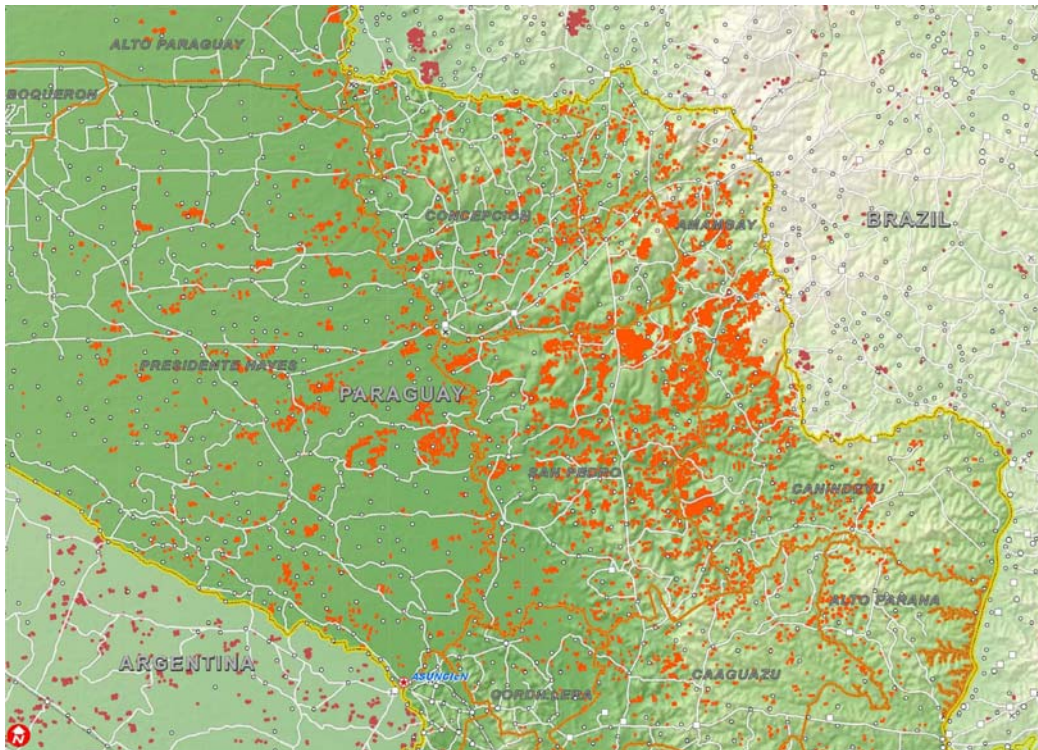


**WILDLAND FIRE MANAGEMENT ASSESSMENT
COUNTRY OF PARAGUAY
MAY 12 - 16, 2008**



UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

**UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE**

BACKGROUND:

On September 12, 2007, after two weeks of unprecedented fire activity in the country, the President of Paraguay issued a disaster declaration for the northern Departments of Concepcion, San Pedro, Canindeyú, and Amambay; because of severe damage to pasture lands, farm lands, community subsistence crops, and protected natural areas. This was the first time ever that Paraguay had declared a wildland fire situation as a national emergency.

A variety of different areas burned: native forests, soybean, wheat, corn and sugarcane fields, and pastures. For many of the poorer communities, the fires destroyed their entire food source. Estimates of the total area affected range from 150,000 to 600,000 hectares. Approximately 3.5% or 10,460 hectares of Paraguay's national park and reserve land was affected by the fires.

The country of Paraguay was gripped in an unprecedented drought beginning in May of 2007 when rain amounts were the lowest recorded in 30 years. Following a cold winter, the temperatures from mid-August through September were above average and the landscape was swept by high winds day and night. The nearly 6,000 fires that burned out of control during this period (beginning August 9) were started by the slash and burn land clearing activities of small and large landowners, by squatters, and by illegal crop growers also known by locals as "mariguaneros". One-hundred percent of the fires occurring in Paraguay are from human activities and related causes. It is a major problem for the country.

The effects on local municipalities were significant, as no municipality or departamento (state) was prepared for fires of such magnitude. When fire fighting resources arrived, local resources were depleted quickly. Communities simply could not support the hundreds of fire, police, military and other personnel that showed up to assist on the fires. One local landowner we interviewed used \$60,000 of his own money to support a large contingent of firefighters on local fires. Some mayors, or "Intendentes", played key roles in resource allocation without benefit of coordinated priorities or strategies. Not all intendentes of the affected communities and governors of departments were involved in the emergency.

Command and control of the fires was hit-and-miss. When trained firefighters were involved, they directed fireline operations. Though an attempt was made to provide national coordination of fire fighting activities, there never was a clear and unified strategy.

Wildland fire fighting became *de facto* the responsibility of two-volunteer groups, the "Cuerpo de Bomberos Voluntarios del Paraguay", or "yellows", and the "Junta Nacional de Bomberos Voluntarios del Paraguay", called the "blues". These groups are lead by competent leadership, though minimally trained in wildland fire suppression or complex multi-incident emergency management. When activated, these volunteers rely on donated support from local municipalities and conscientious civilians until a National Disaster is declared by the President, which allows the Secretaria de Emergencia Nacional (Secretary of National Emergencies or SEN) to provide financial and logistical resources and support.

During the fires of 2007 SEN initially was the lead agency responsible to coordinate between the volunteer firefighters, military, local landowners and local authorities in the fire fighting efforts. Following the declaration, SEN coordinated with the Ministerio de Salud (Ministry of Health) to assist persons affected by the smoke, coordinated the evacuation and relocation of civilians, deployed firefighters, and provided food and water to firefighters and affected civilians. These responsibilities and authorities were shifted to the Ministerio de Industria y Comercio (Ministry of Industry and Commerce) at a later time during the event.

On September 7, 2007, USAID Paraguay requested assistance from the Office of Foreign Disaster Assistance (OFDA) to conduct a rapid on-the-ground assessment of the situation. OFDA recommended a disaster declaration by the American Ambassador, and immediate response by the US in support of the Paraguayan government and people. A component of this support was the request that fire management program experts from the United States Forest Service evaluate Paraguay's wildland fire issue and provide recommendations on actions the Government of Paraguay could take to improve the response to and prevention of large scale fire damage.

The goals, activities, and expected outputs are outlined in the enclosed document "US Forest Service Support to USAID Environment Program in Paraguay: Scope of Work: Fire Management Assessment in Paraguay."

This task was accomplished during the week of May 12th by a team comprised of: Uwe Kurth, Environmental Program Manager, USAID Paraguay Mission; Isidoro Solis, Helitack Manager on the Sequoia National Forest and Training and Capacity Coordinator for the US Forest Service (USFS) - Mexico Fire Management Program; Ed Hollenshead, Director of Fire and Aviation for the USFS Pacific Southwest Region; and Ernesto Alvarado, PhD professor of fire management and fire ecology from the University of Washington and team member of the USFS Pacific Wildland Fire Sciences Laboratory in Seattle, Washington.

FINDINGS AND RECOMMENDATIONS

Implicit in all of these findings is the opportunity for the USFS and other entities to assist in the development of solutions for the people of Paraguay. The ideas are not new, but in order for them to have the intended effect they should be tailored to the specific needs, social, economic, and natural requirements, and limitations accruing to the Paraguayan culture. We offer these observations and recommendations with humility and respect for the wonderful people and rich culture we encountered on our brief visit. The USFS is willing to assist Paraguay in the implementation of the recommendations identified in this report.

WILDLAND FIRE MANAGEMENT PROGRAM LEADERSHIP... According to the Ministro de Agricultura y Ganadería (Minister of Agriculture) the Servicio Forestal Nacional (National Forest Service or SFN), located within the agricultural ministry, is the agency responsible to prevent, control, and manage wildland fires. However, those we interviewed in the SFN told us there was neither fire management experience nor culture within the organization.

SFN is staffed with a 10-person national office, and a Director located in each department (approximately 16 offices). SFN is being reorganized with new organizational responsibilities, as the National Forestry Institute. Within this organization (though representatives of SFN were not absolutely sure) each Director would have no additional personnel to address fire management issues, but will accrete the responsibility of fire suppression coordination to the multiple activities for which they are already responsible. SFN also has the responsibility for the national agricultural burning policy, which they have not yet developed or created a process to implement. Moreover, under the Draft Fire Management Plan, SFN has the responsibility to develop and implement the fire prevention / education portion, which they have not yet begun due to the lack of agreement between cooperating partners and lack of funding. It was obvious that SFN is not currently structured or prepared to manage the national wildland fire management program (including the development and implementation of a national wildland fire strategy), nor is the institution prepared to take on a wildland fire emergency such as was experienced in 2007.

On the other hand, those we interviewed in the Secretaria del Ambiente (Secretary of the Environment or SEAM), an agency within the Ministerio del Ambiente (Ministry of the Environment), expressed a clear desire to have the authority and responsibility for fire management within all national parks and reserves.

Recommendation: Identify the entity (ies) responsible to provide leadership to the national wildland fire management program and during national wildland fire emergencies.

- 1) The government of Paraguay should clearly identify and hold accountable the agency or agencies with the responsibility and authority to provide wildland fire program leadership for the country. Once determined, this agency should be tasked with providing the

leadership and energy necessary to finalize and implement the National Fire Plan.

FIRE PREVENTION... The scale of the devastating large fires experienced by Paraguay in 2007 was unique, though every year there are small-scale problem fires in focused areas of the country. Every fire in Paraguay is caused by humans, either by their direct action or as a consequence of other activities. Preeminent among these is agricultural and rangeland burning, which is a cultural and social norm and a mechanism to reduce weeds and pests. There is no government regulation of agricultural and rangeland burning; no permitting system, no requirement to implement best management practices, weak enforcement of existing laws or restrictions. The government has made some effort to change the slash and burn behaviors of its poorer farmers by making the availability of government subsidies contingent upon them not burning their fields. A contradictory message from the Paraguayan legislation is a law that requires burning cotton crop residues to prevent cotton weevil infestation, a practice common in other parts of the Americas where cotton weevil has almost eradicated the cotton crop.

Several officials we interviewed expressed the belief that the fire problem could be eliminated if existing laws were enforced. Annual resolutions to prohibit burning in response to fire season, like a recently promulgated resolution that prohibits burning during the months of June through August, are issued, but there is limited enforcement and sporadic compliance.

Part of this national apathy toward regulating agricultural burning may be that large fires have never before been the kind of problem that, both in terms of scale and effect, were experienced in 2007. Part of the issue may also be that the wildland fire problem is limited to a specific part of the country and represents more of a regional issue than a national issue.

Contributing to the agricultural and rangeland burning issue is the complex and intense land acquisition demands of campesinos and displaced persons, coupled with the lack of a clear federal land policy. Squatters take over land, do what they will (harvest, slash and burn, etc.), move on and demand more land. In response, and in an attempt to slow the pace of deforestation, the government of Paraguay issued the Zero Deforestation Law of 2004, which prohibits the conversion of natural areas to agricultural or other uses. This has had the effect of reducing the average annual number of hectares converted from over 300,000 to less than 50,000. However, a rather large loophole exists in the law, as it allows salvage of forests burned “accidentally”. We were told on several instances that once a forested area burns and trees are salvaged, the land may be dedicated to pastures or agriculture, which contradicts the legal requirement that land owners maintain 25% of their land as a reserve. An issue with these reserves is that they are not managed for “productive” purposes, and are therefore perceived as unproductive lands that are prone to invasion by landless people. Currently, there is no economic incentive to restore burned areas to natural conditions.

The issue of agricultural and rangeland burning in Paraguay, while certainly an environmental issue, is an intensely social and economic issue. Because of the difficulty in addressing the cultural aspect of agricultural burning or offering sustainable, economically viable alternatives to burning, the overriding concern of the public and government leadership is not why fires occur, nor even their impact on natural resources or long-term national health, but is a simple situational response to their immediate effects on people.

Recommendation: Improve public education and understanding of unmanaged agricultural and rangeland burning and its effects on human health and the environment. Consider a cooperative effort between non-government and government entities, the Peace Corps, and other similar organizations.

- 2) The Ministry of Agriculture should consider leading the development of a campaign to improve landowner / land user understanding of best management practices associated with the appropriate use of fire to accomplish land management objectives. The question is not whether to burn or not to burn, it is “how”, “when”, and “why” to burn. Any alternative to land burning needs to be economically viable and sustainable over the long term.
- 3) Improved coordination between SEAM, SEN, and the Ministry of Agriculture would help establish public awareness of the need to prevent unwanted fires. Focus should be on the social consequences, and may be most effective if oriented toward the cultural and environmental services provided to city and rural dwellers alike by healthy landscapes. Avoid the “all fires are bad” message.
- 4) OFDA should continue their fine work through the Ministry of Education to develop prevention and safety awareness at the elementary school level. OFDA should consider expanding the intent beyond municipal fire issues, to include those issues relating to agricultural and wildland fire effects and prevention.

Recommendation: Improve regulation and enforcement of restrictions on agricultural and rangeland burning.

- 5) The Government of Paraguay should explore creative means to enforce restrictions on agricultural and rangeland burning at times and in places when necessary to avoid adverse consequences. Provide local municipalities and other political jurisdictions the flexibility, technical training, and legal authority to address the issue in a manner that is appropriate to the people that live there.

PROTECTION OF NATIONAL PARKS AND RESERVES... Fourteen-percent of the country of Paraguay is protected under conservation instruments within the boundaries of national parks and reserves declared by SEAM. The vegetation types and ecosystems within Paraguay’s national parks and reserves are quite diverse and complex, from those where fire is detrimental to ecosystem

sustainability to several that require fire to sustain their health and character. National park managers interviewed identified the need to establish a comprehensive fire management program that includes the ability to restore fire dependent ecosystems, reduce the threat of invasive species, and improve local capacity to attack unwanted fires quickly and effectively.

Capacity: SEAM personnel respond to fires, but they are very few in number and do not represent an effective “fire force”. There is no fire training requirement for national park or reserve personnel.

National park managers enlist volunteers from local communities and surrounding farms and ranches to assist during fire events, and are continuously working to improve local capacity. They have the ability to request national volunteer firefighters when necessary, but must provide transportation (Junta and Cuerpo cannot transport firefighters) and other logistical support.

Some park and reserve managers have actively sought funding for a semi-permanent organization to create on-site fire management capacity, particularly during the dry season to quickly respond to fires.

Recommendation: SEAM should work to improve the ability of managers to develop local capacity to manage fire (both use and control) within fire prone national parks and reserves.

- 6) Encourage managers to enter into agreements with local communities and ranchers to organize volunteer fire fighting forces capable of responding quickly to fires occurring on or threatening the park or reserve.
 - a. Ensure the delivery of proper training, certification, and equipment to local volunteer groups.
 - b. Provide sufficient training to all permanent and part-time park employees to prepare them to serve as the core of the larger volunteer-dependent fire organization.
 - c. Establish permanent caches of tools, personal protective equipment, and other requisites necessary to facilitate rapid and effective fire suppression response.
 - d. Establish cooperative agreements with the Ministerio de Obras Publicas y Comunicaciones (Ministry of Public Works and Communications) to create fire-safe zones within road and highway rights-of way. These zones would be designed to reduce ignitions and fire spread from highways and roads into protected areas.
 - e. Establish cooperative agreements with surrounding communities and ranchers to create buffer zones that protect the parks from unwanted fires.

- f. Implementation of a system of signs along roads and trails adjacent to parks during the dry season to relay fire prevention messages and fire danger levels.

Command and Control: By default, national park and reserve managers approve tactics and strategies employed by volunteers, the military, and others when suppressing fires inside the boundary of the park or reserve. As there is no fire management structure or established protocols within SEAM, or within the national parks and reserves themselves, the park or reserve manager is left without guidance or authority. Their capability to influence fire fighting actions taken in the parks or reserves is based solely on their personal experience and skills and the willingness of responding entities to cooperate.

Recommendation: Develop national park and reserve managers into a dependable cadre of “agency administrators” for purposes of ensuring actions taken in response to unwanted fires are in compliance with appropriate regulations and supportive of the intent for each park and reserve.

- 7) SEAM should consider working with the US Forest Service to develop a training curriculum for national park and reserve managers that identifies their responsibility and authority to provide oversight of all fire suppression and management activities within the park or reserve boundary.
- 8) Awareness and respect of the agency administrator role, particularly as it relates to fire suppression operations within the boundaries of national parks, reserves, or municipalities, needs to be a component of all fire and emergency management training in the country.
- 9) National Parks and Reserves need a fire management program as part of their park management plan for their specific ecological and physical conditions.

As previously mentioned, national park and reserve managers help coordinate fire suppression on their units and provide ecological / environmental parameters within which fire fighting resources perform their job, but they have little ability (or necessary skills at this time) to influence performance and cooperation on the fireline. This can be complicated by a conglomerate of military and volunteer fire suppression organizations that operate under different, and sometimes conflicting command and control models (more on this later).

National park and reserve managers do not have the authority and must obtain written permission from national officials to perform any modification to the vegetation on their units, even the construction of necessary fireline. In one case personnel were unable to aggressively

engage a fire (construct fireline) during its insipient stages because the permission did not arrive for five days. By this time the fire had grown much larger and was beyond the capability of the park manager and his small crew of park employees and local volunteers. Additional firefighters arrived three days later, and donated equipment arrived 15 days after the fire began. A fire that could have been suppressed the first day eventually took three-weeks to suppress.

Recommendation: To avoid unnecessary delays in attacking fires appropriately when they are small, place the authority for national park and reserve management decisions relating to fire suppression and management in the hands of park and reserve managers.

10) SEAM should initiate dialogue within the appropriate Ministry to discuss delegating park and reserve management decision authority to local managers. To create the necessary level of confidence, consider developing and requiring all park and reserve managers to have demonstrated a set of “core competencies” (education, experience, skills, and performance history) prior to placing them into the positions, or require they acquire them within a limited period of time.

Fire Behavior and Effects: We saw many indications that fire weather, behavior, and ecology are complex in the national parks and reserves. Improved understanding of these elements would increase the effectiveness of management on these areas.

Increased understanding of these elements would improve the management of Paraguay’s national parks and reserves. Moreover, if the public were better aware of the role of fire in the environment their judicial use of it may follow. National parks and reserves are perfect places to interpret the relationship, both symbiotic and adversarial, between fire and the health of the environment.

An issue was discovered regarding the use of the term “fire management”, and it causes concern. The definition of fire management is not clear and is loosely applied in a variety of ways depending on the bias and desire of the applicator. As an example, significant influence by NGOs that had varying degrees of expertise in fire and fire effects, which could at times be at cross purposes with management priorities and the specific ecology of the ecosystem in question.

Recommendation: Improve the science and understanding of fire, its occurrence and role in Paraguayan ecosystems, with an emphasis on national parks and reserves.

11) Core training of park managers and staff should include fire ecology, fire management, and ecosystem restoration. These topics should be included as part of SEAM continuing education.

- 12) SEAM should establish an applied fire behavior and effects research effort in support of national park and reserve management objectives. The intent is to provide insight to managers on how best to manage and use fire within the boundaries of their assigned areas, and to interpret this understanding for public consumption.
- 13) As a component of this effort, SEAM should establish a clear definition and understanding of the term fire management and its associated activities (fire suppression, ecosystem restoration, hazard reduction, etc.) as relates to the national park and reserve system
- 14) SEAM needs to ensure that there is a technology transfer program specific for national parks and reserves. SEAM should consider establishing a variety of areas within several national parks and reserves that demonstrate “best management practices” relative to fire management and ecosystem restoration. Focus is to develop land and fire management practices that can be applied in other federal parks and the increasing number of private parks.

Other issues, like the harmful effects of non-native plant species, could be addressed concurrently. As an example, much of the problem of increasing continuity in flammable fuels is due to the spread of three invasive grass species, *Panicum maximum* (Guinea or Colonial grass), *Hyparrhenia rufa* (Jaragua grass) and *Brachiaria brizantha* (Brachiaria grass). If the public, both rural and in the city, were to better understand the negative consequences of these and other non-native species, a national focus to avoid similar consequences might ensue.

Recommendation: Improve national commitment to manage non-native plant species that are contributing to the growing fire problem.

- 15) SEAM should explore development of a consolidated fire / non-native species prevention campaign, clearly articulating the cause-effect relationship and their adverse affect on the Paraguayan environment and economy. National park and reserves are perfect locations to articulate, display, and explore potential solutions.

STANDARDS IN WILDLAND FIREFIGHTER TRAINING AND CERTIFICATION... There has been a great deal of effort and investment on part of the Paraguayan government and a number of NGOs, OFDA and other entities to develop wildland fire fighting capacity in Paraguay. OFDA has taken the lead to provide a standard training curriculum to both the Cuerpo, Junta and other institutions, using personnel trained in Chile, Argentina, Spain, and Central America. It was expressed by several trainers and trainees that the delivery of the curriculum is

almost exclusively academic with little practical exercise and there is little adaptation to the local natural and physical conditions and fire environment.

According to the Cuerpo and Junta leadership this training is very basic wildland fire training, focused on small grassfire environments. While applicable to many of the fires in Paraguay, they observed that the training does not prepare firefighters to safely and effectively fight fires of moderate to extreme fire behavior or those in densely forested areas. Nor, they observed, does the training curriculum provide for incremental skills development. Cuerpo and Junta leadership indicated the need for additional intermediate and higher level training in fire weather, fuel characteristics, and fire behavior similar to training offered in other countries with well established wildland fire curriculum ranging from an introductory level to an advanced level.

Noted in the review of various photographs of fire fighting operations during the unprecedented 2007 siege, and during interviews with firefighters and those associated with them, an thorough knowledge of fundamental wildland fire fighting tactics was lacking. We found that in most instances fire behavior was not overwhelming (< 1 meter flame height when sheltered by canopy or during calmer winds), yet the lack of fire fighting effectiveness was evident when considering the number of resources available. Simply stated, fire fighting tactics and strategies used during the siege were mostly ineffective. Some tools used to fight fires are rudimentary and ineffective in many cases (machetes and tree branches e.g.) for ground scraping, which probably contributed to lack of control and containment. Use of dozers was helter-skelter with multiple, parallel lines within 100 meters of each other. Mop-up was poorly performed according to basic fire training standards, if at all.

The lack of adequate training and tools may undermine the goodwill and energy of volunteer firefighters. That may create a feeling of dissatisfaction among firefighters and beneficiaries of their work.

Use of aircraft was also generally ineffective. Helicopters with buckets didn't show up until after the emergency was nearly over, and fixed wing use did not appear to be coordinated with ground operations.

Admittedly, implementation of a comprehensive training program, coupled with a performance based certification system, is made more difficult by the lack of continuity in a volunteer fire fighting workforce that is a disincentive to investment. Moreover, because of the historical infrequency of large-fire and multi-fire events, practical application of the training is limited, and practicing of increasingly complex skills is restricted.

However, this would not be the case if national park and reserve employees and employees of SEAM were trained in wildland fire fighting (see discussion in the *Protection of National Parks and Reserves* section). Adequate fire training of armed forces will also improve their response and efficiency when they become directly involved, or when they provide logistical support to volunteer firefighters.

Significant improvement in the wildland fire fighting capacity of Paraguay will require the implementation of a single, comprehensive training and certification program. Such a program helps to avoid creating a broad spectrum in firefighter and crew capabilities, establishes a common and realistic expectation of firefighter performance, eliminates differences in technical terms and operating principles, and will help to reduce the confusion and chaos that naturally occurs during wildland fire events. Such a program exists and has already been implemented in a number of Latin American countries.

Recommendation: Improve wildland firefighter training and certification.

- 16) Government agencies (SEAM, SEN, SFN, etc), the Armed Forces, and any organization that will be involved in wildland fire suppression should join together to work with the appropriate entities in establishing a national system through which firefighters are trained and qualified to perform the wildland fire fighting job. Consider adopting a recognized and respected system being applied in the region (Chile, Brazil, and Argentina) or other areas within Latin America (Mexico has adopted a very progressive approach) with the intent to achieve consistency between countries likely to support one another during emergencies like Paraguay experienced in 2007.
- 17) Review training materials to ensure adequacy for the fire fighting environment of Paraguay. Along with Incident Command training (see following section) specific attention should be given to improve fire fighting tactical training: water use, mop-up, line construction, direct and indirect attack, aircraft use and efficiency, etc. Eliminate any parallel training and develop a single, multi-tiered training strategy.
- 18) Establish a higher level training program for wildland fire trainers already available in the country. Courses might include intermediate and advanced fire behavior, fire weather interpretation and forecasting, use of prescribed fire, incident command system, fuel and fire hazard assessment, and other specialized fire training.

INCIDENT COMMAND... Clearly understood roles, responsibilities and relationships are essential to ensure safe and effective management of any emergency. A consistent message from those interviewed that were directly involved in the Paraguayan fires of 2007; there was confusion, competition and overall lack of recognizable and focused command and control of operational activities. Responsibilities were not well distributed among the fire fighting personnel who were being supported at the expense of local municipalities and landowners. Many fire fighters and military personnel were underutilized.

Leaders of the Junta and Cuerpo interviewed identified the need to improve interagency cooperation, establish a standardized communications system, and develop a unified command structure and strategy.

The existing management structures of the various ministries and secretariats are unique. As a result they are also rather inflexible in their ability to unify and adjust when necessary to deal with large, complex emergencies involving numerous departments (states), complex land ownership, and multiple, competing objectives. Further, centralizing the decision making during a fire conflagration makes it difficult to deal with the problem and creates inefficiencies.

The group originally organized and lead by SEN during the 2007 fire siege was responsible for coordinating support of field activities. While the system used was identified as an "Incident Command System" the organization was not and could not be capable of providing incident-specific command and control.

Command and coordination are two completely different, yet equally essential components of effective emergency management. What Paraguay is now lacking is a standard emergency incident command approach and structure that: 1) Expands or contracts as necessary to meet the needs of incidents of any kind or size; 2) Allows personnel from different ministries, secretariats, agencies, departments, and levels of government to rapidly coalesce into a common management structure using common terminology; 3) Provides dependable logistical and administrative support to operational staff; and, 4) Avoids duplication of effort. Implementation of a well articulated command and control system will provide a consistent, integrated framework for the management of all incidents from small and straight forward, to large and complex.

Recommendation: Implement a clearly articulated incident command system.

- 19) SEN should work with the appropriate Ministries and Secretariats (including SEAM) to develop and adopt a national emergency incident response (coordination, command, and control) system. Following development all involved agencies and entities must be trained and routinely drilled to hone skills in this important area. Components of the system include:

- a. Clearly articulated roles, responsibilities, and authorities among and between all Ministerial and Secretarial levels, federal, departmental, and municipal governments, and the military. Includes developing the necessary agreements and memorandums of understanding ahead of time.
- b. Clearly articulated chains of command and supervision (including the role of the Agency Administrator, identified previously).
- c. Clearly identified communication systems and processes (including common radio frequencies and communication protocols).

- d. Communication plans that address management of intra-governmental and public information flow.
- e. Common codes and terminology.
- f. Orderly, systematic planning process.
- g. Means to effectively integrate involved ministries, secretariats, agencies, and levels of government into the management structure and planning process.

INTEGRATING THE MILITARY INTO THE INCIDENT COMMAND SYSTEM... Contributing to the confusion that occurred during the 2007 fire siege was the lack of clarity on how the military could contribute to firefighting activity. We consistently heard stories about the lack of common terminology, differences in task orientation, and conflicts between local authorities and the command and control assumed by the military.

Moreover, the military is not adequately prepared to perform the fire suppression support mission at this time due to the lack of firefighting experience and training. For example, only two helicopters out of the eight operated by Fuerza Aerea Paraguay (Paraguayan Air Force or FAP) have belly hooks to accommodate buckets, and none were used in water dropping during the 2007 fires. All flying by FAP is IFR (Instrumental Flight Rules); FAP pilots will need to learn VFR (Visual Flight Rules) in order to support fire operations. Additionally, FAP pilots will need to improve their understanding and ability to mitigate aircraft performance limitations relating to external loads, intensify training in Crew Resource Management (currently the pilot is assisted by at least two other individuals during straight and level flight), and be trained in the Incident Command System.

Another issue that may interfere with the effective integration of the military into fire suppression operations is the financial burden placed on receiving agencies or local governments when they are called. As an example, military aircraft cannot be used unless a national emergency is declared and the host agency can purchase the fuel necessary to fly them. That puts a major burden on a volunteer organization that has limited resources.

Recommendation: Explore opportunities to improve the integration of Paraguayan military assets into fire suppression operations.

- 20) Appropriate elements of the government of Paraguay should consider reviewing the role of the military to provide support to civilian authorities during national emergencies.
 - a. If appropriate to the military's role, the government of Paraguay should improve the capacity of the military to provide the necessary support to large fire suppression, which would include: training (fire fighting, ICS, aviation-specific), equipment modification or acquisition (Bambi buckets, helicopter

modifications, etc.), review and amendment of policies that create a disincentive to the use of the military, development of mechanisms that improve civilian agency – military communication and cooperation.

EMERGENCY COORDINATION... The forte of SEN is logistical support; they are the movers of money and supplies. At the beginning of the 2007 fire siege, SEN also had responsibility for coordinating the activities of the various ministries and secretariats in response to the siege. However, some time into the siege, the President of the Republic shifted the leadership for the emergency to the Ministry of Industry and Commerce.

Several things may have contributed to the confusion and shifting responsibilities that ensued during the siege. The first, which we believe contributed to some of the issues surrounding logistical support, is the lack of a resource management system - a component of an Incident Management System that applies consistent terminology to the type and capability of all resources. Secondly, emergency coordination was consistently being confused with incident management; vulnerabilities surrounding this issue were discussed previously. Finally, there is no established system in place to prioritize among multiple emergencies, fires, etc.; incident priorities were being dictated from Asuncion without clearly articulated criteria.

SEN clearly understands many of these issues and is already in the process of correcting them. However, it is important enough to reiterate some of these issues, and recommend additional actions that might be taken to bolster SEN's efforts.

Recommendation: Improve national emergency coordination, response, and effectiveness.

21) Develop a National Response Plan that includes:

- a. Creation of a National Coordination System under the responsibility and authority of SEN. Must clearly identify authorities, responsibilities, and roles among and between levels of government and governmental agencies in response to national emergencies.
- b. Clearly articulate the protocols surrounding national declarations of emergency relating to all hazards, including wildland fires.
- c. Identify membership, the protocols and operating procedures of a national body that will serve to prioritize multiple emergencies and the government response to them. Clearly identify the relationship of this body to the authorities and responsibilities of municipal emergency management committees, as identified in Law 2615.
- d. Ensure the national emergency management center (NEMC) in Asuncion has the capability to expand beyond the threat of

floods to the capital city, and deal with multiple, complex emergency incidents.

- e. Provide NEMC with the capacity and training necessary to provide the field with proactive support and information critical to fire fighting operations, like fire weather forecasts. Consider the creation of a wildfire coordination position.

POST INCIDENT ISSUE MANAGEMENT... Post-fire human health issues have not yet been adequately addressed by the government or external support entities. Fires destroyed the food production for many poorer colonias throughout the affected area. Some relief was immediately provided by the country, supporting governments and NGOs, but there continues to be a rather dire need, which in sporadic cases is being fulfilled by contributions from local landowners and adjacent communities. Respiratory health issues were common complaints we heard as we traveled throughout the affected area. Once again, medical support and relief is sporadic.

Recommendation: Establish strategies to address post emergency needs of effected communities and people.

- 22) USAID work with the appropriate government agencies and NGOs to ensure post-fire human health issues are being addressed. Facilitate the establishment of post-incident management strategies to be included in the National Response Plan.

INTERNATIONAL SUPPORT... In discussions with officials from USAID, OFDA, and several NGOs, areas were identified that could be improved when providing international support. Among these were:

The competition to provide training and other services that at times does not provide consistency, clarity, and adequacy. The possibility exists for this competition to create confusion and complexity rather than consistency, clarity, and adequacy.

A wide variety of skills and expertise exist among these entities in different areas of fire management. These skills and expertise are applied depending on the bias and desire of the applicator.

Recommendation: Improve consistency in the fire management and incident command skills and expertise within governmental (USAID, OFDA) and NGO support organizations.

- 23) USAID should consider reviewing this issue and develop a cooperative and coordinated approach with other countries and NGOs to ensure consistency with international standards relating to fire management and incident command.

- 24) Support Paraguayan fire organizations' active participation in regional wildland fire organizations promoted by FAO and the South American governments.
- 25) USAID/OFDA/NGO's should consider supporting the creation of a Wildfire Coordinating Group within Paraguay to ensure training, equipment, and technical assistance is standardized and coordinated.
- 26) USAID/OFDA/NGO's should consider attending intermediate and advanced fire management and incident command system courses approved by the U.S. National Wildfire Coordinating Group. This could improve the skills of local trainers.
- 27) USAID/OFDA should consider establishing a regional fire equipment cache to rapidly deploy equipment to the areas of need when receiving emergency requests from countries.

FIRE EDUCATION AND TECHNOLOGY... During meetings and travel to the field, exceptional people were encountered who have a deep knowledge of their environmental issues and needs, and in some cases are aware of the solutions. Although there is a need for direct support from international agencies, the country will certainly benefit in the long run by developing its own technical capacity in fire management.

Poor fire education and awareness in Paraguayan society is a source of many of the fire problems faced by the country. Despite the interest generated for the losses during the 2007 fire season, there is no identifiable leadership for fire prevention education in the country. For a country where slash and burn agricultural practices and pasture burning are common practices, it should be expected that foresters, agronomists, and rangeland managers are provided wildland fire related training at technical schools or colleges.

Paraguay has unique natural, physical, social, and cultural characteristics from other Latin American countries. This uniqueness, combined with the obvious role of fire in the Paraguayan environment, would suggest the need to identify an institution or institutions having the expressed purpose of adopting, adapting, or developing science and technology focused on fire management for the Country of Paraguay.

Recommendation: Support the establishment of fire management education and technology transfer programs that will provide guidance to park managers, farmers, and ranchers who are dedicating resources to research, and restoring forest reserves. Assist Paraguay to develop the capacity to deal effectively with current and future fire challenges.

25. Create a living fire prevention campaign that reaches urban and rural populations through appropriate media and with specific messages for each population type.

26. Support the development and delivery of fire curriculum adapted to different levels of the educational system, e.g. elementary schools in rural or urban areas, technical schools, and forestry, agronomy and biology colleges.
27. Support the development of an applied research program designed to adapt, adopt and develop fire technology and science appropriate to the environmental conditions in Paraguay.
28. Continue and enhance the support of Paraguayan universities and NGOS (e.g. Universidad Nacional de Asuncion, Guyra Paraguay, Fundacion Bertoni) who are currently engaged in adopting modern technology that can improve fire suppression and support the development of fire management technologies and practices (e.g. GIS, use of satellites for fire detection and assessment).

NATIONAL FIRE POLICIES... A consistent National Fire Strategy can comprehensively address many of the problems and recommendations outlined in this report over the long term. We applaud the government of Paraguay for taking the initiative in this regard. The fire assessment team recognizes the difficult task of developing a National Fire Strategy for Paraguay. We recommend USAID and USFS International Programs jointly seek support from countries and international agencies that are involved in similar efforts. For instance, FAO has recently published Voluntary Guidelines that may be useful to Paraguay in its own development of a cohesive and consistent long term fire strategy that is adequate for its own conditions. Other countries from which Paraguayan authorities can learn are Mexico, Chile, Brazil, and Argentina. The USFS and the Canadian Forest Service have recently gone through a similar process. We believe that a multinational team of experts can be assembled to work with Paraguayan authorities to develop a National Fire Strategy for Paraguay.

IN CONCLUSION:

The team acknowledges the support and contribution of many wonderful people, too numerous to mention. We were impressed with the intelligence, sincerity, and fierce commitment to the well-being of Paraguay common to every citizen and military man with whom we came into contact. The future is bright if it depends on people like these.

The system in Paraguay is unique to our experience. Balancing the fire fighting responsibility on the backs of volunteers is extraordinary, and the performance by these brave men and women is exemplary. However, there is a clear need to develop a cadre of professionals within government to ensure continuity in the overall management of emergencies. Lines of authority, communication, and responsibility must be clear and well understood. Training must be consistent and match the environment. Decision authority should be driven to the lowest levels necessary to ensure efficiency and effectiveness.

The issue of agricultural burning will be a huge challenge, but offers unique opportunities to educate all the citizens of Paraguay in the value of their ecosystems and the role of fire in shaping or destroying them.

The strength of Paraguay is in her people, and land management issues affect them all. As the people of Paraguay gain awareness in fire management we believe it will contribute to them adequately facing environmental challenges in the future. We wish them well.