Establishing long term observation site in Ghunsa, Kanchenjunga Conservation Area, Taplejung for climate change studies

A FIELD VISIT REPORT
Prepared for Rufford Small Grant Foundation

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Executive Summary

Global climate change is a burning issue in the present world. It has been found that the rate of warming in Hindu-kush Himalayas (Eastern Himalayan region) is higher than average global warming rate. If average temperature increases as predicted all aspects of human and natural life will be affected (ICIMOD, 2009). In such scenario, the high altitude-species will face threaten by endangerment and extinction.

Analysis of impact of climate change on plant diversity in Eastern Himalayan region are limited as there is not enough long-term data available to support modelling and validation. The impact of climate change on plant species can be observed through the shifting in the vegetation zone, change in phenological events, advancing of tree-line, etc.

Phenelogical observation provides one of the best biological indicators of climate change and such studies is almost negligible in Eastern Himalayan region. Rhododendrons are chosen as indicator species for this study as they act as one of the major, ecologically important species in Eastern Himalayan region, supporting a wide variety of habitat, which is vital to maintaining pollinator populations and they function as matrix species in many areas.

For better understanding of the plant diversity in the present context impact of climate change on plant diversity/vegetation studies are essential. The climate change studies are possible through the establishment of long term observation sites. Therefore the current work is designed to establish site for observing phenological events at present but also for the observation of shifting of vegetation zone and biological invasion in long term.

With partial financial support from Rufford Small Grant Foundation and Chinese Academy of Sciences, several 20X20m and bigger sized permanent plots has been set in Ghunsa area of Kanchenjunga Conservation Area, Nepal for climate change studies. During project time plots will be established with all necessary data and information. Beside this phenological trail for monitoring phenological events in Rhododendron arboreum will be developed during project time 2010 (supported by Rufford) and 2011 (continuing support from CAS).

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1. Introduction

Fifteen day long field visit in the Kanchenjunga Conservation Area, Lelep, Taplejung was carried out successfully from March 14 to March 29, 2009. The survey team includes four members from Kunming Institute of Botany (KIB); Central Department of Botany, Tribhuvan University (CDB/TU) and Khwopa College, Tribhuvan University (KC/TU) as follows:

1. Mr. Sailesh Ranjitkar (PhD candidate, KIB) – Main researcher
2. Mr. Niranjan B Ranjitkar (MSc Plant Ecology, CDB/TU) – Assistanting in data collection (ecological data collection, for monitoring field staff appointed for phenological data collection and conducting programs in school with help of local community regarding present work in KCA)
3. Mr. Raju Jati (MSc student, Environment Science, KC/TU) – Carbon sequestration and soil analysis from permanent plots
4. Mr. Shankar Panthee (MSc student, Plant Systematics, CDB/TU) – Ground vegetation analysis in permanent plots

One field staff from was appointed for regular observation of phenological events throughout the year and to assist during locating rhododendron forest sites.

The field was carried out with objective to establish long-term observation site in altitude between 2100 – 3200m and to mark tree rhododendrons for recording phenological events of tree rhododendrons (focusing on *Rhododendron arboreum*) for climate change studies.

Beside these main objectives other purpose for the visit is as follows:

1. To get familiar with the working site
2. To collect voucher specimens for preparing herbarium specimens and proper identification of the species occurring in the study plots
3. To collect soil sample for soil analysis
4. To select proper site for installing temperature loggers
5. To observe proper tree species for collecting tree-core for dendrochronological study

2. Description of the study area

The study was conducted in the KCA in far northeastern district of Nepal with a human population of 122,072 and area of 2035km^2. KCA is politically lies in the Taplejung district, which includes four VDCs – Lelep, Tapelthuk, Walangchung Gola and Yanpondin. It is located between 27^0 30’ to 28^0 00' N and 87^0 45' to 88^0 15' E. It occupies the northeastern part of the district with its boundary extending up to Chinese boarder in the north and Indian boarder in the east.

Topographically KCA represents from 1200m along the bank of Tamur River at Chhiruwa to 8586m at the summit of Mt. Kanchenjunga, the third highest peak of the world. Other eleven mountain peaks above 7000m including Mt. Kumbhakarna (7710m) lie in the KCA. The major rivers in the area Tamur River, Ghunsa River, and Simbuwa River. Rocks and perennial snow cover large area of KCA (Map – 1) has fragile geology, landslide makes a significant part of the area. Areas occupied by different land use classes are described in Table 1.

Table 1: Land use in the KCA

Land use class	Area (sq. km)	Percent (%)
Cultivated Land	10.89	0.54
Forest	317.12	15.83
Grass Land	185.91	9.28
Lake	0.19	0.01
Land slide	1.39	0.07
Perennial snow/glacier	463.67	23.14
Rocks	828.60	41.36
Shrubs	195.74	9.77

Source: WWF Nepal Program

KCA represents an extraordinary landscape and unique flora and fauna diversity and rich cultural heritage. The important flora includes *Larix griffithiana*, *Quercus* spp, *Pinus wallichiana*, *Tsuga dumosa*, *Arundinaria* spp, *Abies spectabilis*, *Betula utilis*, and many species of *Rhododendron*, etc. The faunal diversity includes *Unica unica*, *Maccaca assamensis*, *Ailurus fulgens*, *Moschus chryogaster*, *Naemorhedus goral*, *Naemorhedus sumatraensis*, etc.

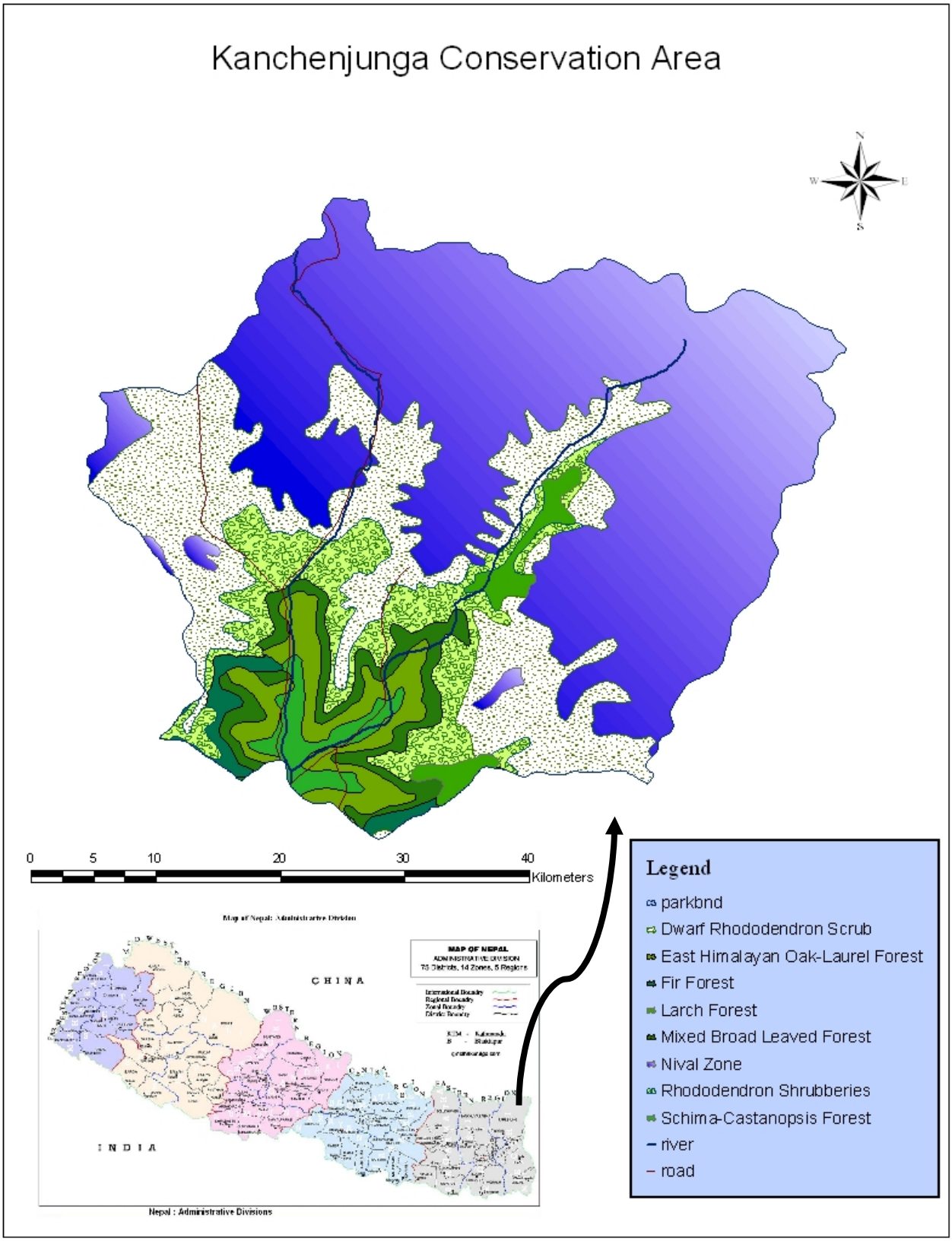
2.1. Present survey site in Kanchenjunga Conservation Area

The present site surveyed in the Kanchenjunga Conservation Area was between Gybla and Ghunsa, in Lelep district (Map – 1 and Map - 2). Permanent plots were established between Phaley to Ghunsa transect because this area is very good in Rhododendron forest and tree-core collection was made between Gybla to Ghunsa transect (between Gybla to Phaley rhododendron trees are present but there is lack of rhododendron forest and landscape is inaccessible. The detail itinerary and activities are as follows:

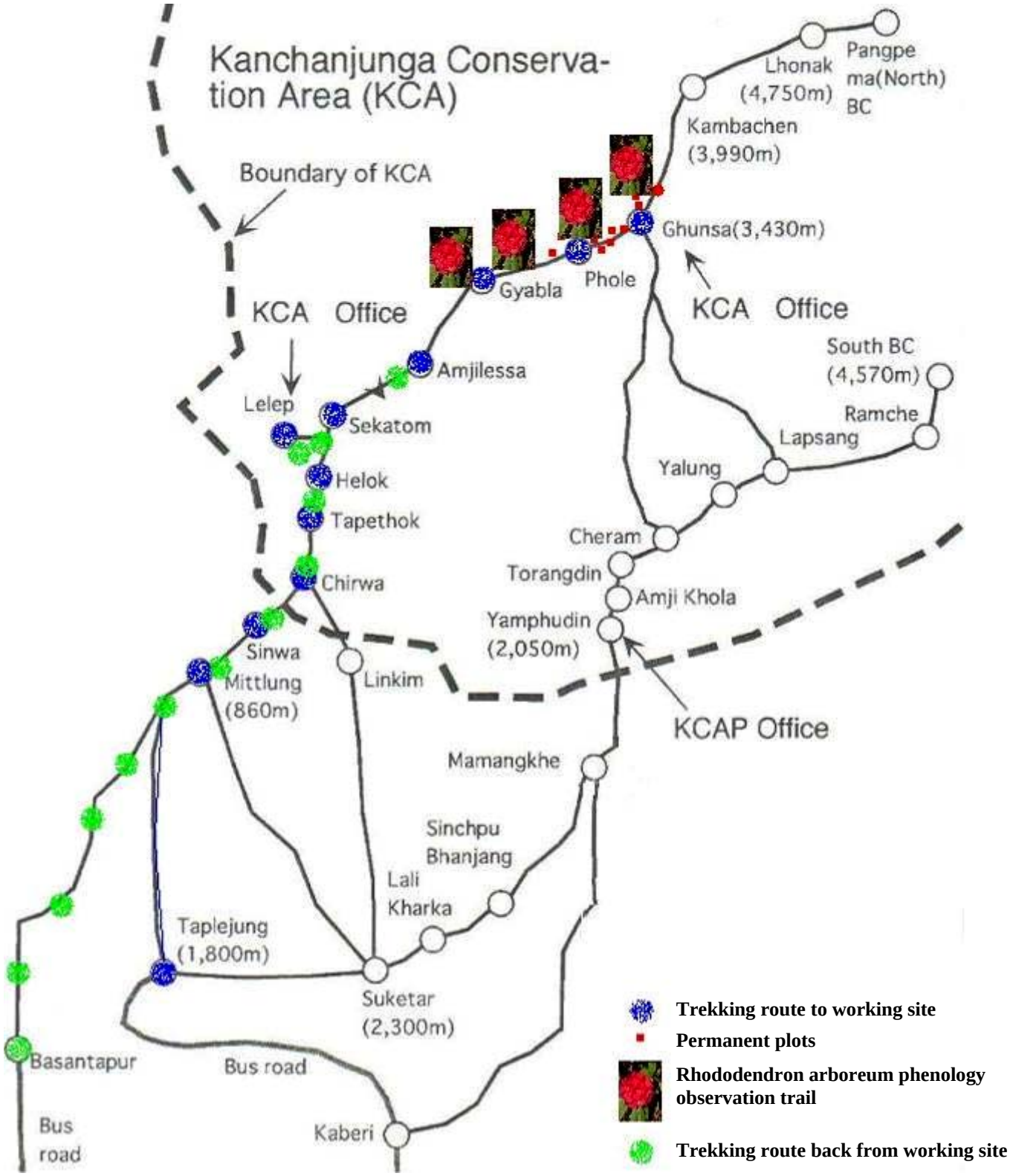
Table 1: Itinerary and Activities

Sn	Date	Destination	Activities
1	Mar 14	Departure from Kathmandu to Birtamod	----------
2	Mar 15	Travel from Birtamod to Phidim	*Stayed at Phidim*
3	Mar 16	Travel from Phidim to Taplejung	*Stayed at Taplejung*
4	Mar 17	Trekking from Taplejung to Thiba	Meeting with Mr. Chandra Chhetri sir (for disseminating awareness program regarding climate change issues in school at Hangdewa through eco-club at school) *Stayed at Thiba*
5	Mar 18	Trekking from Thiba to Lamatar through KCA headquarter, Lelep	Meeting with Mr. Deepak Limbu, Social mobilize, KCA for conducting awareness program regarding present work at Lelep with help from eco-clubs. Meeting with Mr. Shiva Gaire, Ranger KCA Explain work to be carried inside conservation area Requesting for issuing permission letter from KCA headquarter for working inside *Stayed at Lamatar*
6	Mar 19	Trekking from Lamatar to Gyabla	Site observation for establishing permanent plots Survey in Gybla using RRA method regarding utilization of fire-wood (as *Rhododendron arboreum* is one of preferred species for firewood) *Stayed at Gybla*
7	Mar 20	Trekking from Gyabla to Ghunsa	Meeting with (1) Mr Tashi Tenzing, KCAP member (2) Mr.Pemba Sherpa, Villager Ghunsa (3) Mr. 'Kanchha' sir (for disseminating awareness program regarding climate change issues in school at Ghunsa) (4) Discussing regarding Rhododendron forest site with Mr. Tenzing and Mr. Pemba *Stayed at Ghunsa*
8	Mar 21	Merak, Ghunsa	1. Locate suitable site for establishment of plot 2. Establish 40X20m plot at ca.3600m in SW facing slope at Merak, with good occurrence of *Rhododendron arboreum* at last altitude (highest altitude)

			3. Establish 20X20m plot at ca.3500m and 3400m in SW facing slope with good occurrence of *Rhododendron arboreum* 4. Mark plot boundary with GPS recordings, flagging with non-washable paint 5. Tag each tree of *R. arboreum* 6. Record girth and height of all occurring trees 7. Core collection from selected trees 8. Soil sample collection *Stayed at Ghunsa*
9	Mar 22	Descending from Ghunsa to Phaley	1. Setting temperature logger in presence of Mr. Tashi Tenzing, KCA. 2. Establish three 20X20m plot at and one transect with good occurrence of *Rhododendron arboreum* plots between Ghunsa and Phaley transect 3. Procedure 4, 5, 6, 7 and 8 as mentioned above is repeated *Stayed at Phaley*
10	Mar 23	Worked around Phaley area	1. Establish two 10X10m plot two 20X20m plot with good occurrence of *Rhododendron arboreum* 2. Procedure 4, 5, 6, 7 and 8 as mentioned above is repeated *Stayed at Phaley*
11	Mar 24	Descending from Phaley to Amajilessa	1. Set temperature logger at Phaley in presence of Mr. Pemba 2. Core collection on the route along with marking *Rhododendron arboreum* trees *Stayed at Phaley*
12	Mar 25	Descending from Amajilessa to Simwa	*Stayed at Simwa*
13	Mar 26	Ascending from Simwa to Gorja	*Stayed at Gorja*
14	Mar 27	Ascending from Gorja to Gufa and descending to Basantapur	Observed Rhododendron forest at Milke-Jaljale range for phenological stages *Stayed at Basantapur*
15	Mar 28 - 29	Travel from Basantapur to Dharan and Dharan to Kathmandu	----------



Map – 1 Kanchenjunga Conservation Area



Map – 2 Taplejung and Kanchenjunga Conservation Area route map

Table – 2: Locations of permanent plots

Sn	Plot no	Location	UTM		Altitude (m)	Aspect	Slope	Vegetation type
			Easting	Northing				
1	KCA-1	Merak	0593346	3061243	3550	SW 248	30	Mixed conifer forest
2	KCA-2	Ghunsa	0592165	3060441	3600	SE 170	40	Mixed rhododendron
3	KCA-3	Ghunsa	0592168	3060311	3500	SW 224	40	Mixed
4	KCA-4	Smriti chautara	0590745	3059519	3400	SE 147	35	Mixed conifer forest
5	KCA-5	Yanga Samva	0590541	3059171	3300	SE 135	30	Mixed conifer forest
6	KCA-6	Chuda Nigma	0590650	3058844	3200	NE 57	40	Rhodo-Juniper
7	KCA-7	Sugma Devithan	0590716	3058499	3250	SE 122	15	Rhodo-Juniper
8	KCA-8	Laprang Gumba	0590592	3068239	3300	SE 140	7	Mixed rhododendron
9	KCA-9	Puwang Gumba	0590472	3057909	3250	SE 100	20	Mixed rhododendron
10	KCA-10	Dhunga gate	0590311	3056694	3150	SE 176	5	Rhodo-Juniper-Betula

Beside we have work in various transect to get ecological data.

List of all places, including permanent plot sites, where Rhododendrons has been tagged for phenological event observation for developing phenological trail.

Merak – Ghunsa - Chapra Chhusung - Smriti Chautara - Yanga Samva - Chuda Nigma - Sugma Devithan - Laprang Gumba – Phale - Puwang Gumba - Dhunga gate

3. Total expenditure

In this section, I have presented total amount received from Rufford SGF and expenses in field as well as other expenditures as described in proposal/application.

The detail of total expenditure in the present field was as follows.

Table 3: Total expenditure in field

Expenditure category	Particulars	Calculation (amounts in NPR)	Estimated Cost (amounts in NPR)
Travel	**Long distance travel**		
March 14	1. Kathmandu to Birtamod	550 (discount rate) X 4	2200.00
March 15	2. Birtamod to Phidim	300 X 4	1200.00
March 29	3. Dharan to Kathmandu	500 (discount rate) X 4	2000.00
	Local Travel		
March 16	Phidim to Ganesh Chowk	120 X 4	480.00
March 16	Bandewa to Taplejung	25 X 4	100.00
March 28	Basantapur to Dharan	180 (discount rate) X 4	720.00
			6700.00
Daily Allowance	**Food** **March 14 to March 29** (Total including tea and snakes; Expenses for 4 research team members and porter for 7days)	23306	23306.00
	Lodging **March 14 to March 29** Expenses for four research team members	5540	5540.00
Field support	Remuneration		
	Field Coordinator	10000 X 1	10000.00
	Research Assistants	4000 X 2	8000.00
	Local field assistant	2000 X 1	2000.00
	Porter		
	- Taplejung to Ghunsa	500 X 5 days	2500.00
	- Simwa to Basantapur	500 X 3 days	1500.00
Field equipments (minor)	Tree tags	3.25 X 100ps	325.00
	Iron nails – 1pack + Plastic ropes + Paint & brush – 1set, Plastic bags	Together	610.00
		Sub-Total	**53781.00**

Miscellaneous	Medicine (Analgesic, Anti-emetic, Vitamins, Anthelmintic, Antifungal cream)		540.00
	Glucose (4-packs)	25 X 4	100.00
	Torch light/head light - 2	150 X 2	300.00
	Battery – 6 sets (for GPS and torch)	50 X 6	300.00
	Stationary		220.00
		Sub-Totals	**1460.00**
		Grand Total	**61941.00**

Table 4: Total expenditure (major equipments)

Expenditure category	Amount (number)	Price (amounts in NPR)	Total (amounts in NPR)	Remark
Temperature loggers	**2**	25000	50000.00	I need to pay this amount to ICRAF China (I asked Rufford SGF for two loggers – Please refer application)
Digital Camera + Accessories	**1 set**	8500 + 1500	10000.00	For photographing phenological events during each observation (purchased and handed over to field staff)
		Total	**60000.00**	

Total amount received from Rufford SGF = NRP 553,618.00 (conversion rate 1£ = NRP 107, when grant received)

Expenditure till now = NRP 121941.00

4. Accomplishment of the present field

Accomplishments:

1. A field was conducted to establish long term observation site for climate change studies based on flowering phenology observation of tree rhododendrons at Phale to Ghunsa transect, Kanchenjunga Conservation Area, Taplejung. Altogether ten plots (40X20m at highest elevation of occurrence of *Rhododendron arboreum* and remaining 20X20m) were established (Map -2) and several plot-less estimations were made at places between Ghunsa to Gyabla where landscape is not accessible for measuring quadrats. Sampling of all the selected sites was done.

2. Girth and height of all the tree species greater than 10cm dbh occurring in the established plot were recorded. Similarly shrubs occurring within the plot were recorded for community structure study. Seedling and sapling of rhododendrons were counted and height measured to study the regeneration.

3. Altogether 100+ *Rhododendron arboreum* were tagged for phenological observation. All the tree rhododendrons were tagged with plastic plant tag as well as non-washable paint; at the same time to re-locale the established plots GPS recordings of every plot and big rocks at the site were marked as corner of each plot. One local resident at Ghunsa, Mr. Pemba Tsering Sherpa was appointed as field staff to collect phenological data every two week. He was trained regarding estimating the phenological observations and entering such events during field work. Also he was provided with a digital camera set, so that he can snap photos of changing phenological events during recording them.

4. Tree-core from *Rhododendron arboreum* and other tree species like *Juniperus indica, Larix griffithiana* and *Tsuga dumosa* were collected for dendrochronological study. The collected material will be deposited at Central Department of Botany. The collected tree-core will be taken to Kunming Institute of Botany for analysis after necessary documents. After study it will bring back to CDB. (I get permission to collect tree-core in the condition not to take them out of Nepal; therefore I need to take it through Central Department of Botany and after study need to deposit there.)

5. Temperature loggers were set at two places – one at Ghunsa and another at Phale. The loggers were set in presence of staff from Kanchenjunga Conservation Area, Kumbakarna forest user group and community members. After completion of present research the loggers will be handover to KCA.

6. Human activities like logging, lopping, thinning, coppicing and canopy openings were recorded to evaluate human disturbance. The number and frequency of fallen/dead trees were also recorded with girth measurement.

7. Establish cooperation with Kanchenjunga Conservation Area Project (KCAP) and local schools for conducting awareness programs regarding climate change and plant diversity (focusing on plant phenology) starting from May/June 2010.

Annex – 1 Human resources to conduct present research

1) Sailesh Ranjitkar, [PhD Candidate, Kunming Institute of Botany, Kunming, Yunnan, China (KIB); Central Department of Botany, Kirtipur, Kathmandu, Nepal (CDB/TU)] – Researcher
2) Niranjan Bhakta Ranjitkar (Plant Ecologist, Balaju, Kathmandu, Nepal) – Field Coordinator
3) Raju Jati (MSc student, Environment Science, Khwopa College/TU) – Research assistant
4) Shankar Panthee (MSc student, Plant Systematics, CDB/TU) – Research assistant
5) Sudip Ranjeet (Jhochhen, Kathmandu, Nepal) – Accountant
6) Pemba Tsering Sherpa (Ghunsa, KCA, Taplejung, Nepal) – Field staff/Social mobilizer

   Deepak Limbu (Tapethok, KCA, Taplejung, Nepal – Social mobilizer (he will probably join us during conducting awareness programs in local school)

(Any change in team member will be informed)

Annex – 2 Tentative schedule and activities for next field visit to KCA in 2010

Table 5: Itinerary and Activities

Sn	Months	Day	Activities
1	**May/June**	One – five (travel from Kathmandu to Taplejung + trekking)	----------
2		Six – 10 (Ghunsa)	**Major activities as follows** 1. Reviewing + monitoring phenological data/recordings 2. Checking status of temperature logger and collecting data 3. Ground vegetation survey in permanent plots and voucher specimen collection 4. Activities at community and community school regarding research work carried out at KCA region
3		10 - 14 (Phale - Gyabla)	1. Reviewing + monitoring phenological data/recordings 2. Checking status of temperature logger and collecting data 3. Ground vegetation survey in permanent plots and voucher specimen collection 4. Activities at community and community school regarding research work carried out at KCA region
4		14 – 15 (trekking to Lelep at KCA headquarter)	1. Necessary documentation for next year's work 2. Reporting development of current work
5		15 – 20 (trekking and travel back to Kathmandu)	
	August	Itinerary as above	**Major activities as follows** 1. Reviewing + monitoring phenological data/recordings 2. Continuing activities at community and community school at Taplejung
	Oct/Nov	Itinerary as above (days for staying in field will be much longer this time)	Major activities as follows 1. Reviewing + monitoring phenological data/recordings 2. Recording data from temperature logger 3. Tagging each tree in the plot with full scientific, local name, tag number 4. Reviewing and getting report from school activities

Annex – 3 Some photos from field

Recording plot characteristic

Measuring diameter of tree in the plot

Collecting tree-core

Tree-core

Mr. Pemba tagging rhododendron tree

Training Mr. Pemba for recording phenological event; He is trying to figure out proportion of phenology stage

Measuring pH using soil tester

For collecting soil sample along with rootlets of rhododendron

Taking rest during trekking to Ghunsa (Research team and porter)

Preparing to spend night at Lamatar

Briefing work planning to Ranger at KCA office, Lelep

Research team with Mr. Pemba (local field staff) and Mr. Tenzing (KCA staff, Ghunsa)

Mr. Tenzing (KCA staff) inserting temperature logger in Ghunsa

Temperature logger

Activating and setting temperature logger at Phale with GPS readings

Handing over digital camera to field staff Mr. Pemba Tsering Sherpa