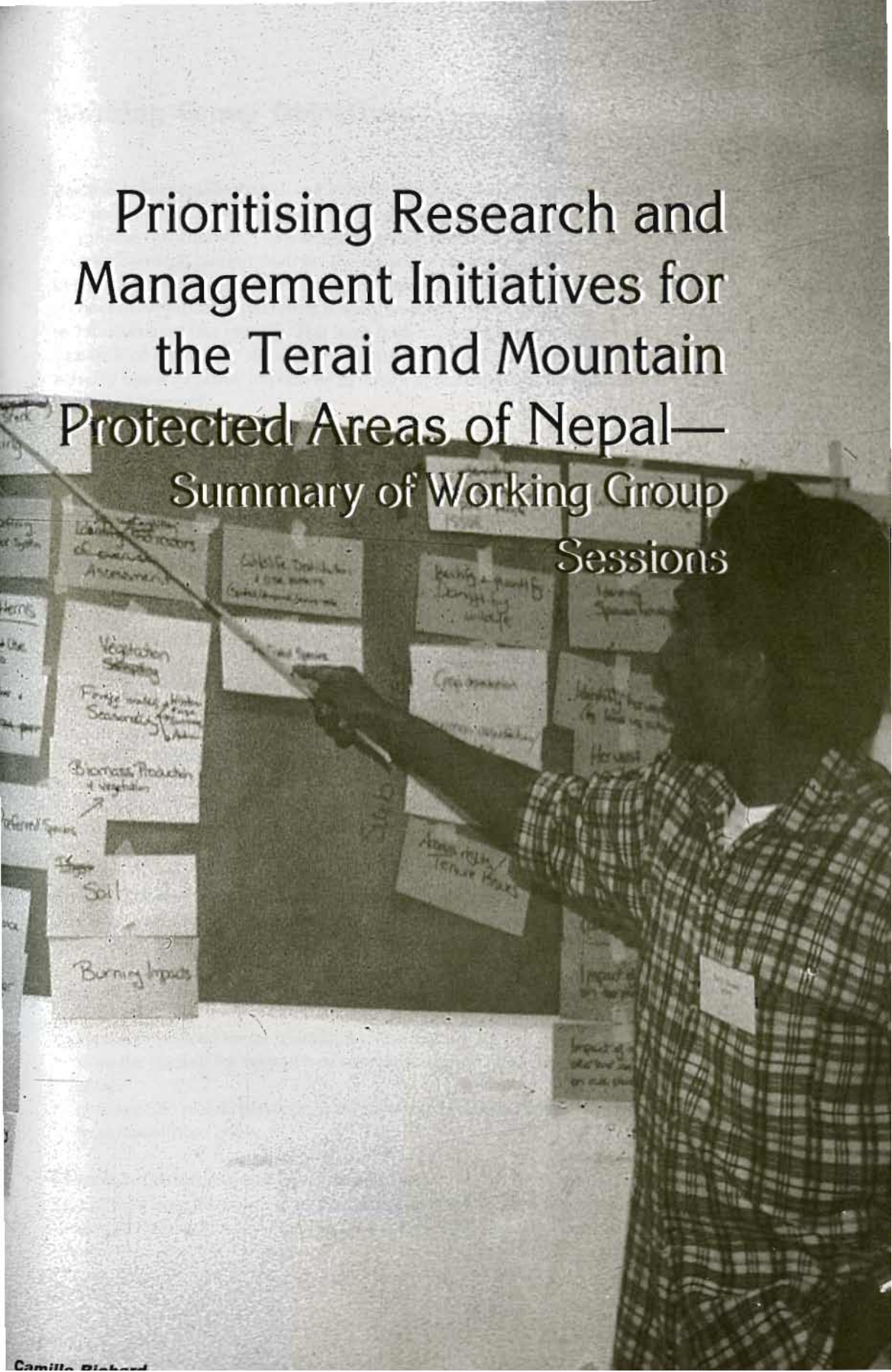
Prioritising Research and Management Initiatives for the Terai and Mountain Protected Areas of Nepal—

Summary of Working Group Sessions



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Working Group Objectives

Session 1. Summarise Issues and Identify Research and Management Gaps
The first working group session was conducted with the primary objective of identifying the important issues affecting the protected areas of Nepal and prioritising those issues based on the degree of research and/or management initiatives conducted to date. The term **issue** is used in this discussion to denote a concern regarding a particular activity or phenomena that may be detrimental to PA objectives like grazing. The term **gap** is used in this context to mean either 1) a lack of research to determine whether a particular activity or phenomenon actually has a negative impact, or 2) a lack of management to address a **known negative impact**.

Participants were separated into two working groups, based on their expertise and interest: the *Terai* and mountain protected areas. Each group was asked to:

- assign a group coordinator and scribe;
- list all issues that were raised in the Status Papers;
- indicate whether a particular issue had been addressed by any research and/or management initiatives (using categories of good, partial, or none);
- prioritise issues based on the degree of initiative among all the *Terai* or mountain PAs in Nepal.

The focus was on the major issues that cut across most PAs of the *Terai* or mountains. Granted, one issue may be of greater importance in one PA versus another. However, the purpose of prioritising these cross-cutting issues was to find commonalities among PAs so that initiatives carried out well in one PA can be of value in another. This would reduce the need to conduct redundant research in all the PAs addressing a particular issue, an example being research approaches to study livestock grazing or management approaches for burning of grassland.

Session 2. Devise Research and Management Strategies to Address Gaps
The final working group session focussed on defining research and management guidelines to address the gaps identified in the previous session.

Each group was asked to:

- list the prioritised issues identified in the first session;
- state the goal of the research or management initiative needed to address the issue;
- give specific recommendations on the research and/or management needed to achieve these goals.

Session 3. Conclusions and Recommendations
The groups later reconvened to discuss the outputs of each group and to determine future courses of action for the DNPWC and other conservation groups.

Terai PA Working Group Sessions

Session 1: Identifying and Prioritising Issues Related to *Terai* PAs

Participants in the *Terai* working group first identified various grassland management issues in each of the five protected areas in the *Terai*. Later, those issues were combined together and then the existing research and management initiatives in those protected areas were listed.

Table 1 shows all the management issues identified in relation to the protected areas in the *Terai*. Altogether, 17 issues were identified. Those issues were then ranked within each PA, the value '17' being the highest priority issue, based on discussions in working groups and review of Status Papers. If the value was '0' for a particular issue, it means that it was not found to be relevant to that PA. The score is the total points across all five PAs divided by the number of PAs where that issue is relevant. These scores were then ranked to indicate the more important issues facing all PAs. This ranking scheme will need to be revisited in later planning sessions for particular PAs.

TABLE 1. GRASSLAND MANAGEMENT ISSUES IN THE *TERAI* PROTECTED AREAS AND THEIR RELATIVE IMPORTANCE

Issues	*RBNP*	*RCNP*	*PWR*	*RSWR*	*KWR*	*Score*	*Priority*
Tree invasion in grassland	17	17	0	17	14	16.25	1
Illegal burning	16	16	14	16	16	15.60	2
Collection of grasses	15	15	15	14	13	14.40	3
Illegal grazing	11	14	12	13	17	13.40	4
Settlement in core area	0	13	16	15	9	13.25	5
Hydrology and flooding	13	10	0	9	15	11.75	6
Research and monitoring	12	6	13	11	10	10.40	7
Scarcity of water	8	3	17	10	0	9.50	8
Crop depredation	9	12	11	8	7	9.40	9
Stakeholder collaboration	7	8	8	7	11	8.20	10
Trans-boundary conservation	5	7	6	12	4	6.80	11
Tourism	10	11	0	2	3	6.50	12
Forest road/park infrastructure	14	4	0	5	6	6.25	13
Corridors and conductivity	3	9	9	6	12	5.80	14
Development activities	6	2	10	3	5	5.80	15
Disease transfer	2	1	7	1	8	3.80	16
Park/camp elephant grazing	4	5	0	4	2	3.75	17

Note: (number indicates severity of the problem on a scale from 1 to 17, "0" = not relevant, score = total points/number of reserves where relevant).

Not all the issues were found equally important among all the protected areas. Some of them are more relevant in one PA than in others, and some were irrelevant in a particular protected area. For example, most of the participants agreed that invasion of grasslands by tree species and burning by villagers during the grass harvesting period are the major issues in grasslands in all the

protected areas of the *Terai*. However, the warden of Parsa Wildlife Reserve, urged that the grasslands in that PA are different from those in others as they have been newly created by clearing *Eucalyptus* plantations, so invasion by tree species is not an issue at this stage although it might be in the future. He further emphasised that unlike the grasslands in other protected areas of the *Terai*, those in Parsa Wildlife Reserve are not affected by floods, tourism, elephant grazing, or roads or any other park infrastructure. Mr. Shiv Raj Bhatta pointed out that settlement in the core area may be an issue in other protected areas but it is not an issue in Royal Bardia National Park. Similarly, it was mentioned that there is no scarcity of water in Koshi Tappu.

Participants also emphasised that, in a particular protected area, some issues are more severe than others (as indicated by the ranking scheme in Table 1), and thus should be given priority and addressed urgently. For example, grazing by domestic livestock is the major issue and impact of tourism the least important in Koshi Tappu Wildlife Reserve. Whereas the impact of tourism is more prominent in RCNP and RBNP. Invasion by tree species is the most important threat to the grasslands in three protected areas, RCNP, RBNP, and RSWR and a major threat in Koshi Tappu, but it is not an issue in PWR. When all the issues were combined and prioritised, tree invasion in grasslands was considered to be the major threat overall in the *Terai* PAs.

In some protected areas, many research and management initiatives are already being undertaken to differing degrees. Table 2 shows the state of management initiatives and research activities in the protected areas of the *Terai*. The priority score is a different ranking scheme, based not just upon what is considered to be the major issue, but also the extent of activity initiated to address that issue. A score of 1.00 means that the issue has been well addressed with either research or management initiatives and thus would have a low priority for follow-up action (the formula used is explained in the table). A score of 0 means no effort has been made to address this issue, thus a higher priority for action. Issues have been sorted in the Table according to the extent of research conducted, although individual PAs will have different priorities. This table is merely a guide. See Annex 1, Tables A-1 and A-2 for the research and management initiatives conducted in each PA.

Session 2: Research and Management Recommendations for *Terai* PAs

Before identifying further management initiatives to be taken to address such issues, the broad objectives were first described so that the management initiatives would be problem and site specific. Thereafter, management oriented research gaps were identified. During the discussion, it was realised that the outcome of such research would strengthen the existing knowledge, help conduct the specific management activity, and help in monitoring.

Table 3 lists all the issues raised during Session 1, ranked in order of priority according to Table 1, followed by recommendations for follow-up management and monitoring activities. The activities recommended in Table 3 should not be generalised for all the protected areas. Their implementation should be site specific based upon local prioritisation exercises to be conducted at a later date.

TABLE 2. SUMMARY OF ISSUES AND RESEARCH / MANAGEMENT INITIATIVES FOR ALL *TERAI* PROTECTED AREAS (TOTAL OF 5 PAS). SUMMARISED FROM TABLES A-1 AND A-2 IN ANNEX 1

Issues	Issue	Research Initiatives			Management Initiatives		
	*Yes**	*Good*	*Partial*	*Priority Score***	*Good*	*Partial*	*Priority Score***
Disease transfer	5	0	1	0.10	0	5	0.50
Tourism	4	0	2	0.25	2	2	0.75
Transboundary conservation	5	0	3	0.30	0	3	0.30
Development activities	5	0	5	0.50	0	2	0.20
Tree invasion in grassland	4	0	4	0.50	0	3	0.38
Corridors and conductivity	5	0	5	0.50	0	4	0.40
Illegal burning	5	2	1	0.50	0	5	0.50
Illegal grazing	5	0	5	0.50	0	5	0.50
Scarcity of water	4	0	4	0.50	0	4	0.50
Forest road/park infrastructure	4	1	2	0.50	0	4	0.50
Hydrology and flooding	4	0	4	0.50	0	4	0.50
Park/camp elephant grazing	4	2	0	0.50	0	4	0.50
Stakeholder collaboration	5	0	5	0.50	0	5	0.50
Settlement in core area	4	1	3	0.63	0	3	0.38
Research and monitoring	5	2	3	0.70	2	3	0.70
Collection of grasses	5	3	2	0.80	0	5	0.50
Crop depredation	5	3	2	0.80	0	5	0.50

* Total number of *Terai* PAs (out of 5) that were identified as facing this issue.
**Priority score calculated as [(#Good) + (#Partial/2)] / #Yes

Mountain PA Working Group Sessions

Session 1. Identifying and Prioritising Issues Related to Mountain PAs

The mountain working group identified 19 issues that are affecting the mountain PAs to varying degrees. Table 4 lists the issues and whether that particular issue is relevant to a particular PA or not. As with the *Terai* PAs, not all issues are important to all mountain PAs. However, some issues are cross-cutting such as livestock grazing, livestock-wildlife competition, poaching, tourism, extraction of forest products, stakeholder collaboration, indigenous management systems, and conservation awareness. They differ in the degree to which PA managers have addressed these issues.

Table 5 summarises the issues identified for all mountain PAs combined, together with the research and management efforts conducted to date to address these issues. The specific research and management initiatives for each mountain PA can be found in Tables A-3 and A-4 in Annex 1. A priority score was calculated based on the extent of activities initiated in the PAs to address an issue (the formula used is explained in the table). A score of 1.00 means that the issue has been well addressed with either research or management initiatives and thus would have a low priority for follow-up action. A score of 0 means that no effort has been made to address this issue, thus a higher priority for action.

TABLE 3. MAJOR OBJECTIVES AND THE RESEARCH AND MANAGEMENT ACTIVITIES RECOMMENDED TO ADDRESS THE ISSUES IDENTIFIED IN THE *TERAI* PA WORKING GROUPS

Issues	Goal/Objectives	Management Activities	Research/Monitoring Activities
1. Tree Invasion - Important to control invasion to maintain habitat for wildlife species	• Maintain existing diversity and area of grassland • Maintain patchy structures of grasslands within and between grasslands	• Identify prime critical/at risk grassland • Describe past history and determine present status • Survey, map, and demarcate with other habitat • Identify and determine the status and trends of invading species (woody, shrubs, weeds, etc) • Remove (uproot, cut, dig) invading species • Test and adopt controlling strategies • Develop monitoring strategies	• Conduct survey and mapping (RS, GIS, ground samples) of grassland areas • Fixed print photographs • Fixing poles/posts and plane table survey • Inventory of diversity • Impact of removing the invading species • Research for methods to maintain mosaic grasslands (e.g., short and tall grasslands)
2. Burning - managed burning as well as illegal burning. Patch burning preferred to maintain grassland mosaic	• Develop prescribed burning, cutting, harvesting regimes to maintain grassland habitat quality, based on the movement of wildlife	• Divide the grasslands into blocks • Conduct rotational control burning • Leave some areas without burning • Finish all controlled burning before mid February • Combine burning and harvesting treatments, such as: a) no burning and no harvesting; b) no burning but harvesting, c) burning but no harvesting, and d) burning and harvesting	• Monitor rotational burning • Monitor timing of burning • Monitor combined treatments
3. Collection of Grass - both legal and illegal harvesting. Not known whether grass harvesting is having a negative impact. This is currently being used as a grassland management tool.	• To maintain a diverse, patchy mosaic of grasslands	<u>Legal</u> • Develop a policy to regulate grass cutting (a task force can be made for this) <u>Concessional</u> • Review the policy of concessional grass cutting <u>Illegal grass cutting</u> • Develop a resource base in the Buffer Zone (BZ) to reduce pressure on PA resources	• Examine the impact of grass harvesting on grassland ecosystems and on the socio-economy of the people • Research on nutrient cycling • Research on the impact of babiyo (*Eulaliopsis binnata*) harvesting
4. Livestock grazing - especially pronounced problem in KWR. Little information on the extent of impact.	• 1. To minimise impacts of grazing	• Identify problem areas in PA's/ corridor areas • Coordinate with local community to manage community areas (BZ) for grazing • Create effective physical barriers (trench, bio-fencing) around affected areas • Coordinate with other line agencies to reduce grazing pressure	• Conduct site specific research on the impact of grazing as well as removal of grazing • Conduct trials of grazing and non-grazing
5. Settlement inside the core area - All PAs other than RBNP have settlements within the core areas that need to be removed.	• Make the core area free of settlements • Increase the area of grassland such as in the PWR	• Relocate the settlement and convert that area into grassland • Prepare plan for relocation (e.g., PWR) • Expedite relocation and land compensation (e.g., KWR) • Make a plan for management inputs after relocation (e.g., levelling, making water holes, uprooting, bio-fencing)	• Conduct research on the impact of relocation on the ecology of the area and the socio-economic condition of relocated people

TABLE 3. CONT....

Issues	Goal/Objectives	Management Activities	Research/Monitoring Activities
6. Hydrology and Flooding - grasslands of the *Terai* are reliant on flooding to arrest succession to forest but flooding can also be detrimental, such as in KWR.	• Conserving catchment area • Maintaining proper hydrological regime	• Catchment conservation • Public conservation awareness programme • Lobbying to government to conserve catchment areas	• Research on the impact of flooding and sedimentation on grassland structure and function • Research on river dynamics in and around grasslands
7. Research and Monitoring	• To generate database • To improve networking and information flow with other protected areas.	• Identify and prioritise research and monitoring fields/tools • Identify research/monitoring resource persons or agencies both domestically and internationally • Develop skill of DNPWC staff to carry out management, research, and monitoring • Develop and implement monitoring system within PA's management framework	
8. Scarcity of Water – water is limiting for wildlife in some PAs such as RSWR and PRW.	• Providing drinking water to the wildlife consistent with the grassland ecosystem	• Create alternative water holes where needed	• Conduct research on the movement of wildlife in relation to the sources of water and their use by wildlife • Compile existing information on water sources • Develop water maps • Identify gaps
9. Crop Damage – crop raiding from adjacent PAs is a common problem.	• 1. Reduce park-people conflicts	• Effective measures to minimise crop damage by fencing, making trenches, and working with local communities to change their cropping patterns.	• Research on extent of damage and appropriateness of method in site-specific areas
10. Stakeholder Collaboration and Coordination among Agencies	• Strengthen collaboration among stakeholders	• Identify stakeholders and make reports • Strengthen coordination	• Stakeholder and user group identification
11. Trans-boundary Conservation and Coordination	• Effective implementation of trans-boundary meetings with India	• Develop mechanism and processes to achieve the goal • Exchange tours between countries	•

TABLE 3. CONT....

Issues	Goal/Objectives	Management Activities	Research/Monitoring Activities
12. Tourism - More than 60,000 tourists visit RCNP annually and numbers are increasing in RBNP	• To minimise disturbance in grassland areas from lodges, camps, and resorts within the PAs	• Assess the impacts caused by tourism - activities/number of tourists • Assess spatio/temporal impacts of visitors • Propose strongly to relocate tented camps to buffer zone, especially in Chitwan, Bardia, and Shukla Phanta. • Relocate others when their contracts expire • Zonation in potential tourism areas (e.g., Babai Valley)	• Conduct research on the impact of tourism on grassland ecosystems • Document socio-economic conditions and culture of the local community
13. Park Infrastructure – although necessary for routine management within the PAs, there is concern that such infrastructure may disturb wildlife and habitat	• To minimise disturbance to grassland areas resulting from the presence of roads, guard posts, towers, etc	• Review the existing infrastructure in grasslands and their vicinity • Classify infrastructure based on the use and importance • Regulate the use of infrastructure accordingly (e.g., in Baghaura Phanta in Bardia where a road passes through the grassland from January to April; in Shukla-review the location of a guardpost near the *machan* and relocate if possible)	• Conduct research on the impact of infrastructure affecting any grassland ecosystem
14. Corridors and Connectivity – wildlife numbers are increasing in PAs and will need habitat beyond PA boundaries	• Conserve/protect existing corridors and if possible create additional corridors	• Generate good maps of corridors • Develop strategies to reduce human impact in corridors • Tighten linkages with other line agencies working outside the PAs	• Ground investigation for the use of corridors by wildlife and people
15. Non-PA Development Activities – activities outside the PAs that impact core areas such as dams, high tension line, highways, and irrigation schemes	• To minimise/stop activities adversely impacting the grasslands	• Lobbying from local level to international level	• Conduct research on the environmental impact of any kind of developmental activities
16. Disease Transfer and Genetic Pollution – potentially resulting from interaction with domestic livestock	• Maintain healthy and disease free wildlife populations	• Immunise (anthrax, FMD, rinderpest) livestock in Buffer Zone to reduce disease transfer • Minimise wildlife-livestock interaction	• Conduct blood/stool analysis • Disease survey in wildlife • Monitor wildlife health by external morphological features • Genetic study in wildlife
17. Park/Camp Elephant Grazing – impact from domestic elephants unknown	• Sustainable use of grassland resources for park elephants	• Do not increase the present number of elephants grazing inside the park (based on research findings in Bardia)	•

TABLE 4. ISSUES IDENTIFIED FOR EACH MOUNTAIN PROTECTED AREA OF NEPAL

ISSUES	KNP	RNP	SPNP	LNP	DHR	KCA	ACAP	MBNP	SNP	MCA
Forest burning	N	Y*	Y*	N	N	N	Y	Y	Y	?
Wild plant extraction	Y	Y	Y	Y	Y	Y	Y	Y	?	Y
Poaching/hunting	Y	Y	Y	Y	Y♦	Y	Y	Y	Y	Y
Livestock grazing	Y	N▲	Y	Y	Y	Y	Y	Y	Y	Y
Winter forage/fodder	N	N	Y	Y	N	Y	Y	N	Y	?
Livestock depredation	Y	N	Y	Y	Y	N	Y	Y	Y	?
Tourism/pilgrimage	Y (pt)	Y (t)	Y (pt)	Y (pt)	Y (pt)	Y (pt)	Y	N	Y	Y
Livestock-wildlife competition	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Crop depredation	Y	Y	Y	Y	N	Y	Y	Y	Y	?
Transboundary	N	N	Y	Y	N	Y	Y	Y	Y	Y
Agricultural encroachment/ illegal settlement	Y	Y	Y	Y	Y	N	Y	N	N	?
Indigenous management systems	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Disease transfer	Y	N	Y	Y	Y	Y	Y	Y	Y	?
Livestock composition change	Y	N	Y	Y	Y	N	Y	?	Y	?
Extraction of forest products	Y	Y	Y	Y	Y	Y	Y	Y	Y	?
Collaboration among stakeholders	Y	Y	Y	Y	Y	Y	Y	Y	Y	?
Shifting cultivation	N	N	N	N	Y	Y	Y	Y	N	?
Conservation awareness	Y	Y	Y	Y	Y	Y	Y	Y	Y	?
Non-park development projects and activities	N	N	N	Y	N	Y	Y	N	Y	N

Index: 'Y' = yes; 'N' = no '?' = not known; (p) = pilgrimage; (t) = tourism; (pt) = both pilgrimage and tourism

* controlled burning, lack thereof leading to disease in livestock/wildlife as indicated locally

♦ managed hunting

▲ lack of livestock grazing/fire leading to invasion by pines

Issues have been sorted in the table according to the extent of research conducted, although individual PAs will have different priorities. This table is merely a guide.

Table 6 shows the total research and management initiatives to date in each of the PAs in the mountain areas. A priority score for each PA was calculated based on the extent of activities initiated in that PA to address the issues pertinent to it (the formula used is explained in the table). The lower the priority score, the less work has been done in that PA to address the issues of concern. This table is presented to show that some PAs have received more attention and resources than others. For example, PAs such as ACAP and Makalu Barun have initiated many activities to address comprehensive issues, while Kanchenjunga (which is a young PA) and Khaptad have not adequately addressed many issues. This table can be a starting point to identify which PAs need additional focus from the Department for research and management planning and resource allocation.

TABLE 5. SUMMARY OF ISSUES AND RESEARCH/MANAGEMENT INITIATIVES FOR ALL MOUNTAIN PROTECTED AREAS (TOTAL OF 10 PAS). SUMMARISED FROM TABLES A-3 AND A-4 IN ANNEX 1

Issues	Issue?	Research Initiatives			Management Initiatives		
	Yes*	Good	Partial	Priority score**	Good	Partial	Priority score**
Forest burning	5	0	0	0.00	0	0	0.00
Disease transfer	8	0	0	0.00	0	1	0.06
Livestock-wildlife competition	10	0	4	0.20	0	5	0.25
Livestock composition change	6	0	3	0.25	0	0	0.00
Crop depredation	8	1	3	0.31	0	2	0.13
Wild plant extraction	9	1	4	0.33	2	0	0.22
Shifting cultivation	4	1	1	0.38	1	1	0.38
Winter forage/fodder	5	1	2	0.40	1	2	0.40
Livestock depredation	7	2	2	0.43	0	3	0.21
Transboundary conservation	7	1	4	0.43	1	4	0.43
Non-park development projects and activities	4	0	4	0.50	0	2	0.25
Indigenous management systems	10	3	4	0.50	3	2	0.40
Extraction of forest products	9	0	9	0.50	1	7	0.50
Conservation awareness	10	2	7	0.55	0	6	0.30
Collaboration among stakeholders	9	2	6	0.56	1	7	0.50
Livestock grazing	9	4	4	0.67	4	2	0.56
Tourism/pilgrimage	10	4	6	0.70	3	6	0.60
Agricultural encroachment/ illegal settlement	9	8	1	0.94	0	4	0.33
Poaching/hunting	10	10	0	1.00	9	0	0.90

* Total number of mountain PAs (out of 10) that were identified as facing this issue.
**Priority score calculated as [(#Good) + (#Partial/2)] / #Yes.

TABLE 6. TOTAL RESEARCH AND MANAGEMENT INITIATIVES IN EACH MOUNTAIN PA (ADDRESSING THE 19 ISSUES)

PA:	Total No. of Issues Identified	Research Initiatives			Management Initiatives		
		Good	Partial	Priority score*	Good	Partial	Priority score*
KCA	15	2	6	0.33	0	4	0.13
KNP	14	1	8	0.36	2	6	0.36
DHR	14	2	7	0.39	1	3	0.18
RNP	11	2	5	0.41	2	6	0.45
SPNP	17	5	8	0.53	3	7	0.38
LNP	17	4	10	0.53	4	7	0.44
SNP	16	6	7	0.59	3	6	0.38
ACAP	19	9	7	0.66	8	8	0.63
MBNP	14	8	5	0.75	5	6	0.57
MCA	not counted						

* Priority score calculated as [(#Good) + (#Partial/2)] / #no. of issues identified

Session 2: Research and Management Recommendations for Mountain PAs

The mountain group sessions indicated a significant absence of research related to high elevation rangelands and forests. Thus the participants focussed on developing research strategies to address the high priority issues of wildlife-livestock competition, crop and livestock depredation, medicinal plant extraction, stakeholder involvement, and transboundary protection. Table 7 highlights the major goals and activities needed to address the lack of research in mountain PAs. It was felt that to address these issues best, there should first be a solid understanding about the pastoral production systems operating in the various PAs, including the socioeconomic and bio-physical constraints these communities face. This in turn would help prioritise research and management activities in the future, especially if the decision-making process regarding research and management is to be truly collaborative and participatory. Issues should be prioritised within each PA specific to their own needs and concerns, but with a clear picture of local land-use systems. All the 19 issues identified can be addressed to varying degrees in each PA.

General recommendations were made by the group to address research and management gaps.

- Each PA to prioritise research and management according to specific PA needs and concerns
- Promote collaboration/cooperation at the local and national level (among line agencies and NGOs working in the natural resource sector)
- Promote collaboration/cooperation among international entities
- Include local herders and other relevant stakeholders in the decision-making and planning process
- Tighten linkages between research entities and PA management
- Improve communication and sharing of information within and among PAs
- Revise and update management plans for all PAs, including policies, programmes, implementation strategies, schedule and budgets
- Adopt an interdisciplinary approach to both research and management
- Develop on-going research facilities and systems to conduct and manage research for each PA
- Develop and implement relevant monitoring systems for each PA such as monitoring of livestock numbers and composition

Conclusions and Recommendations of Working Groups

Each group approached their assigned tasks in different ways, but overall the recommendations made were appropriate to address the key issues related to grassland conservation and management.

The *Terai* working group sessions revealed that, while much research on grasslands has been conducted to date, the results have not been incorporated into grassland management practice. The *Terai* PAs are at a stage where they can begin implementing many of the management recommendations provided by researchers over the years. Therefore, the participants of the *Terai* working group outlined a number of research and management strategies to address gaps, primarily focussing on maintenance of grassland habitats for key wildlife

species. In addition, policy recommendations were put forth to deal with the more difficult aspects of landscape management, such as stakeholder involvement in buffer zone and corridor areas, hydrology impacts of upriver dams, and land conversion in corridor areas.

The mountain group sessions indicated a significant absence of research related to high elevation rangelands and forests. Management of mountain PAs offers a challenge because human use in these areas is much more extensive than in the *Terai* (where human use is mostly concentrated in buffer zones outside the core PA), making park-people conflicts more likely, more pronounced, and more difficult to manage. Thus, stakeholder involvement in the management of core areas of the PAs becomes much more important, especially as these communities are allowed access by law. The working group felt that to address the major issues best, it is vital to understand the rationale of why local communities use resources in the manner that they do and to document the extent of that use and its overlap with PA resources of concern such as wildlife. Thus the participants focussed on developing research strategies to address the high priority issues of wildlife-livestock competition, crop and livestock depredation, medicinal plant extraction, stakeholder involvement, and transboundary protection.

The Following Follow-up Actions were Recommended

- An editorial committee would be established to compile the *Terai* and mountain papers and summarise working group sessions for the workshop proceedings. A summary of the workshop would be sent in the form of an action document to the DNPWC for review before publishing by ICIMOD.
- This action document should be provided to small working committees assigned to refine and implement the research and management guidelines identified in the workshop: one for *Terai* and one for mountain PAs. No agreement was made regarding who should be on these committees as this would need to be the initiative of the DNPWC. The DNPWC needs to identify who should be on these committees, define tasks, and develop logistical arrangements for how and when these committees could meet.
- Each warden should refine the priorities discussed in the working groups according to specific PA needs in a subsequent planning workshop.
- Levels of follow-up and action should depend on the type of recommendation: such as policy, management, or research. A core grassland committee could act as a link between these various levels of action.
- Follow-up training in research methods and management techniques should be done.
- Conduct a future regional meeting to discuss the status of grassland research and management in *Terai* and mountain PAs of India and Nepal.

Concluding Remarks

Mr. K.M. Shrestha chaired the concluding session of the workshop. Speaking on behalf of the mountain PAs, Mr. Fanindra Kharel thanked the organizers for providing a forum to interact on relevant issues of grassland management. He also said that the workshop dealt with genuine issues and explored inherent problems pertaining to the effective management of both mountain and *Terai* parks.

TABLE 7. MAJOR OBJECTIVES AND THE RESEARCH AND MANAGEMENT ACTIVITIES RECOMMENDED TO ADDRESS THE ISSUES IDENTIFIED IN THE MOUNTAIN PA WORKING GROUPS

Objectives	Issues Addressed (of the total 19 identified in the workshop)	Research Activities	Variables to Study	Management/ Policy Activities
I. To document pastoral systems in mountain protected areas - Rationale for use of PA resources (indigenous knowledge) - Socio-economic constraints - Bio-physical constraints	ALL	• Initiate participatory action research to help local communities and stakeholders to identify their own constraints and solutions in a collaborative manner (methods: RRA, PRA, APPA, etc) • Document work done by other government departments for the area in the livestock, forestry, and agricultural sectors	• Indigenous knowledge regarding livestock husbandry, rangelands, forests, burning practices, agriculture, etc • Grazing patterns – extent and distribution • Livestock numbers and composition/distribution by type • Preferred forage species and seasonal availability • Animal performance • Economic value of livestock products, etc • Demographic patterns	• Train local DNPWC staff in participatory research techniques, agro-ecosystem analysis • Set up legal framework to allow collaborative management of resources with local communities • Establish collaborative links with other relevant government departments/NGOs • Establish basic livestock monitoring/ permit system
II. To document bio-physical resources and their extent/ ecology	ALL	• Compile literature to date on PA resources in spatial and temporal format • Map known resources • Identify gaps • Collect additional information	• Map resources: land-use patterns, topography, settlement areas, trails, drainage areas, livestock distribution, pastures (resident and transhumant) wildlife distribution, extent of burning • Conduct ecological studies on forest and rangeland condition with regard to human use (grazing, burning, forest product extraction)	• Develop on-going research facilities/system for each PA • Develop a literature depository at DNPWC and each PA • Develop mapping unit at DNPWC • Train staff in research and mapping techniques • Strengthen collaborative links with other research organizations (e.g., NGOs, government agencies, universities)
III. To document wildlife habitat and movements and how it overlaps with human uses of resources	• Wildlife-livestock competition • Crop and livestock depredation • Disease transfer	• Compile literature to date on livestock-wildlife conflicts • Identify gaps • Study wildlife and livestock distribution patterns • Patterns of crop raiding • Disease incidence	• Wildlife distribution and autecology, livestock distribution, forage niches, landscape characteristics, cropping patterns and associated landscape, patterns of crop raiding, types and extent of disease in wildlife/livestock	• See above

TABLE 7 CONT....

Objectives	Issues Addressed (of the total 19 identified in the workshop)	Research Activities	Variables to Study	Management/ Policy Activities
IV. To document the ecology and use of medicinal plants	• Wild plant extraction	• Compile literature to date on medicinal plants • Identify gaps • Studies on plant ecology • Studies on use patterns, home consumption and commercial use • Legal aspects	• Autecology of plant species (environment) • Distribution, quantity • Impacts of harvesting on plant growth, etc • Estimates of quantity for home consumption • Estimates of quantity for commercial sales • Policy review	• See above
V. To explore means to improve transboundary collaboration at the local and national levels	• Poaching and export • Transboundary collaboration • Wild plant extraction and export • Forest burning • Stakeholder collaboration	• Feasibility studies along border areas to identify issues facing local communities and capability at local level to manage transboundary conservation (already initiated for some PAs) • Legal analysis	• Review literature • Identify border sites of high biodiversity significance • Document perceived threats to biodiversity by various stakeholders • Extent of cross-border resource use and indigenous management • Trade of illegal plant and animal products • Identify opportunities for economic incentives	• Initiate collaborative research with local communities in border areas • Increase local awareness of transboundary issues • Trans-national meetings to determine strategies • Training of local staff in monitoring illegal/legal trade
VI. Improve stakeholder collaboration	ALL	• Participatory action research regarding various issues • Stakeholder identification regarding particular issues (e.g., forest, grazing, medicinal plants) • Document tenure (customary and legal) • Conflict resolution strategies	• Define user groups for particular resources • Tenurial rights among different groups (caste, gender, legal, customary) • Identify world views among stakeholders and conflicts in those views • Conflict resolution techniques	• Train local DNPWC staff in participatory research techniques, stakeholder identification, and conflict resolution strategies • Set up legal framework to allow collaborative management of resources with local communities • Establish collaborative links with other relevant government departments/NGOs

Dr. Nic Peet commended DNPWC, the WWF Nepal Program, and IUCN for organizing the three-day workshop. He also said that the workshop had floated good ideas and made useful recommendations for effective grassland management.

Mr. Vishwas B. Sawarkar spoke on behalf of the Indian participants and acknowledged their gratitude to the organizers for providing the opportunity to interact with researchers, park managers, and conservationists. He said the workshop was successful in setting goals and objectives for effective grassland management. He added that the Wildlife Institute is looking forward to similar interactions in the future.

Ms. Camille Richard thanked the collaborating organizations and remarked that the workshop had been very beneficial not only for conservation groups in Nepal, but also for ICIMOD's programmes in biodiversity conservation and rangeland management. She also said that the workshop presented a clear picture of the major issues on grassland ecology for both the *Terai* and mountain parks in Nepal.

Mr. Shyam Bajimaya of DNPWC commented that the Status Papers and Research Papers presented in the workshop highlighted the ecosystems in the protected areas. They also dealt with the complexities of grassland management. He hoped that the outcome of the workshop would help in developing realistic guidelines for park managers to use practically in the field. The Chief Warden of Royal Bardia National Park thanked ICIMOD, the WWF Nepal Program, and DNPWC for providing support to organize the workshop in Bardia. He also thanked all those who directly or indirectly contributed to the success of the meeting.

The chairperson stated that the extensive discussions and sharing of experiences with each other was enriching. He thanked all the participants for making the workshop a success, and formally closed the session.

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