SUITABILITY ANALYSIS OF TIGER IN CHITWAN NATIONAL PARK

BIPUL NEUPANE

MEMBERS

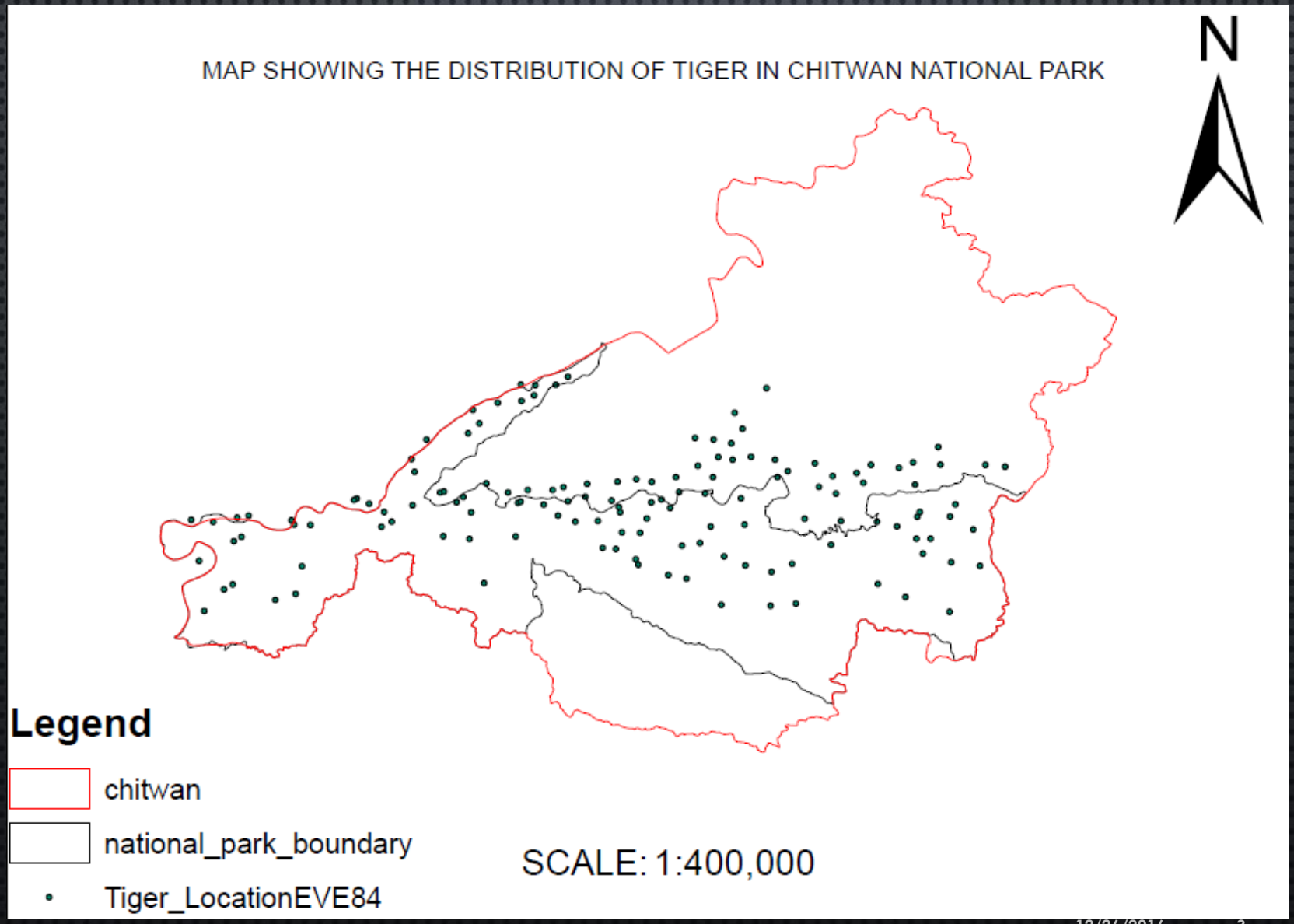
Group Members

- Bipul Neupane
- Sushant Parajuli
- Suman Ghimire
- Biplov Parajuli

Project Supervisors

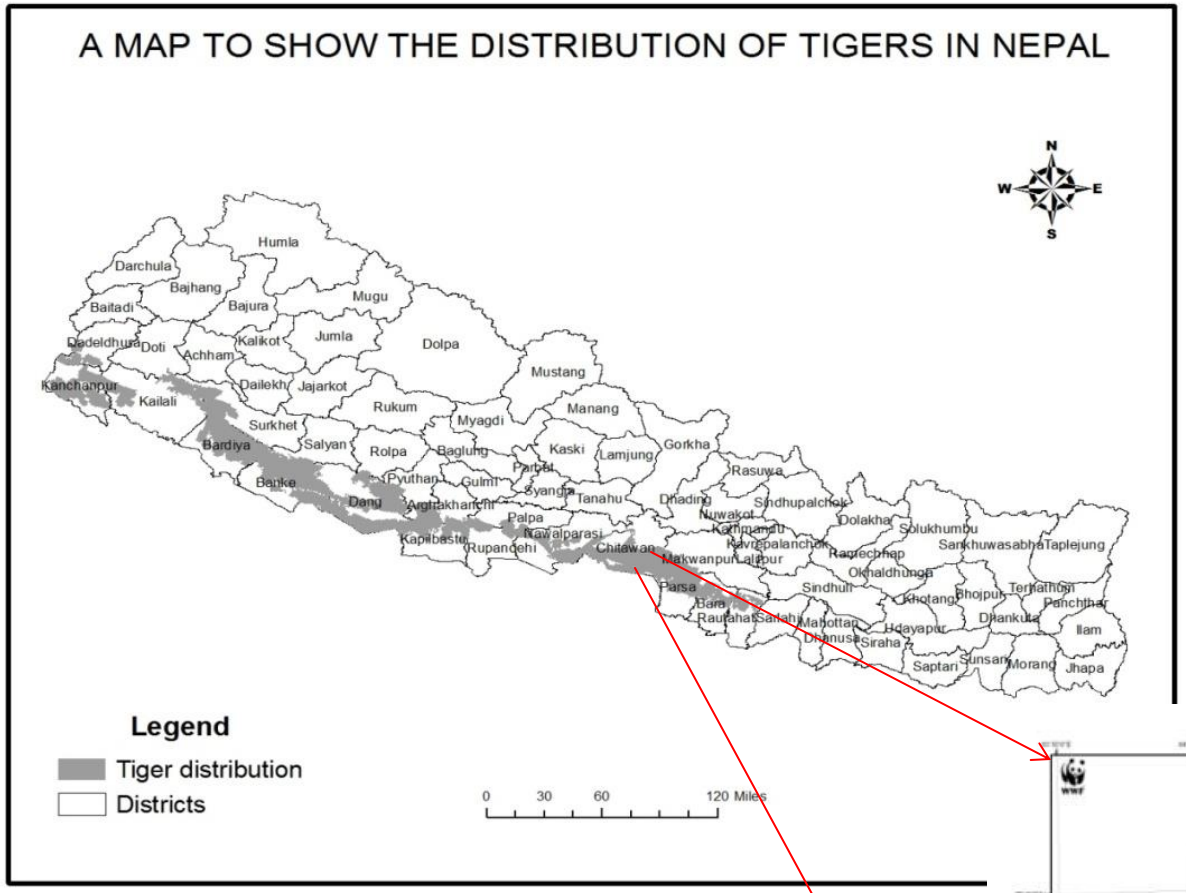
- Asst. Prof. Subash Ghimire
- Mr. Shashish Maharjan

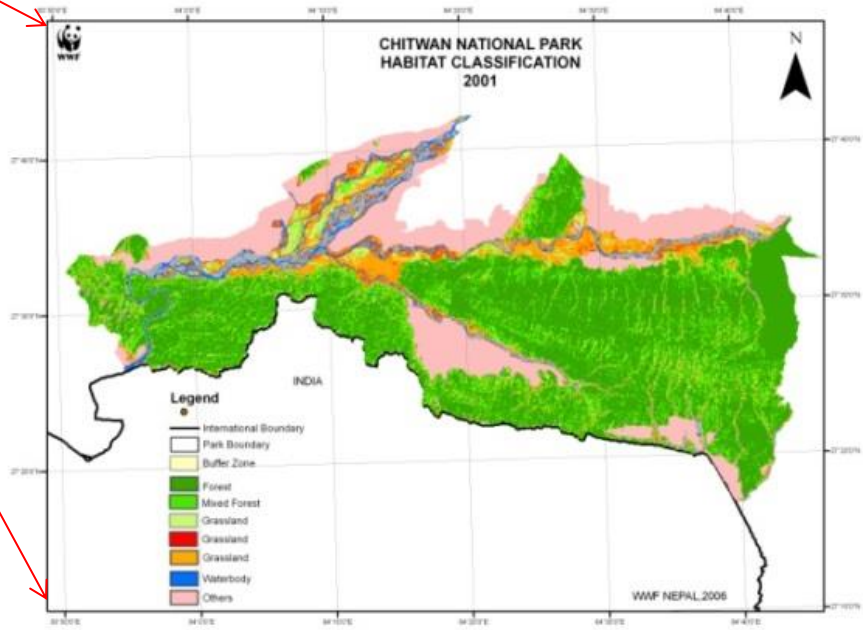
GPS DATA


MAP SHOWING THE DISTRIBUTION OF TIGER IN CHITWAN NATIONAL PARK
N
Legend
chitwan
national_park_boundary
Tiger_LocationEVE84
SCALE: 1:400,000

SUITABILITY MODEL

- IDENTIFIES POTENTIAL RISKS TO THE SPECIES, UNDERSTAND THE IMPLICATIONS OF DIFFERENT LAND USE PRACTICES AND TO IDENTIFY SITES FOR THE REINTRODUCTION OF AN ENDANGERED SPECIES.





Suitability Analysis of Tiger In Chitwan National Park

LITERATURE REVIEW

- CRITERIA FOR THE SUITABLE HABITAT
  - FOREST TYPE
  - PREY
  - WATER RESOURCE
  - SLOPE
  - ALTITUDE
  - SETTLEMENT

Weighted linear combination

$$S = \sum x_i w_i * \prod c_j$$

Where:

- S – is the composite suitability score
- X_I – factor scores (cells)
- W_I – weights assigned to each factor
- C_J – constraints (or Boolean factors)
- $\sum$ -- sum of weighted factors
- $\prod$ -- product of constraints (1-suitable, 0-unsuitable)

For restriction model,

$$S = \sum w_i c_i * \prod r_j$$

Where:

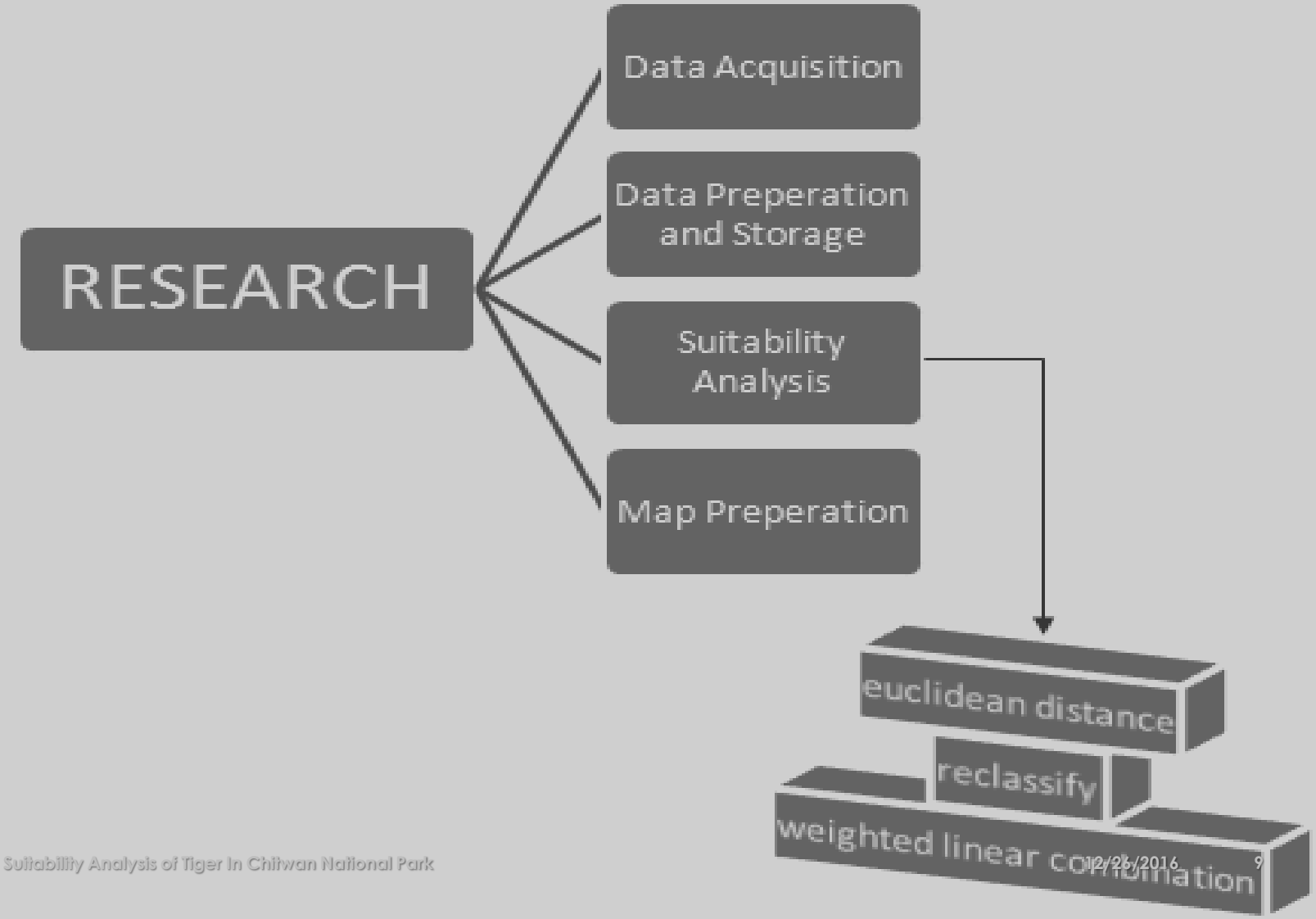
S-suitability for habitat of tiger

W_I – weights assigned to each factor

C_J – constraints (or Boolean factors)

$\prod RJ$ -- restrictions (road, settlement)

METHODOLOGY



DATA ACQUISITION

- DEM, Slope
- Forest Data
- Ecological Data
- Water Resources
- District Data
- Settlement
- Prey Data
- Tiger Location
- National Park Data

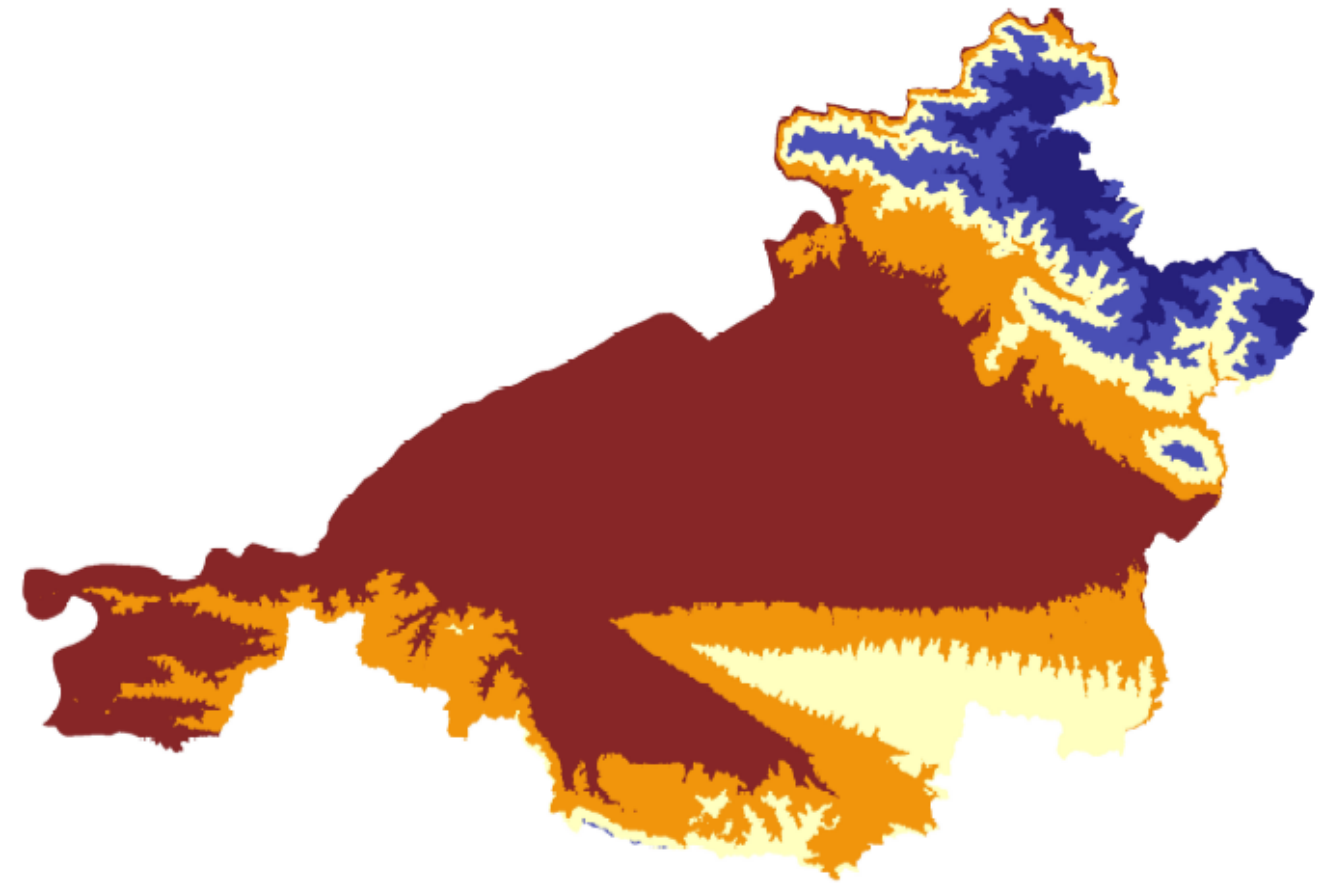
SUPPORT

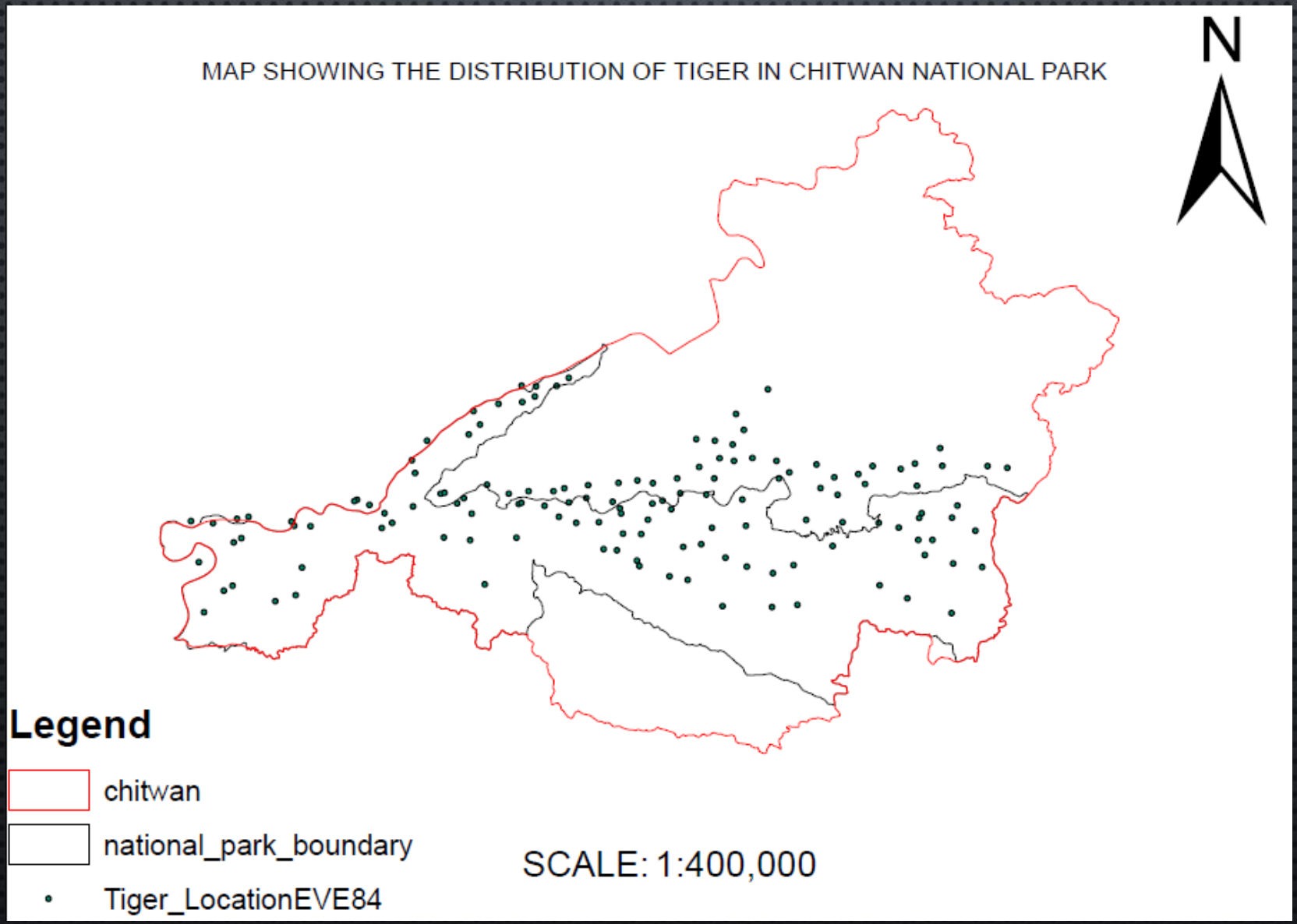
- DEPARTMENT OF CIVIL AND GEOMATICS, KATHMANDU UNIVERSITY
- IUCN (INTERNATIONAL UNION FOR CONSERVATION OF NATURE)
- WWF (WORLD WILDLIFE FEDERATION)
- DNPWC (DEPARTMENT OF NATIONAL PARKS AND WILDLIFE CONSERVATION)
- FRA (FOREST RESOURCE ASSESSMENT)

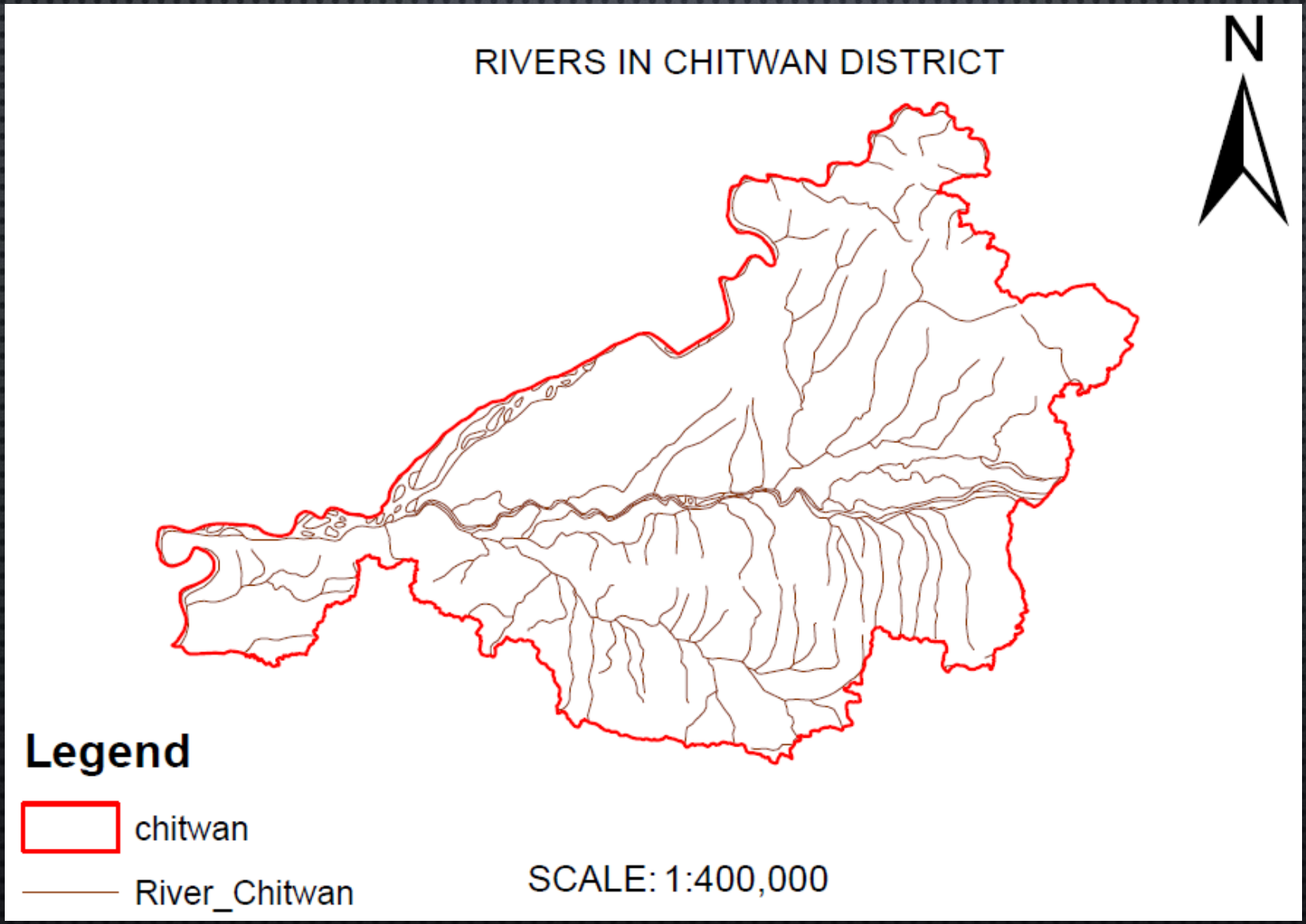
DATA PREPARATION AND STORAGE

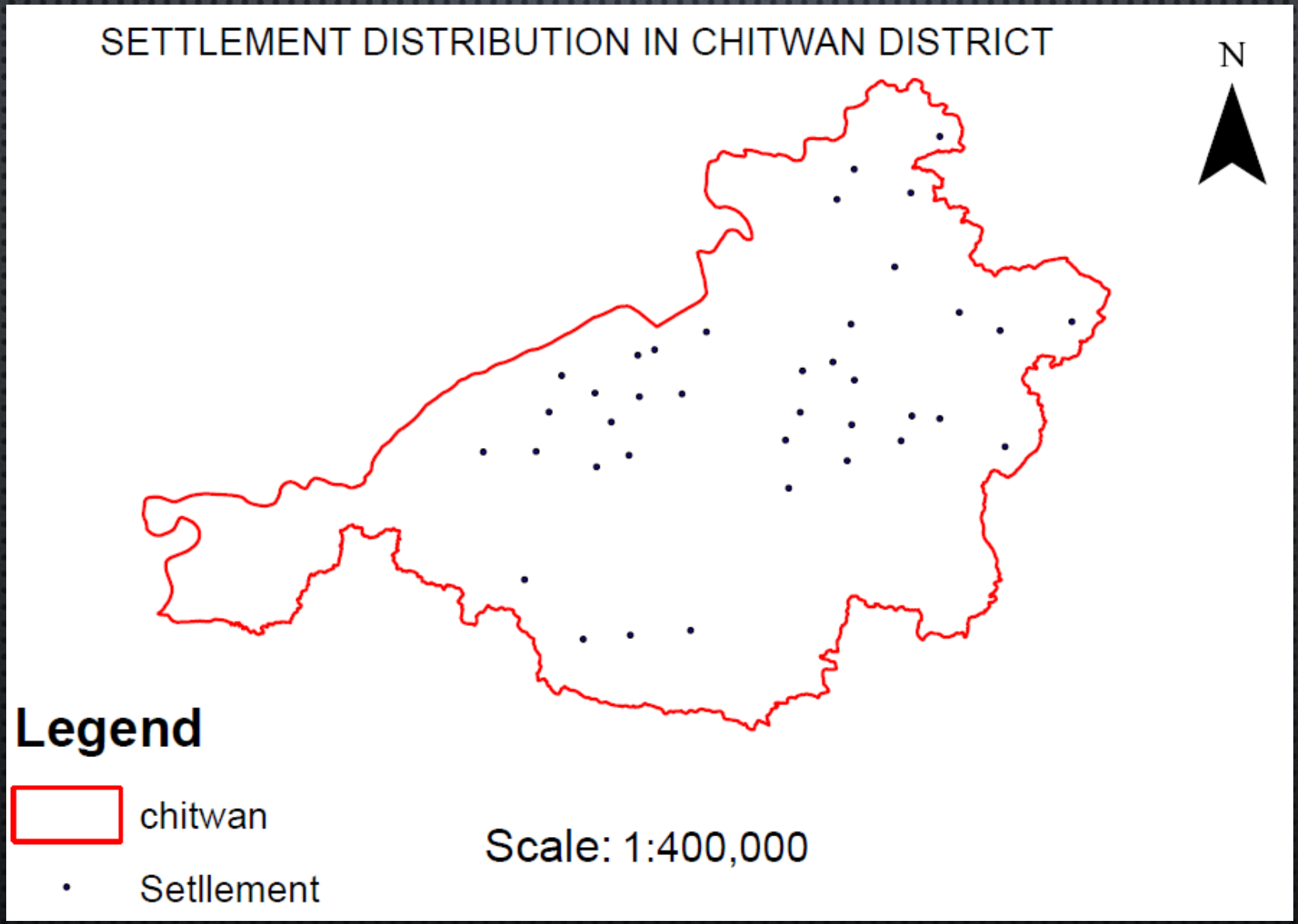
- PROJECTION
- GEO-REFERENCING
- DIGITIZATION
- CLIPPING
- POSTGIS

DEM OF CHITWAN

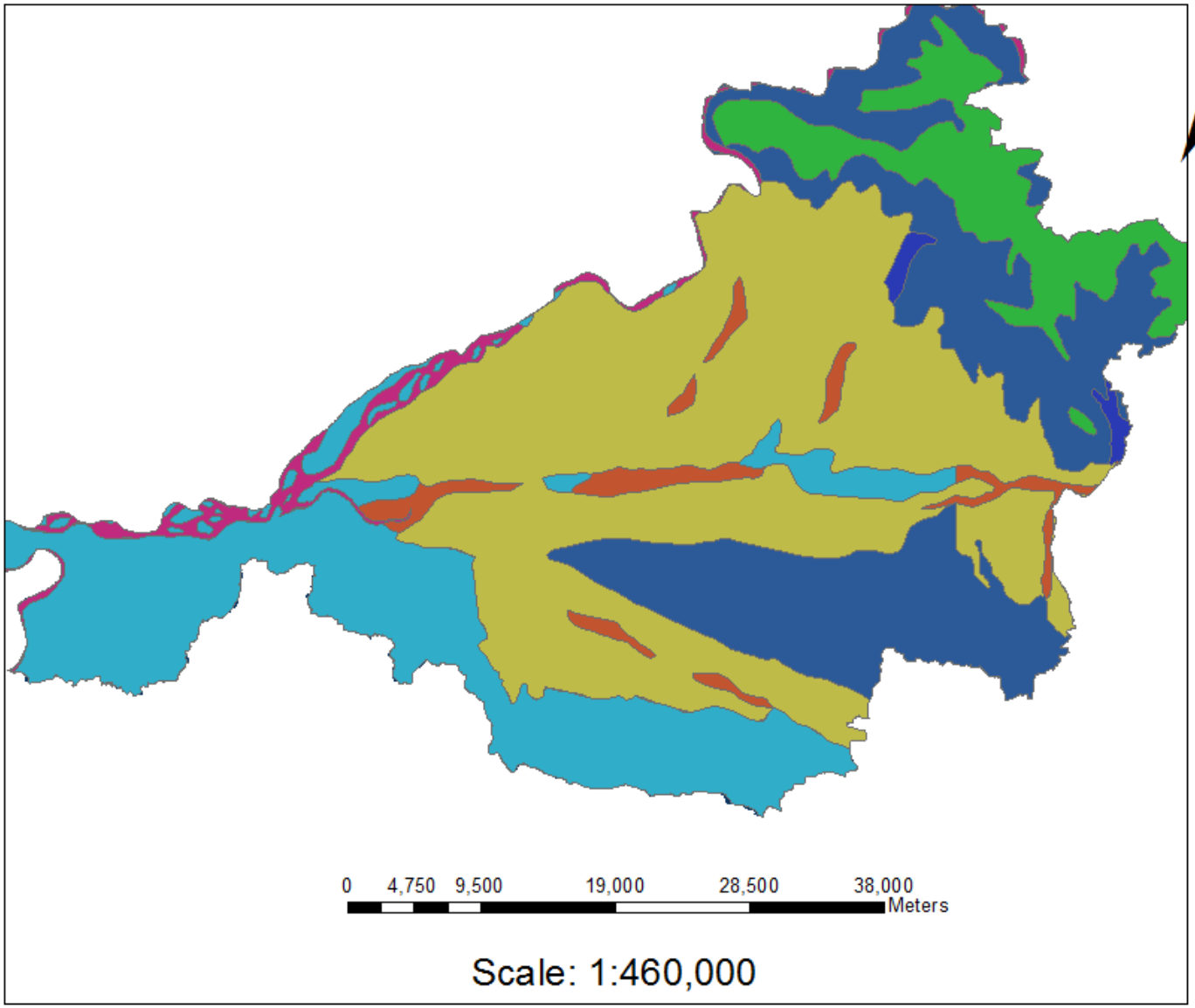


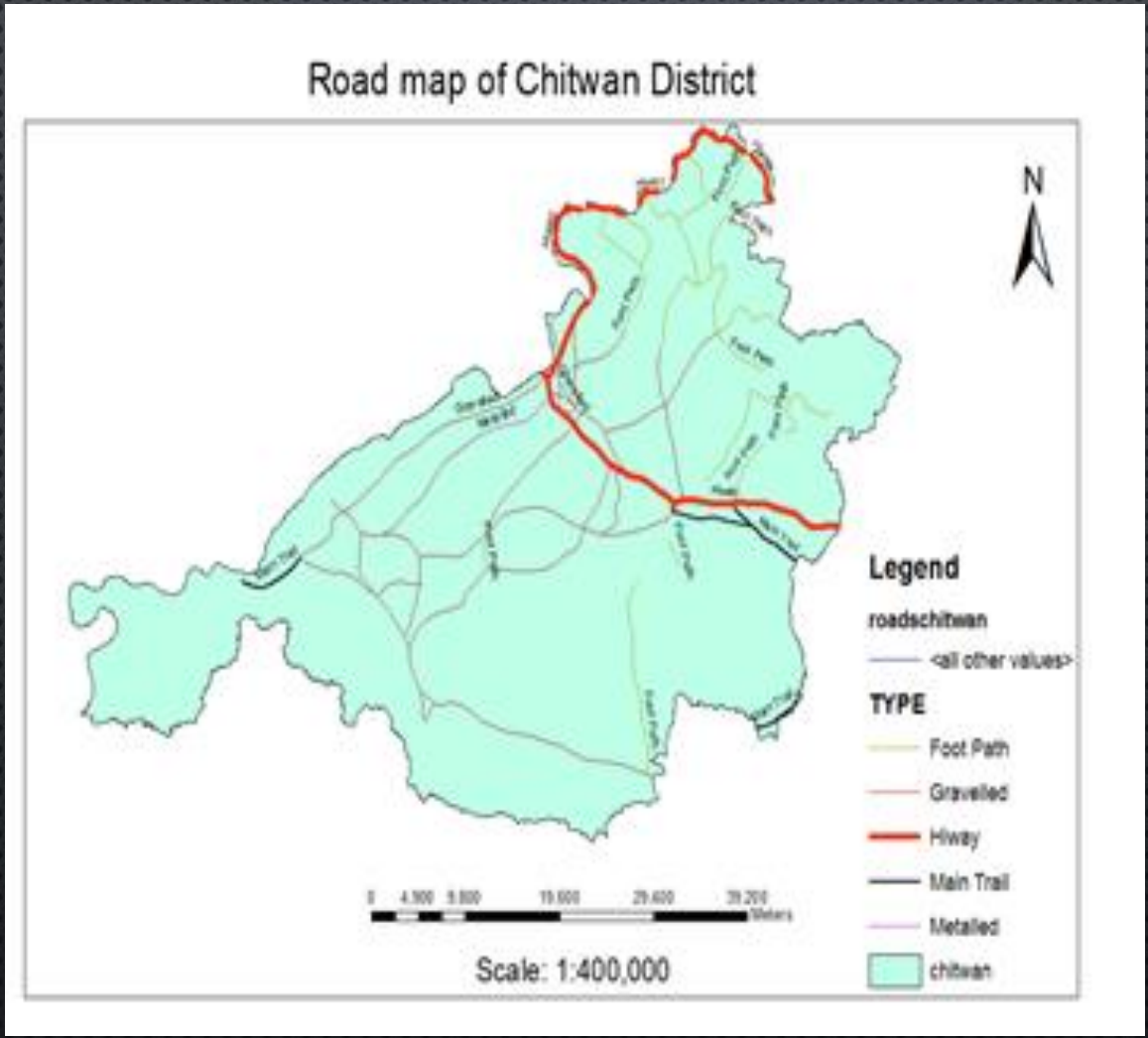

MAP SHOWING THE DISTRIBUTION OF TIGER IN CHITWAN NATIONAL PARK
N
Legend
chitwan
national_park_boundary
Tiger_LocationEVE84
SCALE: 1:400,000


RIVERS IN CHITWAN DISTRICT
N
Legend
chitwan
River_Chitwan
SCALE: 1:400,000


SETTLEMENT DISTRIBUTION IN CHITWAN DISTRICT
N
Legend
chitwan
Setllement
Scale: 1:400,000

Ecology map of Chitwan District




Road map of Chitwan District
N
Legend
roadschitwan
<all other values>
TYPE
Foot Path
Gravelled
Hiway
Main Trail
Metalled
chitwan
Scale: 1:400,000

PREY DISTRIBUTION IN CNP

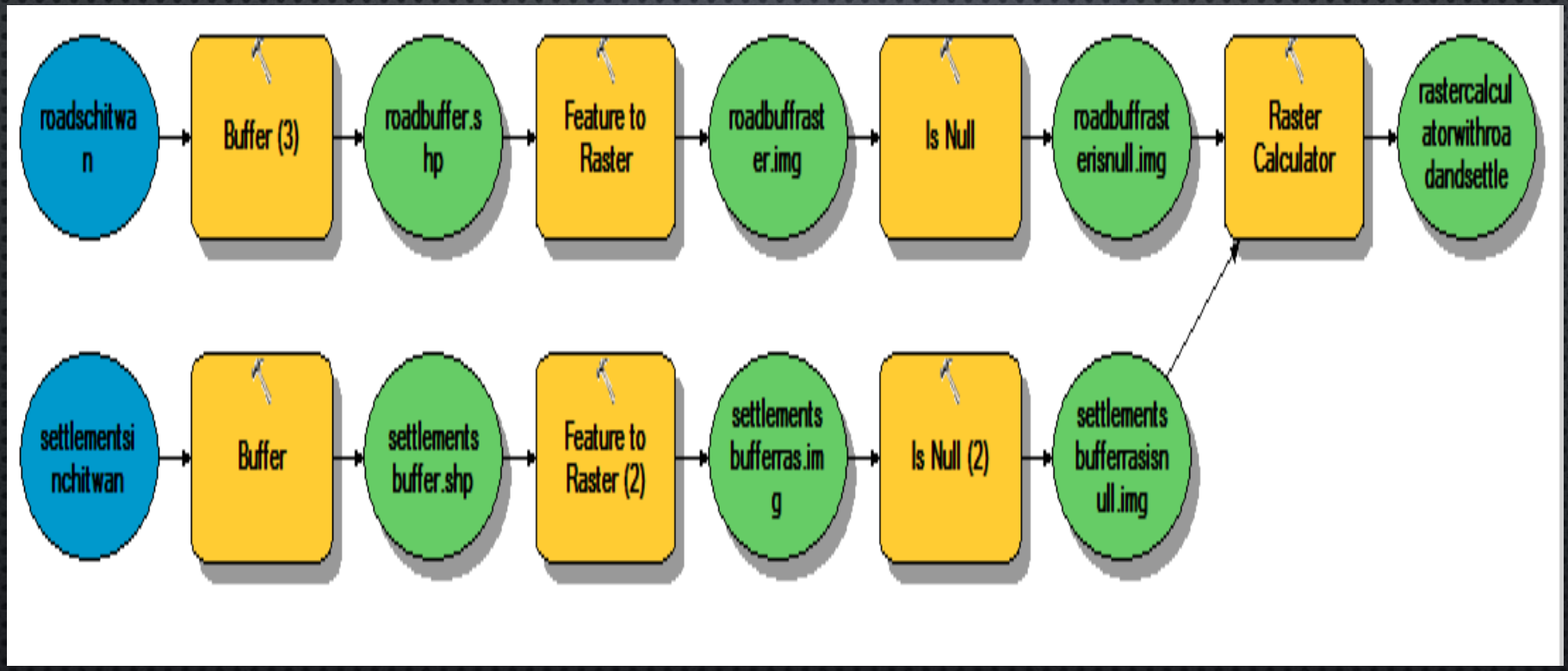
Prey	Scientific Name	Quantity	Density (No. per square km)
Chittal	*Axis Axis*	26,849	43.9
Sambar	*Rusa Unicolor*	4,567	7.5
Wild Boar	*Sus Scrofa*	2,573	4.2
Barking Deer	*Muntiacus*	2,265	3.7

CNP, 2004

ANALYSIS

- MCDA APPROACH
- MODEL PREPARATION FROM MODEL BUILDER
  - BUFFER, EUCLIDEAN DISTANCE, FEATURE TO RASTER CONVERSION, RECLASSIFY, WEIGHTED OVERLAY
- RESTRICTION MODEL
  - ANALYTICAL AND CONVERSION TOOLS SUCH AS FEATURE TO RASTER CONVERSION, IS NULL, UNION, RASTER CALCULATOR

RESTRICTION ANALYSIS



SUITABILITY ANALYSIS

- For the determination of suitable habitat of Tiger geo-referenced vector data of variables were used from various secondary sources.
- The analysis was done in two separate models:
  - One considering the settlement
  - Second without considering it.

WITHOUT CONSIDERING SETTLEMENT

ROAD

Classes	Percentage influence(Weight)	Scale value
1	10	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10

RIVER

Classes	Percentage influence(Weight)	Scale value
1	20	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10

PREY

Classes	Percentage influence(Weight)	Scale value
1	30	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10

SLOPE

Classes	Percentage Influence(weight)	Scale value
1	15	1
2		2
3		3
4		4
5		5

ECOLOGY

Types	Percentage influence(Weight)	Scale value
Chir Pine-Broad Leaved Forest	20	8
Hill Sal Forest		9
Lower Tropical Sal And Mixed Leaved Forest		5
Pseudosteppe Broad Leaved Forest		10
Ravine Broad Leaved		7
Riverine Khair-Sissoo Forest		6
Water Body		7

CONSIDERING SETTLEMENT

ROAD

Classes	Percentage influence(weight)	Scale value
1	10	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10

RIVER

Classes	Percentage influence(weight)	Scale value
1	15	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10

SETTLEMENT

Classes	Percentage influence(weight)	Scale value
1	10	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10

PREY

Classes	Percentage influence(Weight)	Scale value
1	25	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10

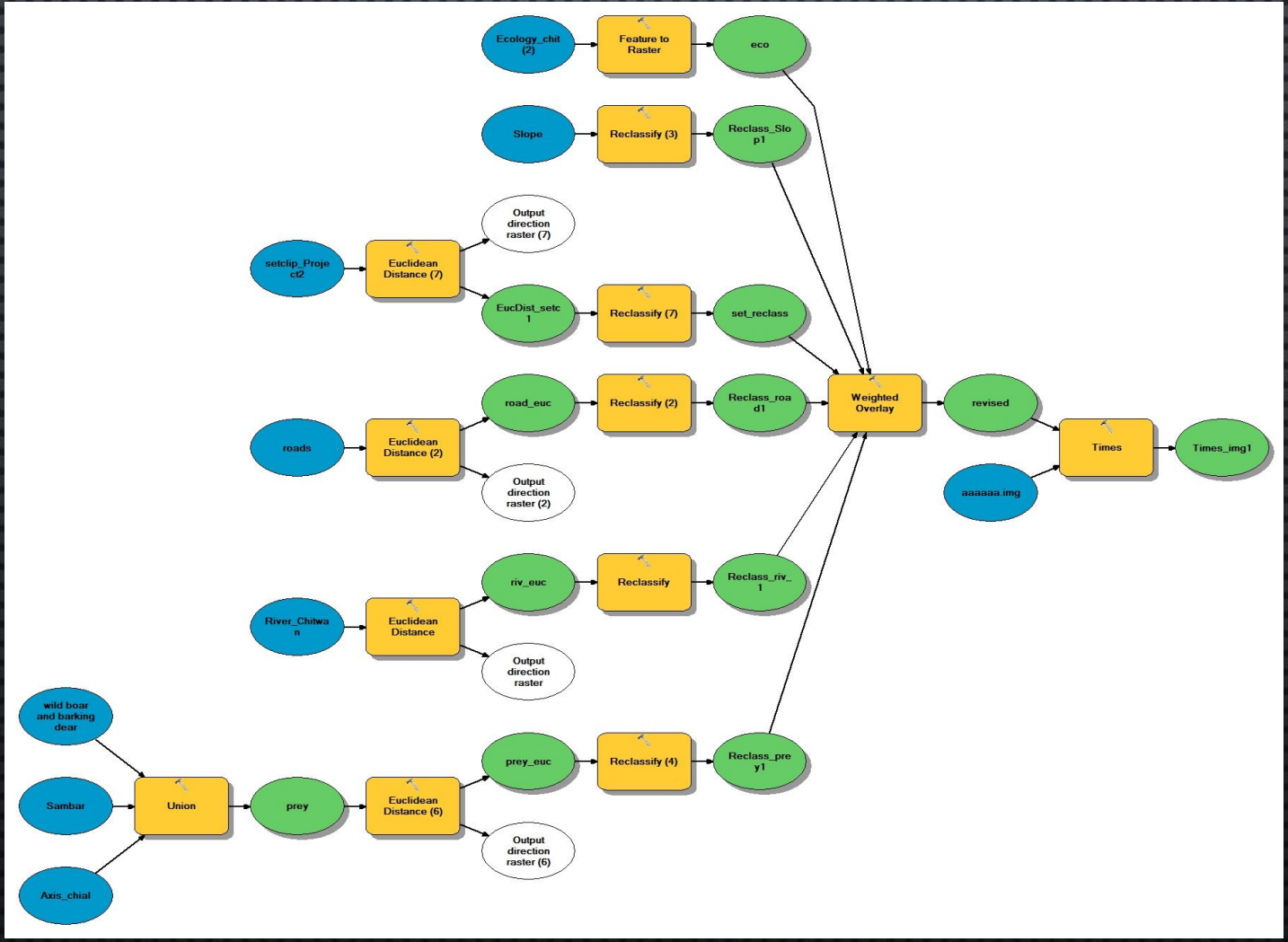
SLOPE

Classes	Percentage Influence(Weight)	Scale value
1	20	1
2		2
3		3
4		4
5		5

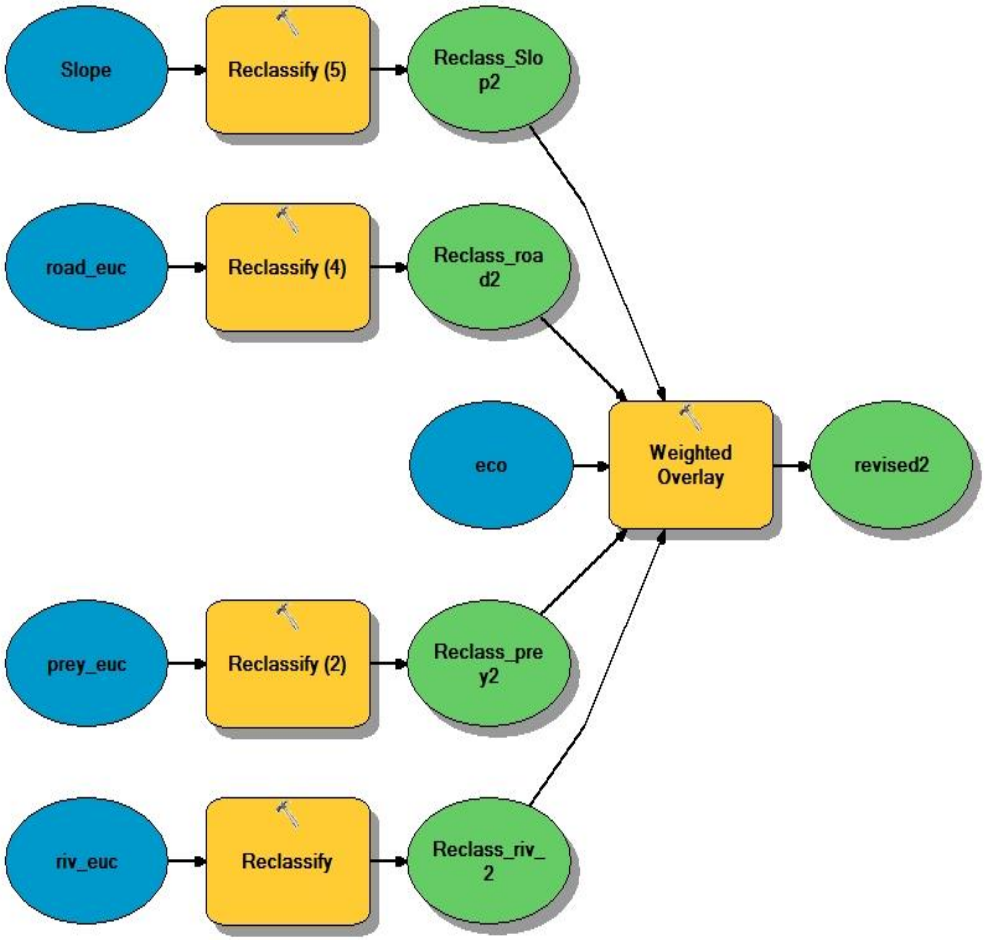
ECOLOGY

types	Percentage influence(weight)	Scale value
Chir Pine-Broad Leaved Forest	20	8
Hill Sal Forest		9
Lower Tropical Sal And Mixed Leaved Forest		5
Pseudosteppe Broad Leaved Forest		10
Ravine Broad Leaved		7
Riverine Khair-Sissoo Forest		6
Water Body		7

FINAL SUITABILITY MODEL WITH RESTRICTION IN CHITWAN DISTRICT



SUITABILITY MODEL WITHOUT CONSIDERING THE SETTLEMENT IN CHITWAN DISTRICT



MAP PREPARATION

- AFTER USING DIFFERENT ANALYTICAL TOOLS IN MODEL BUILDER, MAPS ARE PRODUCED SHOWING SUITABLE HABITAT LOCATIONS, RESTRICTED AND NON-RESTRICTED AREAS WITH PROPER CARTOGRAPHIC TOOLS IN PROPER LAYOUT.

DATABASE TABLE OF ROADS IN CHITWAN

Edit Data - PostgreSQL 9.1 (x86) (localhost:5432) - connection - roads

File Edit View Tools Help

100 rows

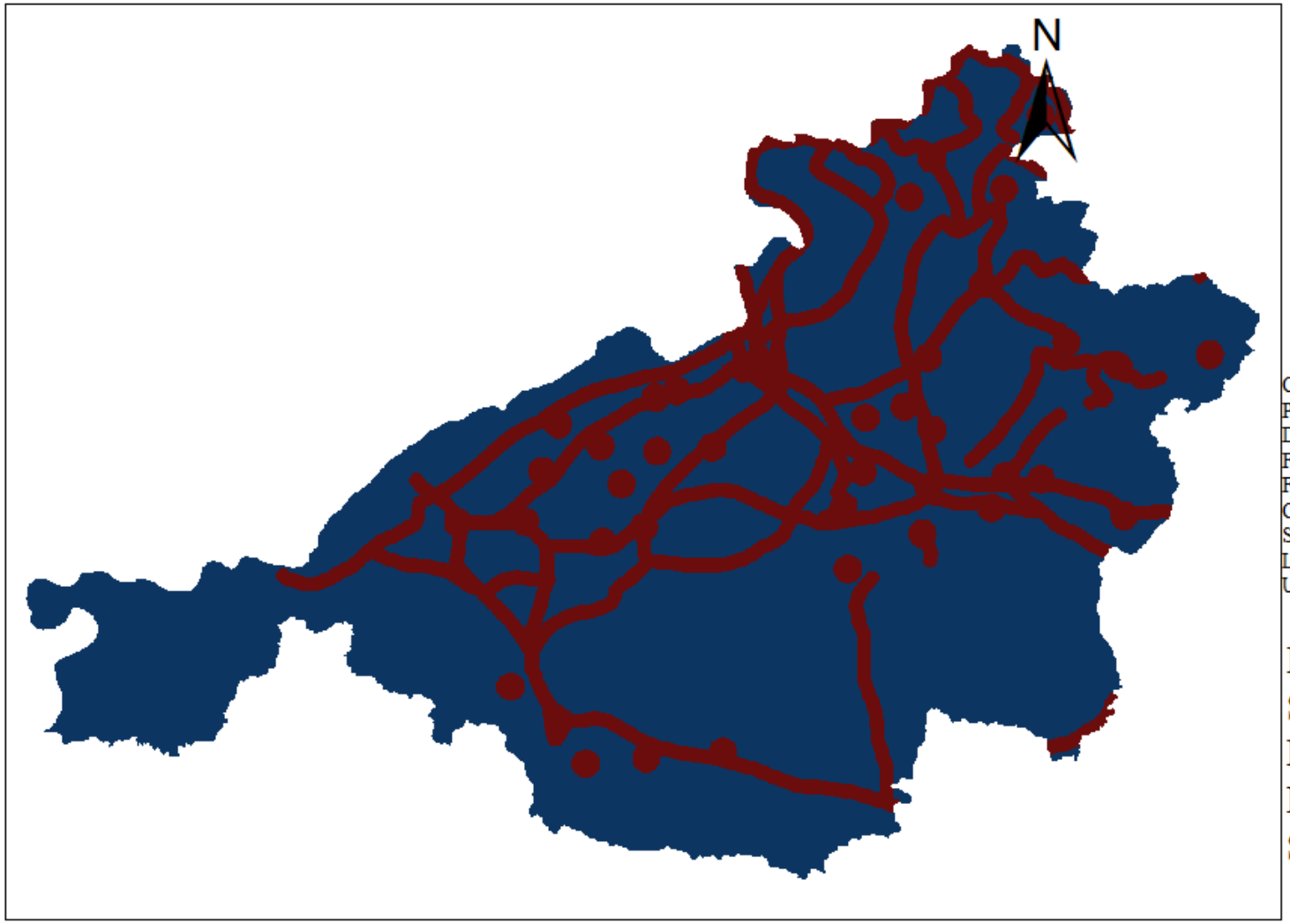
	gid [PK] serial	fnode_ integer	tnode_ integer	lpoly_ integer	rpoly_ integer	length double precis	roads_dd_ integer	roads_dd_i integer	type character var	shape_leng numeric	geom geometry(Mu
1	1	2609	2647	0	0	0.0474197	2453	5	Main Trail	4847.942940	01050000000
2	2	2647	2649	0	0	0.0710021	2455	1	Hiway	7238.350209	01050000000
3	3	2649	2658	0	0	0.0104867	2466	1	Hiway	1047.981315	01050000000
4	4	2658	2698	0	0	0.0485744	2504	1	Hiway	5035.635644	01050000000
5	5	2725	2647	0	0	0.0500114	2523	6	Foot Path	5340.625512	01050000000
6	6	2698	2730	0	0	0.0314849	2529	1	Hiway	3231.118143	01050000000
7	7	2730	2724	0	0	0.0146109	2530	1	Hiway	1452.558418	01050000000
8	8	2744	2649	0	0	0.0807806	2544	6	Foot Path	8436.096636	01050000000
9	9	2744	2698	0	0	0.0483496	2545	6	Foot Path	5026.293262	01050000000
10	10	2805	2730	0	0	0.0588503	2594	6	Foot Path	6171.681514	01050000000
11	11	2805	2724	0	0	0.0692107	2595	6	Foot Path	7172.496432	01050000000
12	12	2767	2810	0	0	0.0810293	2597	6	Foot Path	8488.335176	01050000000
13	13	2826	2810	0	0	0.022159	2612	6	Foot Path	2266.091411	01050000000
14	14	2724	2876	0	0	0.164305	2648	1	Hiway	16990.38514	01050000000
15	15	2891	2805	0	0	0.0541928	2662	6	Foot Path	5846.766303	01050000000
16	16	2856	2895	0	0	0.0445913	2664	5	Main Trail	4511.579071	01050000000
17	17	2893	2901	0	0	0.0824923	2670	6	Foot Path	8445.476215	01050000000
18	18	2925	2826	0	0	0.0745351	2693	6	Foot Path	7950.284865	01050000000
19	19	2876	2933	0	0	0.0300944	2701	1	Hiway	3244.850271	01050000000
20	20	2870	2933	0	0	0.0289816	2702	3	Gravelled	3179.962071	01050000000
21	21	2891	2950	0	0	0.0603263	2722	3	Gravelled	6132.949775	01050000000
22	22	2876	2950	0	0	0.0324682	2723	3	Gravelled	3592.100431	01050000000
23	23	2933	2962	0	0	0.0138632	2735	1	Hiway	1476.829804	01050000000
24	24	2933	2965	0	0	0.0131995	2738	2	Metalled	1459.348755	01050000000
25	25	2965	2962	0	0	0.00963319	2739	3	Gravelled	955.4642350	01050000000
26	26	2965	2970	0	0	0.000936895	2745	2	Metalled	103.6726655	01050000000
27	27	2974	2901	0	0	0.058755	2749	6	Foot Path	5989.404075	01050000000
28	28	2950	2970	0	0	0.0191763	2750	3	Gravelled	1949.280993	01050000000
29	29	2962	2976	0	0	0.00620104	2753	1	Hiway	643.0440992	01050000000
30	30	2963	2976	0	0	0.00331925	2754	1	Hiway	347.8553203	01050000000
31	31	2970	2987	0	0	0.00497567	2767	2	Metalled	550.7756041	01050000000
32	32	2976	3014	0	0	0.0160711	2794	1	Hiway	1763.011774	01050000000
33	33	3034	2901	0	0	0.0776842	2820	3	Gravelled	8129.798924	01050000000
34	34	3034	2925	0	0	0.0435111	2821	3	Gravelled	4777.687036	01050000000
35	35	2950	3036	0	0	0.0325018	2822	3	Gravelled	3585.337221	01050000000
36	36	2987	3039	0	0	0.0211219	2825	2	Metalled	2335.814902	01050000000

100 rows.

OUTCOME

- Spatial Database containing the geo-referenced data required for the analysis.
- Restriction map of Tiger habitat.
- The suitability map without considering the settlement of Chitwan District.
- The suitability map considering the settlement of Chitwan District.
- A final suitable map.

Map showing restricted and allowed zone of chitwan district



Legend

chitwan a

0(Restricted)

1(Allowed)

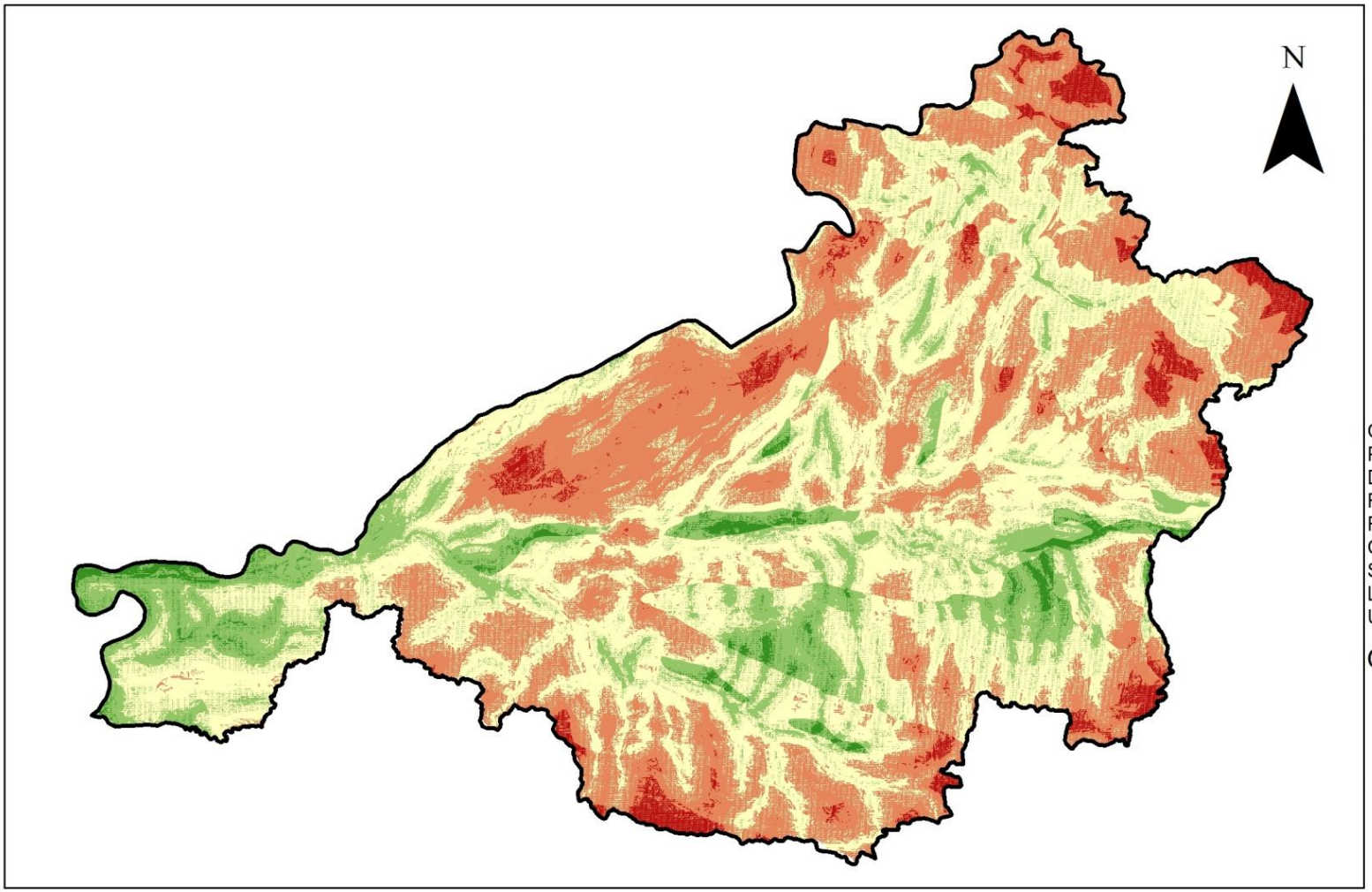
Coordinate System: Modified UTM84
Projection: Transverse Mercator
Datum: Everest Adj 1937
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: 84.0000
Scale Factor: 0.9999
Latitude Of Origin: 0.0000
Units: Meter

Prepared BY:
Suman Ghimire
Bipul neupane
Biplov Parajuli
Sushant Parajuli

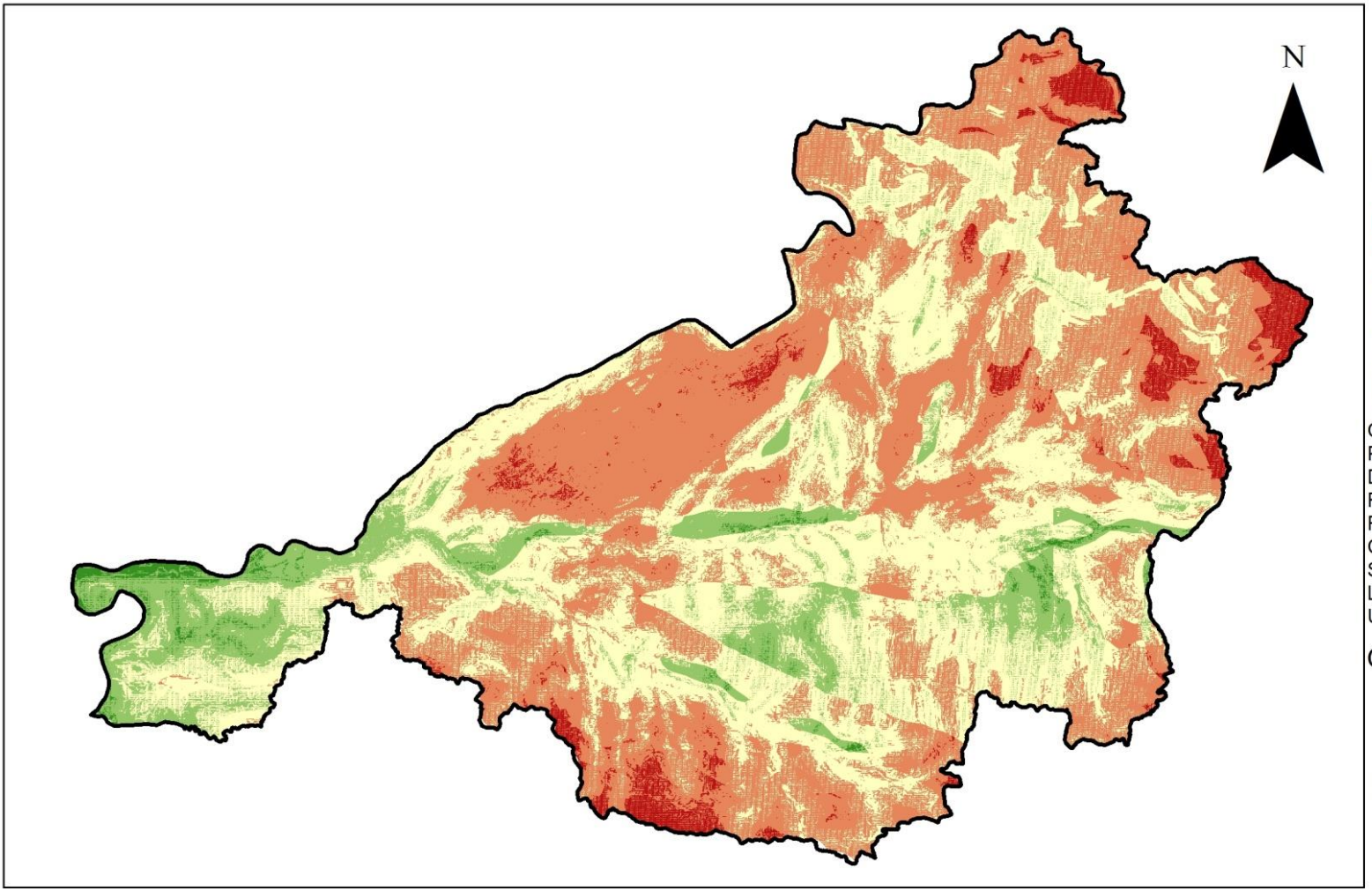
0 4,450 8,900 17,800 26,700 35,600
Meters

Scale: 1:400,000

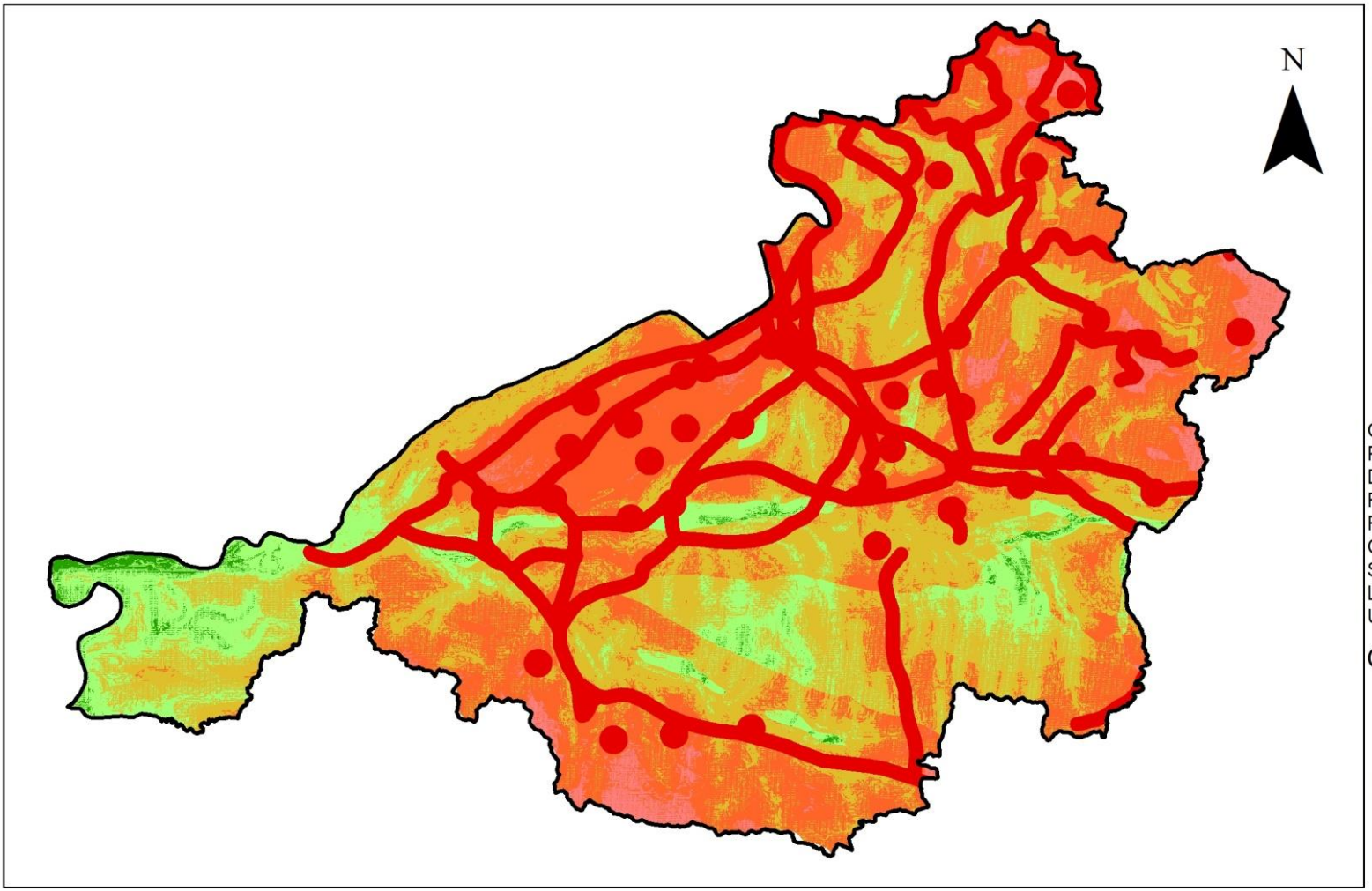
Tiger habitat suitability without considering settlement in Chitwan District



Tiger habitat suitability considering settlement in Chitwan District



Tiger habitat suitability with restriction in Chitwan District

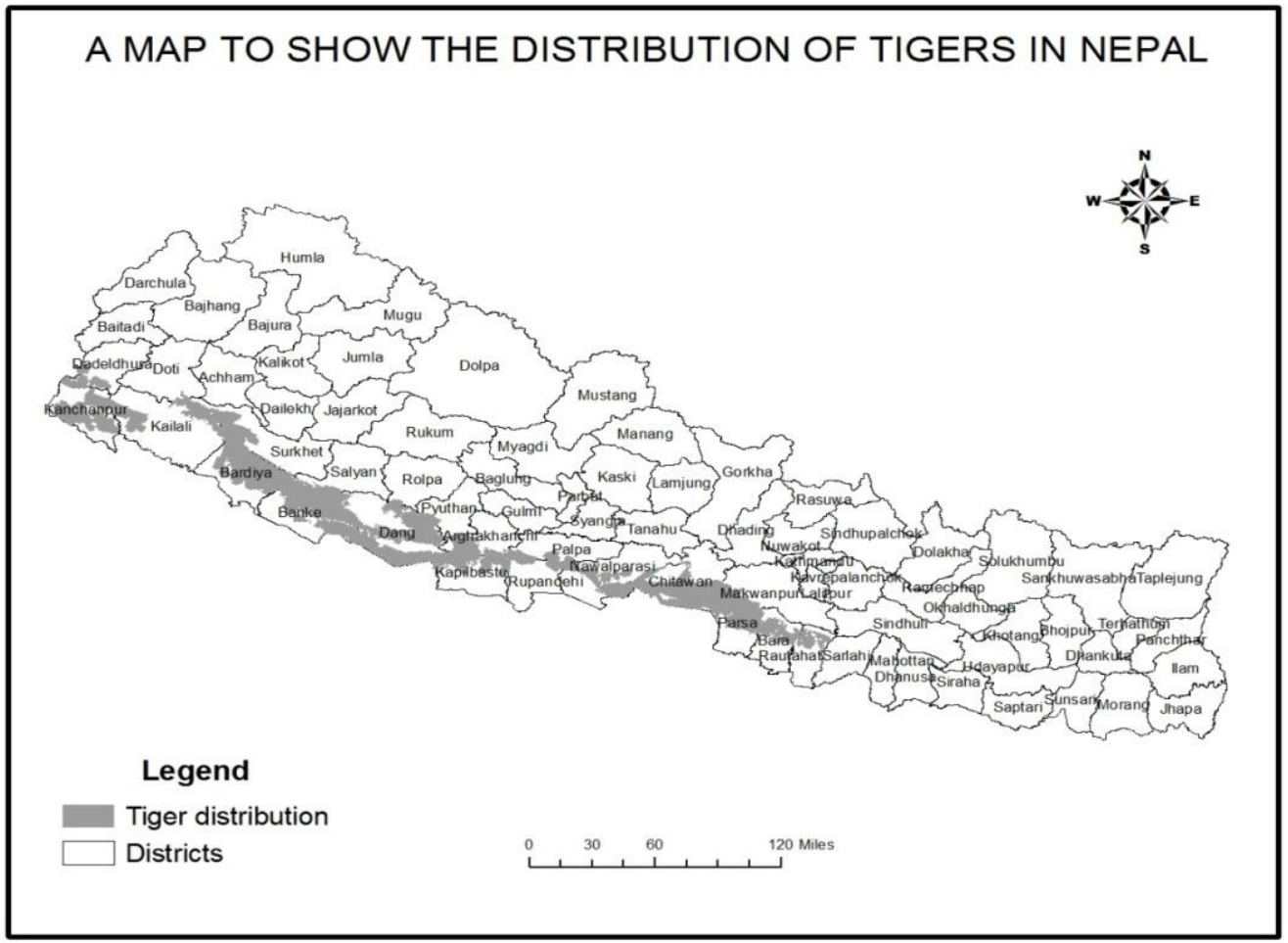


Coordinate System: ModifiedUTM 84
Projection: Transverse Mercator
Datum: Everest Adj 1937
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: 84.0000
Scale Factor: 0.9999
Latitude Of Origin: 0.0000
Units: Meter

Group Menmbers:
Suman Ghimire
Bipul Neupane
Biplov Parajuli
Sushant Parajuli

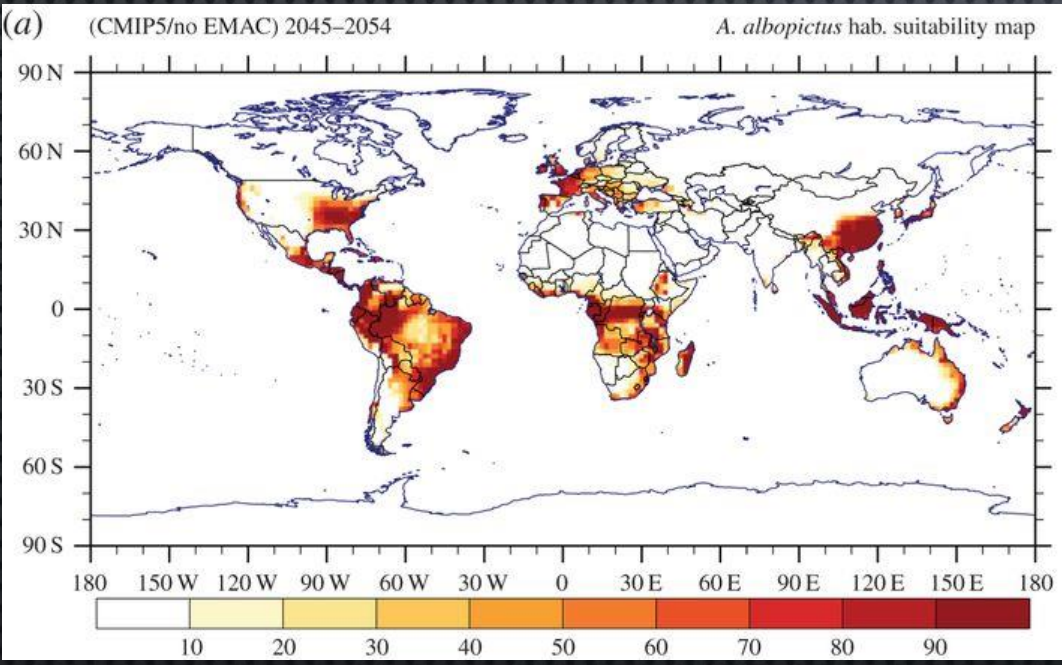
Scale: 1:400,000

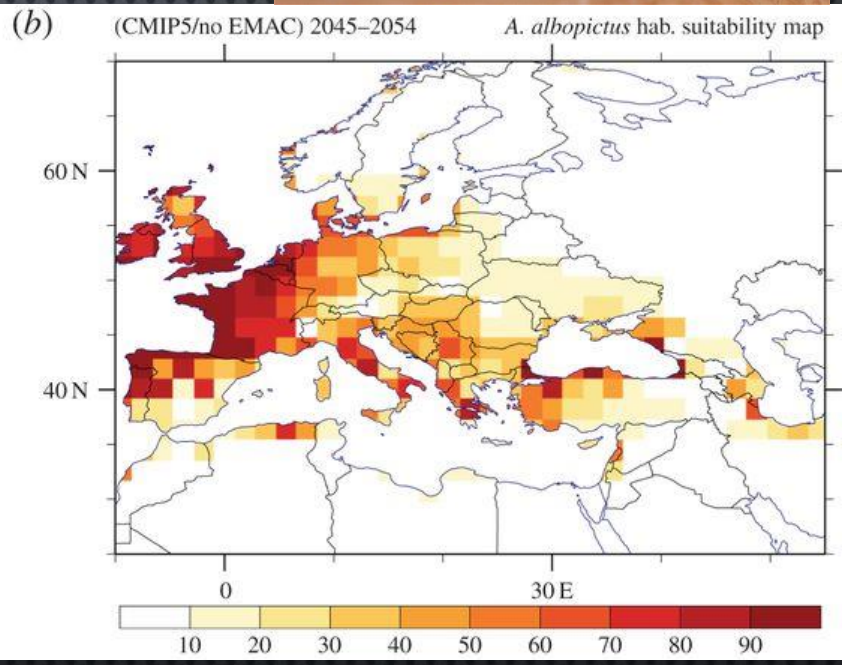
POSSIBILITIES FOR LARGER CONSERVATION AREA



SIMILAR APPLICATION

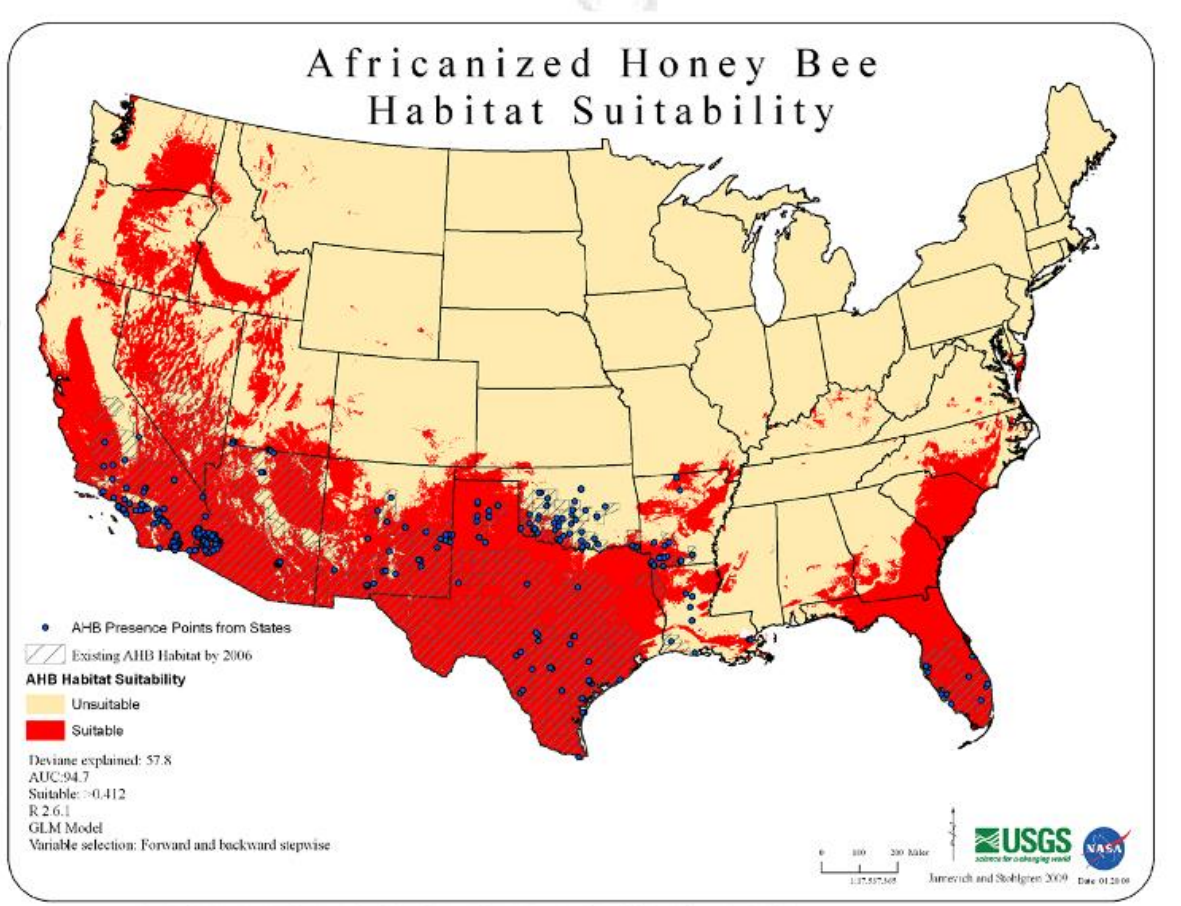
ALBOPICTUS





Y. Proestos, G. K. (2015). *Present and future projections of habitat suitability of the Asian tiger mosquito, a vector of viral pathogens, from global climate simulation.* Royal Publishing Society.

HONEY BEE



This map shows AHB habitat suitability from a recent logistic regression model that is based on state collected AHB occurrence data (blue points) and both bioclimatic and remotely sensed vegetation data. In both this logistic and a similar Maxent model, the major influential variables include: Frost days, percent tree cover (VCF), mean temp of driest quarter, mean temp of wettest quarter, range in Enhanced Vegetation Index (EVI), and precipitation event size. The eastern spread of the Africanized bee from western Louisiana has been delayed, possibly due to major differences in honey bee forage and phenology in the mesic forests.

Assessed on 7th December, 2016: http://www.adkinsbeeremoval.com/africanized-honey-bee.php

REFERENCES

- DoD (2009). Clarifying Guidance Regarding Open Source Software (OSS). http:CIO- NII.defense.gov/sites/oss/2009OSS.pdf
- Assessed on 4TH April, 2014 : www.chitwannationalpark.gov.np
- Assessed on 4TH April, 2014 : www.forestrynepal.org
- Assessed on 7TH December, 2016: http://rstb.royalsocietypublishing.org/content/370/1665/20130554
- Assessed on 7TH December, 2016: http://www.adkinsbeeremoval.com/africanized-honey-bee.php

THANK YOU