



Observations and Recommendations on Fire Management in Nepal

Final Report – May 14, 2013



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Report covers a trip to Nepal funded by United States Department of State, United States Forest Service (USFS), and the United States Agency for International Development (USAID), and in collaboration with World Wildlife Fund-Nepal. Mission objectives were to provide observations and recommendations of fire management in Nepal after visiting with Nepal Government, stakeholders and Non-Governmental Organizations (NGOs) active in fire management issues.

Table of Contents

Figures.....	2
Introduction	3
General Observations and Recommendations	5
Fire Suppression.....	5
Firefighting Training and Equipment	7
Prebuilding Firelines/Firebreaks	8
Fire Occurrence/Reporting Database	9
Fire Prevention/Awareness/Education.....	10
Early Warning System	11
Basic Fire Research Needs	12
Fire Management Considerations.....	13
Collaborative Forest Management Projects	14
Community Forest Users Groups (CFUGs)	15
WWF Hariyo Ban Project.....	16
Conclusions	18
Appendix A – Meeting Attendee Information	19
Appendix B – List of PowerPoint Presentations.....	24

Figures

- Figure 1. On April 15, 2013 made a field visit to a recent wildfire on the Kapilbastu Forest District, with the district fire crew, unit foresters, and WWF-Nepal. Note fire area in the background, left.. 3
- Figure 2. Visit to Raniban Community Forest User's Group, Kaski Forest District on April 17, 2013. This CFUG received basic firefighting training and equipment provided by WWF-Nepal. Keshav Khanal of WWF-Nepal Coordinator Sustainable Landscapes Hariyo Ban Program (blue shirt left photo). 4
- Figure 3. Formal briefing to the Secretary, Under Secretary and other officials within the Ministry of Forests and Soil Conservation, Kathmandu, Nepal on April 18, 2013. 5
- Figure 4. A portion of the Kapilbastu District fire crew, the current crew size is 25. Currently, the fire crew has no personal protective gear or tools, and has received little to no formal firefighting training. . 7
- Figure 5. Five meter wide firebreak on the Tilaurakot Collaborative Forest Management project, Kapilbastu Forest District. These lines will require annual maintenance to maintain their effectiveness as firebreaks. 8
- Figure 6. Photo on left illustrates a seed tree regeneration method, Kapilbastu District. Left photo shows harvested material..... 15
- Figure 7. Local CFUG observed on a wildfire along the East-West Highway on the Rupandehi District between Motipur and Butwal, Nepal on April 16, 2013. This CFUG has not received any basic firefighting training or equipment..... 16
- Figure 8. Visit to the Raniban Community Forest User Group (CFUG members, right) in Bhadaure in the Kaski District, April 17, 2013. Keshav Khanal of WWF-Nepal, Coordinator Sustainable Landscapes Hariyo Ban Program in fire clothes (left photo) 17

Introduction

Charles (Chuck) McHugh from the Fire, Fuels, and Smoke Program, Missoula Fire Sciences Laboratory, Rocky Mountain Research Station traveled to Nepal from April 4-20, 2013. Objectives of the visit were to,

- Attend and present on geospatial decision support tools for modeling wildland fire at the Developing Forest Adaptation Strategies under Changing Climate Scenarios: Geospatial Support Systems for Improved Forest Fire Management workshop. Workshop was held in Kathmandu, Nepal from 10-12 April 2013 at the International Centre for Integrated Mountain Development (ICIMOD <http://www.icimod.org/>).
- Provide targeted technical support and comments regarding fire and fire management on the USAID-WWF Hariyo Ban Project.
- Provide comments and observations regarding fire management issues in Nepal to the Ministry of Forests and Soil Conservation (MoFSC).

April 15-16 a field visit was made to the Kapilbastu Forest District, meeting with local managers and reviewing the Tilaurakot Collaborative Forest Management project (Figure 1). During this visit comments and recommendations regarding the project and potential wildfire and general fire management issues were provided. April 16th a formal presentation was made focusing on issues related to the Tilaurakot Collaborative Forest Management to 25 people (Appendix A). This talk also focused on general firefighting suppression terminology, techniques, and safety as this was identified as an area of concern by local forest managers. The Kathmandu Post, a local daily newspaper highlighted this presentation (<http://www.ekantipur.com/the-kathmandu-post/2013/04/22/development/firefighting-is-no-childs-play/247877.html>).



Figure 1. On April 15, 2013 made a field visit to a recent wildfire on the Kapilbastu Forest District, with the district fire crew, unit foresters, and WWF-Nepal. Note fire area in the background, left.

On April 17th met with the Raniban Community Forest User Group (CFUG) in Bhadaure, Nepal in the Kaski Forest District (Figure 2). This particular CFUG in cooperation and with assistance from USAID and WWF-Nepal had received basic firefighting training, personal protective gear, tools and equipment. Feedback and comments were provided back to USAID and WWF-Nepal regarding this specific area of the larger Hariyo Ban project during a closeout meeting later in the week in Kathmandu. A presentation was also made later on April 17th to 18 people (Appendix A) on general fire management issues in Nepal in Pokhara, Nepal.



Figure 2. Visit to Raniban Community Forest User's Group (CFUG), Kaski Forest District on April 17, 2013. This CFUG received basic firefighting training and equipment provided by WWF-Nepal. Keshav Khanal of WWF-Nepal Coordinator Sustainable Landscapes Hariyo Ban Program examining firefighting equipment (blue shirt left photo).

On April 18th, a formal briefing was provided to the Secretary, Under Secretary, and other officials within the Ministry of Forests and Soil Conservation (Appendix A; Figure 3). Talk focused on observations regarding wildfire and fire management in the country of Nepal based on field visits and discussions with managers, forest community members, and staff of involved NGO's. Topics addressed included;

- Firefighter training and safety
- Early Warning Systems
- Fire Danger Rating
- Fire Prevention Education and Awareness
- Fire Occurrence Reporting and Statistical Databases
- Tilaurokot Collaborative Forest Management Project
- General Fire Management Considerations
- Basic Fire Research Needs
- WWF-USAID Hariyo Ban project and firefighting training and equipment



Figure 3. Formal briefing to the Secretary, Under Secretary and other officials within the Ministry of Forests and Soil Conservation, Kathmandu, Nepal on April 18, 2013.

All PowerPoint presentations given during this trip are available through the USFS International Programs Office (Appendix B).

General Observations and Recommendations

The following observations, comments and recommendations focus on key areas based on site visits and discussions with Nepal Department of Forestry (DoF), Senior MoFSC leadership, CFUGs, ICIMOD, USAID, and WWF-Nepal staff. Allotted time did not permit for visits or discussion with Nepal National Parks.

Fire Suppression

- Currently, fire suppression is the cornerstone of the fire management strategy in Nepal. However, it is *impossible* to use fire suppression to eliminate the wildfire problem.
- Suppression of every fire eventually contributes to an even greater fire problem in the future.
- Excessive suppression may lead to larger and more severe fires in the future, due to fuel build-up and no break in fuel age class distributions across the landscape.
- Currently, the brunt of fire suppression falls on local CFUG's except when fires become large, exceeding the capability of local CFUG's or District Forest Units. Then, either the Army or Police are called in to assist with suppression efforts.

- There appears to be a limited understanding of command/control/responsibility or coordination with Army or Police on fire incidents. This can lead to misunderstandings of who is in charge or responsible for specific incidents.
- Nepal DoF units are not well equipped or formally trained. Require more training on safety, suppression strategy and techniques. Look for additional ways to include information and training on the Incident Command System (ICS).
- With increasing numbers of fire numbers and size, eventually can't depend on CFUG's for initial fire suppression responsibility. Eventually, the problem too large and costly and will become the primary responsibility of the Nepali Government, e.g., DoF, Army or Police.
- Currently, there is little organized and institutionalized training or basic firefighting equipment available at all levels.
- Increasing fire sizes and severity may lead to increased loss of critical forest habitats and contribute to long-term impacts to other natural resources and communities.
- Fire suppression responsibilities cannot be entirely transferred to the CFUG's; eventually too large and costly, will eventually fall on the responsibility of Government.
- In the United States, suppression of all fires has not worked. Currently over 50% of the USFS budget is committed to fire suppression in some form or another with little appreciable change in the number of fires and annual area burned.
- While the statement is made in Nepal that the number of fires and fire severity has been increasing over time there is little to no data available to quantitatively analyze this statement. Currently, no formal reporting system for fires tracking area or cause. MODIS detects and alerts (ICIMOD) are used to count fire occurrences, but little other information is collected regarding fire sizes, number of fires or specific cause
- No fire severity/intensity mapping products are currently available, e.g., no Monitoring Trends in Burn Severity (MTBS <http://www.mtbs.gov>) equivalent.
- Current hypothesis is with climate change Nepal is likely to see an increase in the number of fire occurrences, annual area burned, and an increased fire severity and intensity. Again, there is no systematic data collection occurring to analyze these trends; historically, current status or into the future.
- Nepal DoF should revisit their stated strategy of fire suppression and reexamine its feasibility as a long-term sustainable strategy.

Recommendation:

Short-term: Incorporate cross-training exercises with local CFUG's and DoF, Police, and Army whenever possible. Conduct training focusing on safety, suppression strategy and techniques as well as training in the Incident Command System (ICS).

Long-term: Develop a national institutionalized fire training program across all levels of Government with fire suppression responsibilities (DoF, Police, and Army). Consider assigning training responsibilities to the Regional Forestry Training Center. Development of additional curriculum for wildfire and prescribed fire for land management developed at Institute of Forestry.

Firefighting Training and Equipment

- Real need for training of firefighters at all levels, from CFUGs, local district fire personnel, police and army which are brought in to assist on larger fires.
- Safety training lacking, e.g., Lookouts, Communications, Escape Routes, and Safety Zones (LCES).
- Lack of training in suppression strategy and techniques across all levels of fire suppression responsibility.
- Without training and equipment, investment in building firelines/fire breaks and using them safely may be futile. Without proper training, may contribute to an increase in firefighter injuries and fatalities.
- Currently, most training is being done with CFUG's with support from NGO's, such as the WWF. They are providing training and basic firefighting equipment (tools).
- Training should also focus on prescribed fire management and operations.
- Training and firefighting safety needs to be institutionalized.
- Basic firefighting equipment and personal safety equipment is often lacking. In the areas visited great gains in personal safety could be realized with the provision of proper footwear, long sleeve shirts and pants, and gloves (Figure 4).



Figure 4. A portion of the Kapilbastu District fire crew, the current crew size is 25. Currently, the fire crew has no personal protective gear or tools, and has received little to no formal firefighting training.

Recommendation:

Short-term: Review and synthesize what training has been completed to date. Capture, where training has occurred, who has received this training (DoF, Police, and Army, CFUG's), topics covered (safety, suppression tactics and strategy), and who conducted the training (NGO's or formal Government Institutions). Attempt to understand the depth and extent of training across Nepal, gaps in training, and to identify potential individuals as future instructors.

Long-term: Develop and coordinate training across all levels; DoF, CFUG's, Army and Police. Training exercises should be inclusive across groups whenever feasible, especially within Forest Districts or geographic areas. Consider creating training cadres that could travel and conduct training at the local level, thus allowing for a consistent message and training.

Training on prescribed fire management as related to land management also needs to be addressed. This will require a different approach and focused curriculum.

Prebuilding Firelines/Firebreaks



Figure 5. Five meter wide firebreak on the Tilaurakot Collaborative Forest Management project, Kapilbastu Forest District. These lines will require annual maintenance to maintain their effectiveness as firebreaks.

- Currently, a major investment is being made at prebuilding firelines/fire breaks (Figure 5).
- Often these are being made without consideration of prevailing wind directions associated with fires and the primary fire spread direction they are meant to control or contain.
- To maximize their effectiveness requires firefighters on site. Unattended firebreaks by themselves will not limit fire spread.
- Firefighters on site need to know when it is safe to operate along these predetermined breaks and when to leave. This relates to previous observations and recommendations regarding firefighter training, equipment, suppression strategy and techniques, and safety.
- Building of firelines/firebreaks may eventually become unsustainable due to:
 - Yearly maintenance needs, e.g., removal of accumulated fuels within the lines (Figure 5)
 - Costs associated with yearly maintenance
 - Too many kilometers of lines to maintain. May eventually become, too costly and not enough workers to maintain annually.
- Control lines may provide access to previous inaccessible areas. This may contribute to:
 - Increase in fire starts
 - Increase in poaching or timber theft
 - Increased resource degradation
- Annual maintenance costs may incur additional expenses associated with installation of gates or fencing in attempts to limit or control access.
- Further costs may be incurred as fire prevention patrols or law enforcement patrols are required to limit illegal activities.

Recommendation:

Short-term: Firelines and fuelbreaks may provide some tactical opportunities for fire suppression provided properly trained and equipped personnel are available to take utilize them; these are already limitations. Construction of firelines and fuelbreaks will provide accessibility to areas previous inaccessible areas. This may contribute to Increases in resource degradation, increased poaching or timber theft, and increases in fire starts due to accessibility.

Long-term: Firelines and fuelbreaks may not be viable or sustainable approaches. Firelines and firebreaks require a long-term strategy (budgetary and workforce planning) and reconsideration as an approach to fire control. At some point it can become difficult to sustain due to yearly costs associated with annual maintenance requirements, increased patrolling, and building and maintenance of gates and fences to limit access.

Fire Occurrence/Reporting Database

- A comprehensive fire occurrence database does not exist at this time. Apparently some records may exist at District Forest Offices, but the information is not consolidated and readily available from a central location.

- Lack of fire reporting information cannot quantitatively determine whether the area burned or number of fires is increasing, decreasing or stable. Currently, the Government of Nepal, through ICIMOD, relies on MODIS detects for this information regarding annual numbers of fires.
- Media reports regarding fires sizes, home/structure loss on current fire events are based on loosely gathered information from local District DoF personnel.
- Typically, local forest manger estimates the number and sizes of the fires, tabulates and reports monthly but no official record or data is available.
- All fires are human caused, but no information on specific causes and where they occur. Thus, unable to determine if specific causes vary geographically or temporally. Lack of specific information on fire starts and their associated specific human causes limits opportunities to identify geographically and temporally problem areas and specific causes to focus on when developing prevention, education, and awareness programs.
- Reliance on MODIS detects and alerts for counting and recording fire starts and being used as a surrogate for fire reporting. However, there are issues in trying to use this for accounting such as:
 - Misses many fires due to the coarseness of the data. Center of 1km² area.
 - Fires less-than 100ha are not reported.
 - Misses small smoldering fires and fires not active during satellite overpass
- Does not reflect or account for the actual fire business, missing many small fires that require a cost (workforce and budgetary) for attacking and suppressing.
- MODIS detects do not record/account for the actual area/causes of fires. Is not meant to be for recording/reporting purposes.

Recommendation: Develop a centralized and common themed database on forest fire statistics. At a minimum should include: discovery date, fire out date, size, specific human cause, location, vegetation type, fire effects, and fire intensity.

Fire Prevention/Awareness/Education

- 100% of all fires are believed to be human cause.
- Most successful approach to limiting fire starts is through aggressive fire prevention, education, and awareness programs.
- Many human specific causes but currently unknown the actual numbers of fire starts by a specific cause or where and when occur geographically or temporally.
- Numbers and causes will vary by district and whether in the Terai, central hill or mountain ecoregions.
- Knowing timing of when or why happening and occurring are important to understanding where to focus efforts on prevention messages geographically and the timing of fire prevention/awareness messages.
- Linkages back to the creation of a fire reporting database to assist in directing/focusing the timing and type of message directed at specific causes at appropriate times of the year.

- Currently prevention messages are delivered via announcements on FM radio broadcasts twice a day on individual forest districts. CFUG's utilize a town crier approach, locally referred to as catawalling to deliver messages about fire hazards.
- No formal fire danger rating program to use to help inform on their current fire season compared to average and historical norms to aid in decision making.
- Currently, fire in Nepal is seen as negative, "destructive, tragic, devastating". Fire awareness and education messages need to also account for the positive effects of fire, especially, regarding management ignited fire or the use of prescribed fire. Not all fires should be communicated as bad or negative. This complicates message formulation and delivery. However, presenting all fire as bad will only make it more difficult when trying to implement management ignited or prescribed fire programs and explaining their benefits.
- Need for a focused education and awareness program. Programs need to be active year round not just during the active fire season. Messages need to promote the positive and negative effects of fire, and emphasize the need for actively using prescribed fire as a means to treat fuels and reduce the potential negative effects of fire across the landscape.

Recommendation:

Short-term: Ensure current messages promote the positive and negative effects of fire with emphasize on the need for actively using prescribed fire as a means to treat fuels and reduce the potential negative effects of fire across the landscape. Don't present only the argument that all fire is negative and needs to be suppressed.

Long-term: Develop fire prevention plans specific to the human causes of fires by Forest District or region along with focused community education and awareness programs. Develop cohesive and focused messages regarding fire danger and reasons for limiting fire during certain times of the year. Need for focused education and awareness programs which are active year round, not just during the active fire season.

Early Warning System

- Currently the focus is on detection and notification of emerging fires based on MODIS detection and notification via the ICIMOD system. As noted previously there are many limitations on the detection and notification of real time fire events. Also, these messages only go to District Fire Management Officers and not to the CFUG's (<http://www.icimod.org/?q=10092>).
- A comprehensive Early Warning system consists of more than just detection and alert. There is a need to include and account for:
 - Changes in fuel conditions contributing to significant fire spread.
 - Significant forecasted weather events such as increasing winds that could have significant impacts on existing fires or new or developing fires.
 - Critical weather conditions (temperature, relative humidity, windspeed) associated with fire spread.

- How these vary by Forest District, ecoregion, and affect fire spread over a range of fuel conditions.
- Currently a lack of knowledge in this area of fire management.

Recommendation:

Short-term: Investigate developing information regarding seasonal assessments of fuels and vegetation. This could focus on developing long-term and historical seasonal trends on vegetation greenness maps to assist in seasonal severity (<http://wfas.net/index.php/avhrr-ndvi-moisture--drought-47>). These can be derived based on remote sensing techniques may require working with an NGO such as ICIMOD for technical assistance.

Long-term: Development of such a system would assist in fire prevention messages when communicating fire season severity in terms of fuels and vegetation conditions. Would provide needed information for annual assessments of fire season potential. Allows for comparison of the current fire season to previous fire seasons in tracking fire season potential, timing of the fire season (early vs. late based on fuels conditions). Fire suppression planning could benefit by allowing a geographical comparison of seasonal fire severity across the country and the need for moving or assigning resources.

Basic Fire Research Needs

- Basic fire science
 - Wildfire. Currently little to no information exists under what weather and fuel conditions associated with specific wildland fuel types that problem fire behavior can occur
 - Prescribed fire. Currently, little to no information exists regarding under what weather and fuel conditions and time of year (ignition prescription) to conduct prescribed fire for desirable fire effects across the various fuel and vegetation types
- Fuels and fire behavior:
 - Little to no available information on wildland fuels and their associated fire behavior under any type of weather-fuel moisture conditions exists
 - Base information in this area is lacking for both prescribed fire and wildfire.
- Fire effects
 - Fire severity, similar to MTBS. Nepal currently lacks the technological capacity to do this. Perhaps could be a collaborative endeavor with NGO’s such as ICIMOD.
 - No information on fire effects across the range of vegetation types under a range of fire behavior characteristics.
- Fire regimes
 - Little information regarding fire regime characteristics (fire return intervals) by vegetation types across Nepal.
 - Fire regimes in Nepal are purely anthropogenic. As such, ignitions are driven by social/cultural/religious behaviors and population density.

- Corresponding fire severity and size are affected by fuel loadings and fuel distribution/fragmentation across the landscape.
- Need for consolidation/synthesis of this information.
- Fire Wildlife Interactions
 - Wildlife habitat as affected by fire. Currently, most fire is perceived as bad, tragic, devastating. Need to know where and under what conditions fire has positive effects in terms of restoration or maintaining ecological structure, composition, and function. Could then use management ignited fire or take advantage of fire starts to enhance habitat across the landscape.
- Social perceptions of fire
 - Information on social perceptions may assist in development of fire prevention, education, and awareness messages.

Recommendation:

Short-term: Explore research opportunities for coordination/collaboration on the Tilaurakot Collaborative Forest Management (CFM) project on the Kapilbastu District area due to the amount of information currently collected working with NGO's, ICIMOD, or Universities to address basic fundamental fire research questions for Nepal in Sal forest types. Similar opportunities should be investigated on the other CFM projects across Nepal.

Long-term: There is a need to build research capacity in wildland fire, prescribed fire and fire management within Nepal DoF. Collaborative research efforts need to be established between the University and Regional Training Center wherever and whenever possible.

Fire Management Considerations

- A complete fire suppression strategy is unsustainable and will fail in the long-term. As such, the use of prescribed fire as a fuel treatment tool is essential. Area based fuel treatments strategically designed and placed will be required to have any meaningful long-term effect on reducing the amount of area burned.
- Management Ignited fire needs to be increased. However, there needs to be discussions regarding
 - How much?
 - Where?
 - When?
 - Under what conditions (weather and fuels) to achieve desired fire effects?

Currently little to no information is available on any or all of these topics.

- Current forest management approaches are geared at intensive silviculture designed to maximize tree growth and economics. Eventually will need a mix of landscape level fuel treatments intermixed with silvicultural treatments.

- Area or landscape level fuel treatments using prescribed fire or mechanical removal of accumulated surface fuels should be the long-term goal to limit negative effects from wildfire.
- Need for a focused fire prevention/education and awareness program. Program needs to be active year round not just during the active fire season. Messages need to promote the positive and negative effects of fire, and emphasize the need for actively using prescribed fire as a means to treat fuels and reduce the potential negative effects of fire across the landscape.

Recommendation:

Short-term: Advancement in these areas may require an effort similar to the Government of Nepal Forest Fire Management Strategy 2010. While there is overlap here with previous topics some are new and may require discussion at a national level to determine their applicability to Nepal’s unique situation.

Long-term: Goal should be to not suppress every fire start when and where feasible from a safety and ecological objective. This will require a nationwide strategy considering fire management on DoF lands, CFUG’s, National Parks, and protected areas. Considering cross boundary fire transmission across a variety of stakeholders and land ownership patterns.

Collaborative Forest Management Projects

- Appears to be a successful program due to the level of community involvement, as such they have a stake in the outcome associated with the program. Current management strategy is intensive silviculture (Figure 6).
- Positives:
 - Provides income and products to local communities
 - Local forest unit able to retain control over some of the generated income
- Negatives:
 - Long-term sustainability of the program
 - Income sharing based on the sale of forest products such as timber
 - If there is a decrease in timber value or can’t harvest due to restrictions to meet other environmental demands or considerations, what happens to programs or projects dependent on income generated from these areas?
- Opportunities
 - Could some of the income generated from these projects be redirected to
 - Purchase firefighting equipment?
 - Pay for firefighter training?
 - Pay for maintenance of firelines/firebreaks? This should be balanced with consideration of appropriate training and equipment of personnel.
 - Could income only be used at the local level or redirected to other national priorities?

- As mentioned previously what happens when the level of income decreases or can't be sustained? What happens to programs dependent on



Figure 6. Photo on left illustrates a seed tree regeneration method, Kapilbastu District. Left photo shows harvested material.

Recommendation: Program should continue with Government support. Investigate the use of generated income to support acquisition of firefighting equipment and training for local District Forest Personnel.

Community Forest Users Groups (CFUGs)

- Successful approach. Local people are involved and passionate about their role in management of the surrounding forest.
- User groups able to supervise and exert pressure on other community members regarding fire and other natural resource issues.
- Experience with two Community Forest User Groups on this visit. The first in the Terai region were working an active fire on the Rupandehi District (Figure 7). The second was in the Hill Country in Bhadaure in the Kaski District (Figures 2 and 8).
- The two groups were on different ends of the spectrum regarding firefighting training and equipment.
 - Rupandehi District, had received no training, had no personal protective clothing or basic firefighting equipment
 - Kaski District, had received training and had personal protective clothing and basic firefighting tools provided through WWF and USAID
- Concern is the initial primary responsibility for fire suppression attributed to CFUGs.
 - If hypothesized increase in fire numbers, area burned, and increased fire behavior and intensity occurs, CFUGs will not be able to keep up with the fire problem. Government will be forced to take a more active and primary role in suppression in the future due to the magnitude of the problem and associated costs

- From livelihood perspective, CFUG members may not always be able to respond as they are not paid for responding and suppressing fires
- Absence of training and safety awareness as well as lack of personal protective clothing and basic firefighting equipment is a major concern which should be addressed



Figure 7. Local CFUG observed on a wildfire along the East-West Highway on the Rupandehi District between Motipur and Butwal, Nepal on April 16, 2013. This CFUG has not received any basic firefighting training or equipment.

Recommendation:

Short-term: Continue to provide training and equipment with support from USAID and WWF-Nepal. This program should be expanded if possible. Investigate expanding existing training programs and investigate including Government support from MoFSC in conjunction with USAID and WWF-Nepal. Needed training, safety awareness and provision of personal protective clothing or basic firefighting equipment should also be addressed.

Long-term: Include trained CFUG firefighting crews in cross-training exercises with other Government agencies responsible for fire suppression. This will improve familiarity and communications between groups.

WWF Hariyo Ban Project

- Visited the Raniban Community Forest User Group in Bhadaure in the Kaski District.
- Met with local community members who had received firefighting training, personal protective gear, and basic firefighting tools through the WWF and USAID program (Figure 8).
- During visit we discussed various suppression safety, strategy, and tactics as well as a review of the equipment that had been provided to the local community members.
- It was obvious from discussions they had received training and that the training had been absorbed.

- From short visit in Nepal it appears that this program is very successful in providing training, personal protective clothing, and basic firefighting equipment to the members of these groups.
- On April 17th a close-out meeting was held with USAID and WWF-Nepal (Appendix A) at the US Embassy in Kathmandu where we discussed the project and its goals.
 - During this closeout made several recommendations
 - Also discussed the fact that suppression is not the answer to their fire problem. That Nepal will not be able to suppress its way out of forest and wildland fires. Especially, regarding larger fires and potential negative effects to wildlife habitat, forests, and biodiversity.
 - The need is for active fire management and more prescribed fire.



Figure 8. Visit to the Raniban Community Forest User Group (CFUG members, right) in Bhadaure in the Kaski District, April 17, 2013. Keshav Khanal of WWF-Nepal, Coordinator Sustainable Landscapes Hariyo Ban Program in fire clothes (left photo).

Recommendation:

- Program of providing training, personal protective clothing, and basic firefighting equipment to the members of CFUGs should continue and be expanded if possible.
- Suggested they evaluate where and how they are applying their limited resources. Currently the majority of their funding for such programs is skewed to the hill country rather than the Terai. In the Terai, fire frequency and fire sizes apparently are both greater when compared to the hill country. In the hill country fires are thought to be less frequent and typically smaller in size. Based on the ICIMOD MODIS detect data for the period 2000-2012, 52% of the fire detects were in the Terai compared to 42% in the hill country. However, the hill country is much steeper thereby complicating suppression efforts. Also, the hill country contains greater biodiversity and the potential consequences of soil erosion and habitat loss from fire may be greater. Requires a trade-off for WWF-Nepal and USAID for what they want to focus on.
- Equipment Suggestions:
 - Need for eye-wear protection (goggles). Eye protection was the one piece of missing personal protective clothing.

- Replace flashlights with headlamps. They can be of the backpacking-trekking variety
 - Backpack pumps to provide water delivery capability
- Recommended developing short one-day refresher training. The goal should be to reemphasize safety. Would be an opportunity to focus on safety and practices, but also provide continuing education and training in fire to existing members as well as provide training to new members.

Conclusions

There is a need for a focused fire management unit within the DoF. This will require a long-term commitment to build and will require a significant investment of funding and staffing with sufficient resources and support from the MoFSC. Initial responsibilities of this program should first focus on firefighter safety, training, and equipment as well as coordination with other Government agencies responsible for fire suppression operations.

A complete fire suppression strategy is unsustainable and will fail in the long-term. As such, the use of prescribed fire, removal of accumulated fuel loads (fodder or grazing), mechanical treatments of surface fuels, or some combination to manage wildland fuels is essential. Area based fuel treatments strategically designed and placed will be required to have any meaningful long-term effect on reducing the amount of area burned in Nepal. The use of prescribed fire was identified in Nepal's Forest Fire Management Strategy 2010. Area or landscape level fuel treatments using prescribed fire or mechanical removal of accumulated surface fuels should be the long-term goal to limit negative effects from wildfire.

There is a need for a focused fire prevention/education and awareness program. Such a program needs to be active year round not just during the active fire season. Messages need to promote the positive and negative effects of fire, and emphasize the need for actively using prescribed fire as a means to treat fuels and reduce the potential negative effects of fire across the landscape.

The long-term goal should be to not suppress every fire start when and where feasible, considering the values at risk, life safety, and ecological objectives. This will require a nationwide strategy considering fire management on DoF lands, CFUG areas, National Parks, and protected areas. It will need to consider cross boundary fire transmission across a variety of stakeholders and land ownership patterns.

Nepal as a country faces many challenges as it continues to develop their response to dealing with wildfire. However, these same challenges offer many opportunities to address issues, formulate policy, and strategies specific to Nepal's unique circumstances regarding wildfire and fire management. The struggle is to find a balance between the international community's responses to fire/fire management issues and to critically assess and learn from their experiences, adapting and formulating a plan that is appropriate to Nepal.

Appendix A - Meeting Attendee Information

Attendees Forest Fire Management Interaction Meeting

16th April 2013

Kapilbastu District Forest Office,

Taulihawa, Nepal

S.N.	Name	Designation - Organization
1	Dhan Bahadur Shahi	Armed Police Force
2	MohanThapa	Assist Inspector of Police
3	Chhedi lal Kamati	Police inspector
4	Ganga Nath Tiwari	District Administrator
5	Dr. Jahirul Hasan Khan	Chairperson- Kapilbastu CFM
6	Krishna Raj neupane	Assistant Forest officer
7	Devi Koirala	Under Secretary- District Foerst office
8	Humanath Bhattarai	Chairperson- FECOFUN Kapilbastu
9	Toya Bahadur Sinjali	Armed Police
10	Pashupati Sharma	Forest Product users association
11	Krishna Prasad Paudel	Assistant Forest officer
12	Balaram Neupane	Accountant
13	Rajan Kumar Pokharel	Communication Officer, District development Committee
14	Bijay Raj Subedi	Assistant Forest officer
15	Giri Raj Pathak	Program Officer- RIM NGO
16	Mohan Mishra	Ranger- District Forest officer
17	Indira Aryal	Fire Controller-Fire Control Network
18	Bashu dev Sendai	Assistant Inspector
19	Dhan Bahadur Khadka	Assistant Inspector
20	Manoj paudel	Journalist
21	Jaya Prakash Pandey	Coordinator- CFM
22	Krishna Prasad Pokharel	DFO
23	Rajan Khadka	Assistant Forest officer
24	Ganesh Prasad Bhattarai	Office assistant- DFO
25	Prem Singh Kunwar	Officer District Admin office

Attendees Presentation on Fire Management Issues in Nepal
 17 April 2013
 Hotel Crown Himalaya
 Pokhara, Nepal

S.N.	Name	Organization	Designation
1	Khagendra Raj Bar	District Forest Office, Kaski	Assistant Forest Officer
2	Gyanendra Subedi	Ecosystem Based Adaptation, IUCN	Field Supervisor
3	Dharma Raj Paudel	Panchase Community Development Organization	Member
4	Binod Bahadur Kunwar	Machapuchre Development Organization	Program Officer
5	Kalidas Subedi	FECOFUN Kaski	Chairperson
6	Prakash Thapa	District Soil Conservation Officer	Soil Conservation Assistant
7	Bishnu Prasad Pokharel	District Soil Conservation Officer	Soil Conservation Assistant
8	Raj Kumar Gurung	National Trust for Nature Conservation	Conservation Officer
9	Ram Kaji Shrestha	Regional Forestry Training Centre	Training Officer
10	Rajan Subedi	Institute of Forestry	Assistant Professor
11	Prabhat Sapkota	Regional Forestry Training Centre	Training Officer
12	Megharaj Poudel	Regional Forestry Directorate, Pokhara	Assistant Forest Officer
13	Dil Bahadur Bhattarai	Machapuchre Development Organization	Executive Director
14	Anuja Shrestha	Hariyo Ban, WWF	Program Associate
15	Shrijana Baral	Hariyo Ban, WWF	Program Officer
16	Lila Jung Gurung	Hariyo Ban, WWF	Program Associate
17	Purna Bahadur Kunwar	Hariyo Ban, WWF	Field Coordinator
18	Keshav Prasad Khanal	Hariyo Ban, WWF	Coordinator

Attendees Closeout Meeting USAID and WWF Nepal Hariyo Ban Project
18 April 2013
US Embassy
Kathmandu, Nepal

S.N.	Name	Organization	Designation
1	Netra Sharma	USAID Nepal	NRM & GCC Programs Specialist General Development Office
2	Judy Ogalthorpe	WWF-Nepal	Chief of Party – Hariyo Ban Program
3	Keshav Prasad Khanal	WWF-Nepal	Coordinator – Sustainable Landscapes Hariyo Ban Program

Main Attendees, Presentation Ministry of Forests and Soil Conservation

April 18, 2013

Kathmandu, Nepal

1. Dr. Krishna Chandra Paudel, Secretary, Ministry of Forests and Soil Conservation
2. Mr. Bharat Pudasaini, Director General, Department of Soil Conservation Watershed Management
3. Mr. Sahas Man Shrestha, Director General, Department of Forest Survey and Research
4. Mr. Sundar Sharma, Soil Conservation Officer, Under Secretary, Department of Water Induced Disaster Prevention (DWIDP)
5. Mr. Ram Bhakta Malla, Under Secretary, Ministry of forests and Soil Conservation
6. Mr. Harihar Sigdel, Joint Secretary and Chief, Foreign Aid Coordination Division, Ministry of Forests and Soil Conservation
7. Mr. Bishwa Nath Oli, Joint Secretary and Chief, Environment Division, Ministry of Forests and Soil Conservation
8. Mr. Yajna Nath Dahal, Under Secretary, Ministry of Forests and Soil Conservation
9. Mr. Shyam Prasad Sharma, Under Secretary, Department of Forests
10. Ms. Madhu Devi Ghimire, Under Secretary, Ministry of Forests and Soil Conservation

Appendix B – List of PowerPoint Presentations

1. April 11, 2013. At Developing Forest Adaptation Strategies under Changing Climate Scenarios: Geospatial Support Systems for Improved Forest Fire Management workshop. Kathmandu, International Centre for Integrated Mountain Development (ICIMOD):
Presentation_mchugh_geospatial_tools_nepal_ICIMOD_April_11_2013.pdf
2. April 16, 2013. Forest Interaction Meeting, Kapilbastu Forest District Office:
nepal_presentation_kapilbastu_forest_district_april_16_2013.pdf
3. April 17, 2013, Hotel Crown Himalaya, Pokhara, Nepal:
nepal_presentation_pokhara_april_17_2013.pdf
4. April 18, 2013, Presentation Ministry of Forests and Soil Conservation, Kathmandu, Nepal
nepal_presentation_MoFSC_kathmandu_april_18_2013.pdf

All presentations are available upon request from USFS International Programs (<http://www.fs.fed.us/global/contactus.htm>) at:

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