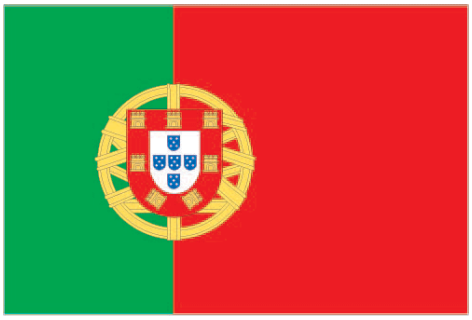

OBSERVATIONS AND RECOMMENDATIONS CONCERNING

PORTUGAL'S WILDFIRE MANAGEMENT SYSTEM

SUBMITTED BY

US FOREST SERVICE WILDFIRE TECHNICAL TEAM

TO THE GOVERNMENT OF PORTUGAL

VIA

EMBASSY OF THE UNITED STATES OF AMERICA

18 DECEMBER 2017

Areas visited by U.S. Forest Service

Wildfire Technical Team

- Coimbra Region
- Leiria National Forest

2017 Fire Information:

- 110 – Deaths
- ~520,000 Hectares Burned – (1,285,000Acres, highest ever for a fire season)

INTRODUCTION

Based on the severity and length of the 2017 wildfire season in Portugal, which resulted in the deadliest summer of blazes in modern history, the Government of Portugal (GoP) indicated it would accept assistance from the Government of the United States. Initial assistance, provided by the U.S. Agency for International Development Office of U.S. Foreign Disaster Assistance (USAID/OFDA), was for $50,000 to support Portuguese humanitarian non-governmental organizations responding to the fires' continuing effects. In addition, in December, the Embassy of the United States arranged for a three-person technical team of U.S. Forest Service wildfire experts (Team) to come to Portugal to observe the effects of the fires and to provide initial recommendations to the GoP on methods to improve fire management systems across the response, rehabilitation, and recovery spectrum.

This report draws upon discussions and observations by the Team with key leaders at several national level organizations. In Lisbon, the Team met with officials of the Office of the Prime Minister, the National Agency for Civil Protection (ANPC), and the National Institute for Nature and Forest Conservation (ICNF-Portugal Forest Service). One Team member traveled to the Coimbra Region, one of the regions most affected by fires and the area where many fire deaths occurred, to meet with regional officials and observe the effects of the fires first hand. Two other Team members traveled to the Leiria National Forest to view the effects of mid-October 2017 fire on the forest.

Commendations:

Considering the enormity and unprecedented scope and complexity of the fire situation faced by the GoP in 2017, the Team is highly complementary of the efforts of all citizens and organizations of Portugal involved in combatting these wildfires. The Team wishes to extend its condolences to the families and colleagues of those who lost their lives or were injured as a result of these fires.

Purpose of Wildfire Technical Team:

- Gain an understanding of the scope and effect of the 2017 fires;
- Learn how the GoP organized at the national level to respond to the fire situation;
- Learn how GoP organized firefighting resources at the regional and local levels to respond to the fire situation;
- Gain an understanding of the reforms recommended by the Independent Technical Committee (CTI) and the current status of that reform effort;
- Offer initial recommendations on potential methods, programs, and procedures to enhance the GoP's capabilities to increase its readiness and effectiveness in combatting future wildfire situations similar to the 2017 fire season.

General Comments:

The Team appreciates the willingness of GoP officials to take valuable time out of their busy schedules to meet with and support the Team's agenda. The initial briefing with Mr. Tiago Oliveira of the Office of the Prime Minister was extremely beneficial and set the tone for the Team's entire visit at all levels, national, regional, and local.

The following report encapsulates the aforementioned objectives into two main categories, *Incident Management System* and Burned Area Emergency Response:

I. Incident Management System
- Strategic Decision Making and Fireline Transition
- Leadership Development in an Incident Management System
- Incident Command System
- General Training Issues

II. Burned Area Emergency Response (BAER)

I. Incident Management System

- Strategic Decision Making and Fireline Transition

Observations:

The Team was informed about the current structure of Portugal's wildfire management system and the various organizations involved in wildfire suppression at the national, regional, and local levels. The Team was briefed by ANPC on how decisions are made concerning the prioritization and allocation of national resources. However, the Team did not have a complete understanding of how the national commander at ANPC made those decisions and from where his authority came. And the Team was not clear on the continuity of the decision making process from the national level to regional and local levels.

The Team felt there was no process or procedure for an Incident Commander to understand what the *values at risk* were when he/she arrived at a fire. How was the IC to know whether the priority was to protect the school, the clinic, the electrical transmission wires, or a threatened watershed? When a Team member asked, "What was the first conversation that a local mayor might have with the IC?" He was told usually the major would say to the IC, "*What are you doing?"*

The Team wasn't quite sure if it was by law or tradition, that once the local volunteer fire brigade commander arrived at the incident, he/she became the IC. That current transition of command on the fireline was not based on qualifications or experience but on the position held by the fire brigade commander. The Team was also told that the second highest number of hectares burned was due to *rekindled* fires. In Portugal fires that rekindle are considered "new fires" and reported accordingly. In the U.S. a rekindled fire is termed a *re-burn*, which is a wildfire that was assumed to be contained and controlled but has now escaped the control lines. Any additional acres lost in the re-burn would be associated with the current fire, and not be considered a new fire. The IC at the time of the re-burn would be responsible for explaining how and why the fire escaped control. The Team was also told that a high percentage of Portuguese wildland fires rekindle, i.e., are not fully controlled during the initial effort.

Recommendations:

1. Consider reviewing the decision making process at the national level to insure that there is an accepted, understood, and consistent decision making process. That process should insure a continuity of decision making and a continuity of action at the national, regional and local levels. Decision makers at all levels should take into account a *complexity analysis* of the wildfire issues they are facing. The following is a simplified outline of a complexity analysis to assist with establishing priorities and allocating resources:

   Define the Criteria to be used in Establishing Priorities:
   - Values at risk and the potential to destroy:
     - Human life
     - Property, infrastructure, and resource values (protected areas)

   - Social/political, economic consequence

   - Resistance to control:
     - Growth Potential
     - Difficulty of terrain

- Probability of meeting suppression objectives within the specified time frame

2. Review the document, *Recommendations on a Strategic Decision Making Process for National Leaders* which will be sent separately from this report, for possible methods to improve decision making and insuring the implementation of decisions.

3. When an IC arrives at a wildfire incident, he/she assumes that they and the resources they have brought to the incident are *working for and supporting* some public official at some level. In the U.S. the IC receives from that public official such as an agency manager, a ***delegation of authority*** which identifies overall priorities and any limitations on wildfire suppression actions. Use of the simplified complexity analysis (recommendation 1), can assist the decision making process for that public official. This delegation of authority does not have to be a lengthy process and can be done verbally, although a written document is preferred. So when the mayor's question to the IC is *"What are you doing?"* The answer from the IC should be *"What do you want me to do?"* The answer to this cannot be "*Put the fire out*", it must identify what values need to be protected, in priority order. This may sound simplistic but it is a fundamental component of an *integrated incident management system*.

4. Consider developing a course or at a minimum a handbook perhaps with an associated public outreach campaign, with checklists that describes the roles, responsibilities, and appropriate actions of appointed/elected officials when dealing with a wildfire incident in their jurisdiction. A section on a delegation of authority discussed in recommendation 3 would be part of such a course or handbook. This recommendation is based on the premise that the *Incident Command System* (discussed in the next section) is a *component* of an *Incident Management System*, where officials have the responsibilities not to *command* an incident but to provide overall *management and direction* to the Incident Commander.

5. The Team believed that the number of acres/hectares lost due to "rekindles" was a key indicator of a competency and management problem associated with *transitions of command* on the fireline. To be successful and effective any new incident management system designed by Portugal must be *competency and experienced based*. As long as rank undermines competency, the system will fail. The Team was briefed on the issues surrounding the laws and traditions related to current incident command practices but laws and traditions don't put out fires, competent people do.

- Leadership Development in an Incident Management System

Observations on a Leadership Development Program:

The Team was told that Portugal does not have a specific leadership development program for their emergency services, including wildland fire management. Given the need for fire managers to communicate effectively, maintain accurate situation awareness, lead up and down and effectively persuade and motivate, the Portuguese fire service might gain similar benefits from a leadership development program that the United States has established.

Recommendations:

1. GoP should evaluate the need for a leadership development program, separate from their existing task-oriented fire skills training program, to develop leaders for the future.

2. GoP could reference the leadership development programs of others, such as the United States wildland fire service, the military or private sector entities, to identify best practices that could be adopted in Portugal.

Observations on Learning from Operations and Continuous Improvement:

The Team could not identify any established process in place for the agencies responsible for wildfires or other emergency services in Portugal that institutionalizes learning and continuous improvement based on reviewing operations that have occurred. Every operation that occurs is a *learning opportunity*. Without an established process to take advantage of learning opportunities, improvements are difficult to achieve at any organizational level.

Recommendations:

1. GoP should study the continuous improvement processes that have gained widespread use in the U.S. wildfire services, such as After Action Reviews or Facilitated Learning Analyses, to determine if any continuous learning and improvement procedures or practices could be institutionalized in Portugal.

- Incident Command System

Observations:

Portugal has accepted and adapted the U.S. based **Incident Command System** (ICS) as the foundational structure for task organizing individuals to respond to incidents. One Team member observed a realistic computer based simulation exercise at the National Fire Service School (NFSS) in Sintra where trainees were using ICS to manage an exercise scenario involving a car crash, patient extraction, car fire and traffic control issues. The simulation instructor said that they could put the trainees through several different scenarios in a day. In each different scenario the trainees would be observed in different ICS functional roles. The Team member who observed the exercise could see that the trainees understood basic ICS but from what he was told by the training officer, functional training specifically targeting Plans, Logistics, and Operations were not currently available.

A lack of ICS functional training diminishes the effectiveness of ICS. This is especially true in the Planning function. Proper incident planning evaluates the situation, selects a strategy, develops incident objectives, improves the allocation and management of incident resources, increases communications among firefighters and improves firefighter safety. A key concept of ICS planning is the development of

an *Incident Action Plan* (IAP) document. The IAP defines the incident objectives and reflects the tactics necessary to manage an incident during an operational period. Clear expectations and mission objectives are provided to all firefighters assigned to the incident. This is of particular importance to the personnel assigned ground and air missions during a given operational period. Providing a printed operational plan, or at the very least, a verbal operational briefing that includes clear communication of incident objectives, resources assigned, and outcomes expected is essential.

A particular challenge in Portugal may be that there are not very many opportunities for fire service personnel to perform on large or rapidly expanding wildfires. The vast majority of wildfires in Portugal are caught successfully on initial attack, and extreme fire conditions don't occur every year. Fires that do escalate beyond initial attack are generally of limited duration, limiting opportunities to mobilize trainees. This may indicate a need for even better preparedness activities to fully exploit any opportunities that become available.

The Team later in the week attended a meeting with an official from the Office of the Prime Minister where the principle purpose of the meeting was to discuss if Portugal was on track with its implementation of ICS or whether it needed to change certainly aspects. A member of the Valencia, Spain fire brigade was also in attendance and made a presentation of how Spain has adapted ICS for its response to incidents. After discussions, the Team felt that Portugal's acceptance and adaptation of ICS to the Portuguese context was positive and it should not look for ways to change the way ICS is described in law.

Recommendations:

1. Reconfirm at a national level by the Office of the Prime Minister that as part of a nationwide ***Integrated Incident Management System,*** ICS is the recognized system for incident organization and response at the *tactical level*. A key emphasis of this acknowledgement should be on the concepts of unity of command and unity of effort.

2. To insure that there is knowledge, acceptance, and efficient use of ICS nationwide; review the current basic ICS courses and the level and frequency of their delivery. This review may lead to a necessity to refocus training schedules to determine when and where basic ICS courses are presented.

3. More in depth functional training for ICS positions (logistics, operations, plans, command) must be developed. Without this training, incident responders will not have all the tools available through ICS to successfully and efficiently manage incidents.

4. The Team feels that a Planning function course is the highest need. Have the National Fire Service School training staff obtain and review I-440 Planning Section Chief course materials from the U.S with the focus on developing a Planning course to meet Portugal's needs. Any course that is developed needs to have an emphasis on the development of an Incident Action Plan (IAP). As a sub-recommendation, discuss with other EU partners

who use ICS, how they have adapted and teach the Planning function and how they develop IAP's on incidents.

5. *NOTE: The following recommendation may already be in place but the Team did not hear it referenced*. Consider developing a mentoring program to allow less experienced staff to gain knowledge and expertise from senior level staff with broad firefighting backgrounds and with ICS. In order to gain operational experience, consider exchanging fire personnel with other countries, such as Spain, that have more frequent large fires.

- General Training Issues

Observations:

Training is a key component of an Incident Management System. The Team has offered training recommendations specific issues in other sections of this report. These observations are about general training issues and trends observed by the Team.

One Team member received extensive briefings at the National Fire Service School. The briefings included information about the school's mission; certifications; relationships with other training institutions; training courses and materials; community outreach programs; and the school's publications management system. The Team member also learned about the three regional. A more specific briefing on the wildfire training courses and course materials was presented by a senior trainer from the Lousa training center. The Team member was very impressed with the extensive multilevel training curriculum on wildfire at Lousa. When the Team member noted that some course material and job aids looked very familiar the senior trainer said that trainers at Lousa were using a great deal of materials from the U.S. One concern that was brought up was that when the trainers from the National Fire Service School requested permission from ANPC to visit fires to evaluate how the training was being implemented and how effective it was, ANPC denied the request to visit fires. The Team member did not gain a full understanding for ANPC's decision. Another group is the Forest Sappers (not sappers like the guys that blow things up). The sappers assist with fire suppression efforts usually in the final stages during "mop-up," but their main duties are as silviculture teams. They are very involved in planning and carrying out fuels management projects for municipalities and individual land owners.

One wildfire suppression skill area that was repeatedly emphasized as a high need was fire behavior analysis. The Team was briefed on the skills available by 18 staff members within the Special Forces Fire Brigade (FEB). However, it was pointed out that this year due to the size, number, and locations of fires it was very difficult for the FEB specialists to meet all the requests for assistance. The National Fires Service School provided the statistic that from 2014 to 2017, 918 students attended Forest Fire Behavior and Safety courses. The Team was not sure what level of fire behavior training was involved but it did indicate the National Fire Service School recognizes the need for this critical skill. The Team did not understand how with that many trainees over a three period there weren't more staff available to provide some level of fire behavior analysis. The Team felt that there was some level of disconnect between what

the school taught, the numbers of individuals attending various courses, subsequent availability of trained individuals when needed, and how useful and effective the training was when applied on the fireline.

Another issue that was not fully understood by the Team was why ICNF Sappers did not seem to be fully integrated into the wildfire response system. Their main duties are as silviculture teams. They are very involved in planning and carrying out fuels management projects for municipalities and individual land owners. Some of these activities like fuels management and prescribed fire use are requisite skills needed to suppress wildfires in all phases of the suppression effort. The Team was told that the Sappers do assist with wildfire suppression efforts but usually only in the final stages during "mop-up." It seemed to the Team that here are skilled personnel who are underutilized in the wildfire response system.

Recommendations:

1. An earlier recommendation on rekindled fires dealt with a *command issue*. This recommendation involves a specific *skills training issue*. If the second highest number of hectares lost each year is due to rekindles then the Team recommends an extensive review of the basic firefighting skills training provided to agency staff performing wildfire suppression activities. The review should include if and how individuals' qualifications are tracked as they move from one level to the next. The review should look at how individuals are selected to attend training. That selection should be linked to two things: 1) the potential for large/catastrophic wildfires in their home area and 2) their availability throughout the year to respond to emergencies anywhere. The goal of the review should be to improve an integrated skills training system among the agencies to insure there are skilled agency personnel available to perform in a unity of effort on the fireline when needed.

2. A related issue to skills training and rekindles has to do with having Standard Operating Procedures (SOP) that link to that training. In the case of Portugal an SOP needs to be written that states that the initial incident commander on a small fire that is quickly contained, must stay on that fire and ensure it is completely out. This should be reinforced by training in patrolling and mop-up procedures so firefighters and fire managers have the basic skills to find remaining hot spots on contained fires and extinguish them effectively.

3. National officials responsible for an Integrated Incident Management System must require that the training component of that system travel to active wildfires to monitor and evaluate the use and effectiveness of basic skills training and ICS functional training. No training system can be effective or improve without knowing the use and effectiveness of what it is teaching.

4. Review the current wildfire response system to evaluate how underutilized staff with wildfire suppression skills such as ICNF, can be more effectively integrated into that response system. Interoperability and unity of effort among wildfire suppression agencies should be the goal.

II. Burned Area Emergency Response (BAER)

Observations:

***Personnel*:** Portuguese ICNF personnel recognize the need for evaluation and identification of post-fire threats from erosion and flooding. ICNF personnel demonstrated competency and an understanding of post-fire threats, the need to standardize timely data collection analysis, and that implementation should focus on the greatest areas of concern or 'values at risk' (VAR). However the Portuguese lack a systematic approach by trained personnel to accomplish an effective BAER assessment and implementation in a timely manner.

***Process*:** The current Portuguese BAER process utilizes a comparison of satellite imagery pre and post fire to determine fire severity similar to the Burned Area Reflectance Classification (BARC) utilized by U.S. Forest Service (USFS) BAER teams in the United States. However, little validation of the accuracy of the BARC mapping has been conducted to determine the efficacy of the satellite imagery in depicting changes in soil properties which is the key factor in predicting post-fire watershed response.

Once acquired, the BARC mapped is sent to a contractor[1] who runs a model to predict post-fire watershed response. Inputs to the model include 1) burn severity as determined by the BARC map, 2) roads, 3) slope, and 4) stream courses. Site specific information on precipitation amount and intensity are not incorporated into the model. These precipitation variables are key drivers in predicting the relative increase in erosion and flood flow potential following wildfires.

The results of this model are then used to determine emergency post-fire stabilization measures and develop funding requests. Theoretically each municipality has a forester to help with assessment and implementation, although efficiency of this participation is highly variable.

***Timing*:** The current Portuguese BAER assessment takes 3-4 weeks to complete. Once funding is approved implementation occurs through individual municipalities. Challenges for rapid implementation include 1) funding comes from European Union (EU) funds which have time consuming processes as well as constraints, and 2) there are no dedicated teams or personnel for implementation, so it is largely dependent on the capacity of the municipalities to implement along as part of their other priorities. Currently there is no prioritization of funding requests or implementation based on values at risk.

Recommendations:

[1] Current understanding is that the contractor is a local university or someone in academia, but this needs to be verified

Opportunities to assist the Portuguese in developing a more effective 'BAER' program are outlined below. These opportunities address training of personnel to conduct a more robust BAER assessment that can be completed in a timely manner:

1. ***Exchange of materials*:** Much of the information developed in the United States to support the BAER program is available through websites and published research. Important websites include:

    a. http://fsweb.wo.fs.fed.us/wfw/baer/index.html : This is the national BAER homepage. Key available information includes links to:

        i. The Remote Sensing Applications Center (RSAC) which develops the BARC maps for USFS BAER teams. Information on what BARC is, how it is derived, and how to adjust images based on field verification is available here.

        ii. Key publications including 1) a comparison of post-fire flood flow models, 2) links to research publications that address the effectiveness of various BAER treatments, 3) the Burned Area Emergency Response Treatments Catalog

        iii. Example reports and guidance papers

        iv. Past BAER training webinars. While some of the training material is specific to Forest Service policy, many of the general concepts would assist the Portuguese in developing their own BAER program

    b. https://forest.moscowfsl.wsu.edu/BAERTOOLS/ : This website provides links to the most commonly used models for post-fire erosion and flood flow predictions.

2. ***Training*:** The current USFS BAER training program is largely dependent on trainees working with journey level BAER specialists on a BAER assessment. As such, the best opportunity for the Portuguese to gain experience in the BAER process would be to work with a BAER team in the United States. BAER assessments on more complex fires take 10-14 days to complete.

    Having Portuguese technical specialists travel to the United States would allow them to the see the complete BAER process including:

    a. How values at risk are identified;

    b. How the initial BARC map is field verified based on soil properties and adjusted as needed;

    c. How erosion and flood flow modelling is conducted in a rapid and timely manner and where input variables are derived from;

    d. Identification and prioritization of BAER treatment recommendations;

    e. A cost-benefit analysis of treatments to ensure that funding requests are justified.

The intent of embedding the Portuguese into a USFS BAER team would be for them to experience the overall process so that they could then develop their own process based on the structure of their agency, available data, applicable models etc.

3. ***Other opportunities*:** Several other opportunities were identified that could help the Portuguese to develop a more robust BAER program:

    a. BARC validation: Forests in Portugal have a wide variety of vegetation communities intermixed on a small scale. Vegetation communities include pine, eucalyptus, 'broad-leaf' trees (English and American oak, 'strawberry' trees, birch etc, shrublands or 'heatherlands', and grazing lands. However it appears that there has been no validation of how accurately the BARC map reflects soil burn severity among these different vegetation types. Field validation of the accuracy of the BARC map to reflect soil burn severity amongst these different fuel types is recommended to help calibrate the predictive model(s) used to determine post-fire watershed response.

    b. Treatment effectiveness: Following the 2017 fires some treatments to reduce erosion were proposed and implemented by the municipalities with assistance from ICNF. While the concepts and intentions had the potential to reduce erosion, the actual treatments selected may not have been the most effective available, and/or may not have been implemented properly.

    Several sites were visited where either experimental plots had been established or treatments had been implemented. Monitoring of the effectiveness would help to inform not only BAER team members but also local municipalities of which treatments are most effective at meeting objectives as well as how to improve implementation.

    c. Post-fire vegetation communities: Data provided by ICNF indicated a substantial shift since 1905 from shrublands and agricultural lands to forests. This shift has resulted in higher fuel loads which are likely a contributing factor to the large scale high intensity fires that occurred in 2017. Development of land-use planning and incentives that include a higher percent of grazing lands may help to reduce the fuel loads and subsequently the degree or extent of future high severity fires.

Conclusion

For fifteen years, the US Forest Service has worked with the Government of Portugal to address critical issues of forest management related to wildfires including preparation, suppression, and recovery. The observations and recommendations presented by the U.S. Forest Service Wildfire Technical Team in this report represent a continuation of that relationship while specifically focusing on issues associated with the Portuguese wildfire management system during the 2017 fire season.

This report is presented with the understanding that the Team's observations were conducted following a very complex and stressful time for national, regional, and local leaders and firefighters.

The intent of the recommendations is to provide strategies on how to improve Portugal's methods of managing and preparing for future wildfires. The Team wishes to note that due to limitations of time to fully understand the complexity of the issues faced by national leaders and firefighters at various levels, some recommendations may be incomplete, inaccurate, or unnecessary. The Team accepts the responsibility for those deficiencies in this report.

The team wishes to thank the invaluable assistance and access provided by the Office of the Prime Minister, the National Civil Protection Authority (ANPC), the Institute for Nature Conservation and Forestry (ICNF), and the National Fire Service School (NFSS) which allowed us to do our technical assessment. Our hope and intent is that this report will provide some useful ideas for dealing with the future wildfire challenges Portugal will face.

The U.S. Forest Service, through the U.S. Embassy, looks forward to discussing opportunities for continued engagement with Portugal concerning the observations and recommendations presented in this report.