to feed elephants. This is consistent with the statement of Abdullah et al (2009) where this condition supports elephants to use open forest (secondary forest) as a foraging area and use primary forest as a place of refuge, rest and marriage. Changes in the amount of secondary forest and primary forest cause changes in elephant habitat. Changes in this habitat lead to long changes in habitat use and elephant cruising. This is due to because the remaining locations have been clearing forests into oil palm plantations and some former forest fires, thus reducing the shade trees that are usually reserved for elephants as a place of rest. Shade categories in elephant habitat locations are included in the C stratum based on tree height criteria. Stratum C is a tree that has a height of 4-18 meters and a continuous head, the trees in this stratum are low, small and have many branches and the layers are continuous and somewhat dense (Anonimous, 2013). The remaining dry land has been fragmented and has a poor perimeter shape, this creates a mosaic of areas of human use and elephant habitat that are not suitable for conservation and migitation of human elephant conflicts (WWF, 2009). This change in land cover in the TNTN area needs to be rehabilitated by local plants that can be shade for elephants such as meranti (Shorea leprosula) , medang (Litsea sp), forest durian (Durio zibethinus) and other local plants that can be a thermal cover for elephants.

4. Environmental conditions

Air temperature is a condition that is felt on the surface of the earth as hot, cool or cold. Air humidity is the level of air wetness because air water is always contained in the form of water vapor. Observation of the physical condition of the elephant habitat environment was measured as follows

Table 5. *Conditions for Temperature and Humidity of Elephant Habitats.*

No.	Temperature (° C)	Humidity (%)
1	28.6	71
2	28.4	74
3	28.3	73
4	28	75
5	27.7	77
6	27.6	77
7	27.3	82
8	29.2	80
9	30.5	83
10	30.4	79
11	29.9	79
12	29.2	79
Average		

The characteristics of the air temperature around elephant habitat is quite high. Table 5 shows the air temperature during the daytime can reach 30.5 0 C which is the maximum temperature when observing in the field. While for the lowest temperature is 27.3 0 C. This is not much different from the study of Mahanani et al (2012) the temperature and humidity of elephant habitat in Padang Sugihan BC ranged from 25-33° C, with humidity between 55-74%. These conditions of temperature and humidity are in normal conditions for the growth and development of wild animals. According to Arief (1994) for tropical forests the air temperature that is good for plants ranges from 22-33 0 C. The temperature measured at the study site ranges from 30-31 0 C from the numbers obtained means that the air temperature is still within that

range. Table 5 shows the air humidity in elephant habitat shows values ranging from 71% - 83%. During the day air humidity can reach 71%. Air humidity came from water evaporation, river and plants. Data on temperature, humidity and light intensity are related to the formation of microclimates around the location of elephant habitat.

5. Soil and Topographic Conditions

In general, the condition of elephant feed habitat locations in three locations is covered by shrubs. The dominant vegetation found in shrubs other than shrubs is acacia. The following are soil types, slope and topography at the location of elephant habitat.

Table 6. *Land Type, Slope and Topography of Some Elephant Habitat Locations.*

No.	Location	Type of soil	Slope	Topography
1	Camp WWF	Organic top soil mineral soil	0-8%	flat
2	Lancang Kuning Resort	Organic top soil mineral soil	0-8%	flat
3	Air Hitam	Organic top soil mineral soil	0-8%	flat

Based on Table 6 it can be seen that the type of soil in the location of the TNNP is a mineral soil with a top soil layer consisting of organic material. Soil characteristics with organic layers have high organic C. Topographic conditions are included in the flat category where this location is an ideal location for elephants. The topography of the data makes it easy for elephants to roam over long distances. Topographic conditions are a limiting factor for elephant habitat suitability. This is in line with what was stated by Abdullah et al (2012) where the habitat factor that determines habitat selection is a gentle slope (0-20 o). This factor is caused by flat habitats, elephants are easier to move and protect their children from predators and it is easier to get food in groups or solitary, and avoid heavy areas and mountains. Furthermore, it can be seen the height (masl) and the pH of the soil where the elephant habitat is located.

Table 7. *Altitude and pH Conditions of Elephant Habitat Soils*

No.	Altitude (masl)	pH
1	0	3.9
2	13	44
3	52	4.3
4	55	4.3
5	52	4.6
6	49	4.0
7	45	4.2
8	60	3.8
9	58	4.3
10	57	4.5
11	57	4.5
12	49	4.1

The physical properties of soil found in elephant habitat can be seen in the following table.

Table 8. *Nature of Soil Physics.*

No.	Location	Texture	Bulk density	Criteria	Total pore space	Criteria	Density particles	Criteria
1	WWF LKB Camp	Sand: 72.04% Dust:	1.30	high	18.47	Low	1.59	Many organic ingredients
2	Lancang Kuning Resort	7.78% Clay: 20.18%	2.14	high	10.79	Low	2.40	A little organic matter
3	Air Hitam		1.40	high	17.30	Low	1.69	Many organic ingredients

Land at Camp site WWF LKB with high bulk density conditions, low total pore space and lots of organic material. Soil in the location of the Lancang Kuning Resort with higher bulk density with relatively more dense soil conditions so that it requires a little soil swelling. Land on the location of Air Hitam with high bulk density, low total pore space and lots of organic matter. Soils with little organic matter increase the content of other elements. Red yellow podzolic soil is preferred by elephants compared to organic soil because it contains high salt. This is in line with the research of Mahanani et al (2012) which states that Red yellow podzolic land has a high salt content. Some physical properties of soil that will affect the growth of elephant feed plants are texture, drainage conditions, total pore space and permeability. Firmansyah (2003) states that organic matter can improve soil physical properties in the form of an increase in total pore space, improved soil aeration, available water pores, soil permeability and decreased penetration resistance. Bulk density and total soil pore space are important in the assessment of soil density or density. This is in accordance with the opinion of Hardjowigeno (2007) that soil with low pore space causes an increase in soil bulk density. Soil that has a large bulk density , the more dense the soil, which means it is difficult to continue the water and conversely the soil with low bulk density , it is easy to carry on the water. Based on the results of laboratory analysis in each location the results of the soil chemical properties are as follows:

Table 9. *Chemical Properties of Soil.*

No.	Location	Organic C (%)	N (%)	P2O5 (mg)	K2O (mg)
1	Camp WWF	2.86 (medium)	0.28	28,54	21.21
2	Lancang Kuning Resort	2.86 (medium)	0.28	28,54	21.21
3	Air Hitam	2.86 (medium)	0.28	28,54	21.21

In general, pH in the location of elephant habitat is included in acidic pH with organic C conditions, including in moderate conditions. Organic matter is generally found on the surface of the land and for mineral soils the amount is not large, only 3-5 percent. Although the amount is small, the effect on the properties of the soil is enormous. Phosphorus and Potassium are macro nutrients that are needed by many organisms. Phosphorus and Potassium from soil samples extracted with 25% HCl extract in the form of P 2 O 5 and K 2 O are considered as potential amounts of these elements in the soil. Phosphorus and potassium elements are needed by elephants to meet their salt needs. This is consistent with Ribai'i et al (2012) which states that elephants need calcium, magnesium and potassium minerals.

4. CONCLUSION

a. Condition of elephant habitat located in the Tesso Nilo: a) The source of feed made up of the types of tree seedlings and saplings as well as the types of herbs found in secondary forest and scrub, b) Shade found in primary forests and woods secondary consists of drainage trees, pelajau, acacia, lalan and meranti flowers, c) Source of water is found in rivers and creeks in the Tesso Nilo National Park with characteristics of flowing water and normal pH, d) Mineral salts are found on river and soil cliffs around the river with mineral content consisting of magnesium, calcium, potassium and sodium.

b. Characteristics of elephant habitat found in Tesso Nilo National Park are as follows: a) relatively flat topography to sloping conditions, b) existence of feed sources from seedlings and saplings as well as herbs, c) close to water sources, d) far from settlements, e) have shade in the form of secondary forest and primary forest.

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