# REPORT: TRAINING AND CLOSING CONFERENCE

15/9/2014
**Editor:** George Mitri, Ph.D.

## University of Balamand – Koura campus – August 7, 2014

This event was organized by the Biodiversity Program at the Institute of the Environment, University of Balamand, and came within the framework of the project "Towards a better assessment and management of Wildfire Risk in the Wildland-Urban Interface in Lebanon: gaining from the US experience" of the Program Partnerships for Enhanced Engagement in Research (PEER), sponsored by USAID.

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# Report

**AN OVERVIEW OF THE EVENT**

## SUMMARY

The Biodiversity Program at the Institute of the Environment, University of Balamand (BP-IOE-UOB) organized a closing conference of the project "Towards a better assessment and management of wildfire risk in the Wildland-Urban Interface in Lebanon: gaining from the US experience" funded by the US Agency for International Development (USAID) and supported by the Partnerships for Enhanced Engagement in Research (PEER) in agreement with the US National Academies of Science (NAS). The conference was preceded by a training session mainly addressed to wildfire risk managers on the use of the FireLab web-application which is an online interface developed by the research team of the project and aiming at improving wildfire risk decision-making in line with the main objectives of Lebanon's National Strategy for forest fire management (Decision No. 52/2009). Both events took place at the University of Balamand Main Campus – Koura on Thursday August 7, 2014.

The closing conference aimed at presenting the most prominent results and tools of the project in forest fire risk management, and discussing how to take advantage of them at both the local and national levels. First, Dr. Manal Nader, the Director of the Institute of the Environment (IOE) welcomed the participants and exposed the important role of the Institute in advancing wildfire research in Lebanon. Next, Dr. George Mitri, the Director of the Biodiversity Program at the Institute of the Environment (BP-IOE) and the Project's Principal Investigator presented the project's background and explained how studies and researches supporting and promoting the improvement, sharing of expertise, monitoring and dissemination of knowledge on wildfire risk and fire management under a climate change scenario are vastly needed among all relevant actors.

The main results presented in the conference showed that 33% of the Lebanese territory (including forests, shrublands, and grasslands) is characterized by moderate to very high risk of fires, while the average length of the fire season is 147 days knowing that the season can extend up to 200 days in some years. In addition, Lebanon's climate proved to have increasing trends of drought promoting recurrent, larger, and more intense and severe wildfires in the near future, especially with the continuous

lack of efficient forest management plans. According to Dr. Mitri, the project's results and findings are expected to pave the way towards a better assessment and management of wildfire risk in Lebanon, and to contribute to better legislative measures in the forestry sector.

Around 50 participants from different ministries, public agencies, union of municipalities, Non-Governmental Organizations, universities and research centers, and committees of Nature Reserves among others, expressed interest in the main outputs of the project and highlighted different possibilities for use of the project's results within ongoing local and national initiatives. Also, they discussed how the ongoing wildfire research is one of the necessary steps to help in developing the capacity of stakeholders in assessing and adaptively managing wildfire risk in Lebanon.

The conference hosted a photo exhibition on Lebanon's forests and forest fires, and a handbook on wildfire risk management in Lebanon was distributed.

# AGENDA

| Time | Subject |
|---|---|
| 9:30-9:50 | Registration |
| 9:50-10:50 | Training session on the use of FireLab |
| 10:50-11:00 | Closure of the training session and registration to the closing conference |
| 11:00-11:10 | Opening and welcoming speech |
| 11:10-11:30 | Introducing the project, and presenting its background and main activities |
| 11:30-12:00 | Presenting the produced forest fire management maps and tools |
| 12:00-12:15 | Coffee break |
| 12:15-12:45 | Presenting the web-application FireLab for fire risk management |
| 12:45-13:00 | Evaluation and closing |
| 13:00-14:00 | Lunch |

# TRAINING SESSION

## Training overview

The training session was mainly addressed to wildfire risk managers on the use of the FireLab web-application which is an online interface developed by the research team of the project and aiming at improving wildfire risk decision-making in line with the main objectives of Lebanon's National Strategy for forest fire management (Decision No. 52/2009).

The **aim** of the training was to introduce to the participants a tool that enables them to build capacity within their institutions/organizations in improved wildfire risk management. The **objective** of the training was that participants will acquire knowledge and technical understanding on how they can benefit from the FireLab web-application tool.

The outcomes of the training were that at the conclusion of the session participants should be reasonably able to:

- Understand the purpose behind using the FireLab web application tool;
- Identify different aspects related to wildfire risk management at both the village and country levels;
- Generate village and country reports of wildfire risk management statistics.

Participants received a handbook at the beginning of the training that contained relevant information to the FireLab web-application tool. They also received a USB that contained electronic copies of the handbook and relevant pdf maps.

Throughout the training participants received many examples on the use of the different commands of the tool (e.g. the display of information, the generation of pdf reports, the understating of terminologies, etc.).

## Training evaluation

At the end of the session participants were asked to fill in a questionnaire sheet in which they were asked a series of questions regarding their understating of certain content relating to the provided training:

- 100% of participants felt that the training session 1) met its stated objective on acquiring knowledge and technical understanding on how to benefit from the FireLab web-application tool, and 2) was well organized, understandable, and useful.
- 100% found that the developed web-application tool is user-friendly, but some argued that the tool is not easy to use for non-English educated people and they recommended to have the tool available in Arabic language
- The most helpful information of the web-application tool comprised (in order of importance): the generation of country reports, the assessment of overall wildfire risk at cadastral level, the assessment of future wildfire hazard, and the provided glossary.
- 77% of participants claimed that the developed tool is of potential use to their institutions/organizations, and 23% said that the tool could be of potential use to their institutions/organizations. However, all participants agreed that there is a possibility to use the web-application tool in their future work in relation to wildfire risk management.
- The new information/modification that were suggested by the participants to be included in the web-application comprised 1) the subdivision of large areas, place of fire ignition, link with other environmental risks, maps, link to fire response centers and units, and availability of tools for firefighting in each village.
- Some of the recommendations and remarks of the participants included: 1) the update of the trial version of the web-application (including the association of village names with their correct boundaries on the map especially in the case of the Zgharta Kadaa, 2) increase the resolution of maps, 3) continue updating the country reports, 4) add more information/maps/layers (e.g. road networks, and water sources), and 5) include an Arabic version of the web-application).


**Figure 1.** Participants to the training session

## List of participants to the training

*(In alphabetical order)*

| Name / الإسم | Institution / المؤسسة |
|---|---|
| Charbel Hanna | USAID-Lebanon |
| Fadi Matar | Council for Development and Reconstruction |
| Jean Stephan | Food and Agriculture Organization - Lebanon (FAO) |
| Joseph Bechara | Lebanon Reforestation Initiative (LRI) |
| Kamal Abou Assi | Al Shouf Cedar Nature Reserve |
| Karine Zoghby | Disaster Risk Management Unit |
| Lara Samaha | Ministry of Environment |
| Mario Rbeiz | USAID-Lebanon |
| Maya Nehme | Lebanon Reforestation Initiative (LRI) |
| Nabil Salhani | General Directorate of Civil Defense – Ministry of Interior and Municipalities |
| Nour Ezzddine | Lebanon Reforestation Initiative (LRI) |
| Rana El Hajj | Issam Fares Institute/AUB |
| Raymond Khoury | Bentael Nature Reserve |
| Sandra Saba | Horsh Ehden Nature Reserve |
| Suha Serhan | Lebanon Reforestation Initiative (LRI) |
| Tony Chahine | Lebanon Reforestation Initiative (LRI) |
| Youssef Matta | Bentael Nature Reserve |

# CLOSING CONFERENCE

## Conference overview

This conference aimed at 1) offering the most prominent results and tools of the project in the process of forest fire risk management, and 2) discussing how to take advantage of the produced results and tools at both the local and national levels.

The conference started with a welcome note by Dr. Manal Nader, the Director of the Institute of the Environment (IOE), who welcomed the participants and exposed the important role of the Institute in advancing wildfire research in Lebanon.

Then, Dr. George Mitri, the Director BP-IOE-UOB and the Project's Principal Investigator introduced the different activities and achievements of the BP. He highlighted that forest fire and fire risk management is one of the main research lines of the BP-IOE-UOB. As a result, a large number of scientific articles on forest fire research in Lebanon have been published in international journals and conference proceedings. In addition, the BP has established a number of partnerships and collaborations at both the International and National levels (e.g. Ministries, and Non-Governmental Organizations among others) to advance research on wildfire risk assessment and management in Lebanon. As a result of the extensive work of the BP on forest and forest fires, the Program has been engaged in building a large database about the forestry and forest fire sectors in Lebanon. This included: high quality satellite imagery, field data, and maps, among others.

Consequently, the project was introduced and its background and main activities were presented (Annex 1). Dr. Mitri explained how studies and researches supporting and promoting the improvement, sharing of expertise, monitoring and dissemination of knowledge on wildfire risk and fire management under a climate change scenario are vastly needed among all relevant actors.

The main results presented in the conference showed that 33% of the Lebanese territory (including forests, shrublands, and grasslands) is characterized by moderate to very high risk of fires, while the average length of the fire season is 147 days, knowing that the season can extend up to 200 days in

some years. In addition, Lebanon's climate proved to have increasing trends of drought promoting recurrent, larger, and more intense and severe wildfires in the near future, especially with the continuous lack of efficient forest management plans. Also, the FireLab web-application tool was presented to all participants by demonstrating the functionality of its main features and their use for improved decision-making in wildfire risk management in Lebanon.

Also, the presentation of the results highlighted the established collaboration between the Department of Ecosystems at the Ministry of Environment and the BP-IOE-UOB for reporting annual fire statistics from all over Lebanon. The partnership between the IOE-UOB and Lebanon Reforestation Initiative (LRI), a project funded by the United States Agency for International Development (USAID) and implemented by the United States Forest Service (USFS), was also highlighted. Dr. Mitri explained how the project succeeded in pooling various resources for advancing research and building technical knowledge in wildfire risk management in Lebanon. Mr. Joseph Bechara from LRI highlighted the achievements of ongoing collaboration with BP-IOE-UOB and discussed the LRI mapping tool which can easily complements the FireLab web-application tool.

Dr. Mitri concluded that the project's results and findings are expected to pave the way towards a better assessment and management of wildfire risk in Lebanon, and to contribute to better legislative measures in the forestry sector.

The different sessions comprised questions and answers in relation to the various topics of discussion, Around 50 participants from different ministries, public agencies, union of municipalities, Non-Governmental Organizations, universities and research centers, and committees of Nature Reserves among others, expressed interest in the main outputs of the project and highlighted different possibilities for use of the project's results within ongoing local and national initiatives. Also, they discussed how the ongoing wildfire research is one of the necessary steps to help in developing the capacity of stakeholders in assessing and adaptively managing wildfire risk in Lebanon.

**Figure 2.** General view of the closing event

**Figure 3.** Participants to the closing event

## Conference evaluation

At the end of the conference all participants were asked to fill in a questionnaire sheet in which they were asked a series of questions regarding their evaluation of the event:

- Overall, most participants acknowledged the high quality of the conducted work.
- Almost all participants found that the disseminated information during the conference were understandable and useful. However, non-Arabic speakers found some difficulties in fully understating the disseminated information.

- The participants found that the most helpful information/tools for them included (in order of importance): the web-application and maps, the distributed handbook, and the presented new datasets.
- Most information and/or tools from the conference that could be of potential use to the participants included (in order of importance) the web-application tool and the maps, the handbook, the project's website for raising awareness, and the provided statistics on different fire-related aspects.
- According to the participants, the other information and/or tools that should be included in wildfire risk management in Lebanon included: procedure protocols in case of a fire occurrence event, dataset of existing water outlets and sources for fire suppressions, real-time fire monitoring tools, expanded fire statistics in cropland areas, guidelines for post-fire management activities and land restoration, a daily fire risk forecast system, and awareness material for fire prevention.
- The main recommendations of the participants included the need to 1) benefit from conducted research and studies for implementing future projects, 2) expand the collaboration and cooperation network in future forest fire activities, 3) translate the project's website into Arabic language, 4) use the results of the project to elaborate practical recommendations for forest fire prevention at the local and national levels, 5) empower local communities for wildfire risk management, 6) improve accuracy of fire related data, and 7) add to the fire risk map a layer of existing resources and infrastructure for efficient fire response.

## List of participants to the closing conference

*(In alphabetical order)*

| Name / الإسم | Institution / المؤسسة |
|---|---|
| Annette Bejany | Lions Club District 351 |
| Charbel Hanna | USAID-Lebanon |
| Charbel Zgheib | National Council for Scientific Research |
| Fadi Karam | DAI - Lebanon Industry Value Chain Development - LIVCD Project |
| Fadi Matar | Council for Development and Reconstruction |
| George bejany | Lions Club District 351 |
| Hadi Tabbara | Consultant |
| Hassan Harajli | UNDP/CEDRO project |
| Jean Stephan | Food and Agriculture Organization - Lebanon (FAO) |
| Joseph Bechara | Lebanon Reforestation Initiative (LRI) |
| Joyce Bejjani | Lebanon Reforestation Initiative (LRI) |
| Kamal Abou Assi | Al Shouf Cedar Nature Reserve |
| Karine Zoghby | Disaster Risk Management Unit |
| Khalil Al Hajal | Former General Director of Municipalities |
| Lara Samaha | Ministry of Environment |
| Lea Kai | UNDP/Ministry of Environment |
| Manale Abou Dagher | Institute of the Environment – University of Balamand |
| Mario Rbeiz | USAID-Lebanon |
| Maya Nehme | Lebanon Reforestation Initiative (LRI) |
| Nabil Salhani | General Directorate of Civil Defense |

| | |
|---|---|
| Nour Ezzddine | Lebanon Reforestation Initiative (LRI) |
| Peter Mahfouz | University of Balamand |
| Pierre Haddad | Save Energy Plant Trees (SEPT) Organization |
| Qamar Chaouk | University of Balamand |
| Raffaella Sardi | ECO/ARDP Lebanon |
| Ramy Sakr | Saint-Joseph University |
| Rana El Hajj | Issam Fares Institute/American University of Beirut |
| Rana El Zein | Saint-Joseph University |
| Rawan Bahij | University of Balamand |
| Raymond Khoury | Bentael Nature Reserve |
| Richard Paton | Lebanon Reforestation Initiative (LRI) |
| Rim Mikati | University of Balamand |
| Roman Bruder | Association for the Protection of Jabal Moussa (APJM) |
| Sabine Saba | Institute of the Environment – University of Balamand |
| Salam Khalifé | Lebanon Mountain Trail (LMT) |
| Salim Roukoz | Ministry of Agriculture |
| Sandra Fahd | DAI - Lebanon Industry Value Chain Development - LIVCD Project |
| Sandra Saba | Horsh Ehden Nature Reserve |
| Sarah El Jeitani | Saint-Joseph University |
| Shadi Indary | Institute of the Environment – University of Balamand |
| Suha Serhan | Lebanon Reforestation Initiative (LRI) |
| Tony Chahine | Lebanon Reforestation Initiative (LRI) |
| Tony Matar | Lebanese Association for Energy Saving and for Environment (ALMEE) |
| Vahakn Kabakian | UNDP/Ministry of Environment |

| | |
|---|---|
| Victoria Dawalibi | Lebanese University |
| Youssef Matta | Bentael Nature Reserve |
| - | Batroun Union of Municipalities |

# ANNEX 1. PRESENTATIONS OF THE PROJECT BACKGROUND AND ITS MAIN RESULTS

USAID FROM THE AMERICAN PEOPLE

Partnerships for Enhanced Engagement in Research (PEER)

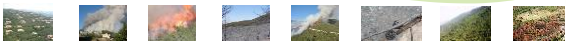
MONTANA STATE UNIVERSITY

"Towards a better assessment and management of wildfire risk in the Wildland-Urban Interface (WUI) in Lebanon: gaining from the US experience" (2012-2014).

## Project's background and main activities

Closing Conference – August 7th, 2014
University of Balamand

George Mitri, *Ph.D.*



## Project's summary info






- ✓ Funded within the framework of Partnerships for Enhanced Engagement in Research (PEER) , sponsored by USAID.
- ✓ Collaboration with the Department of Earth Sciences Montana State University
- ✓ Implementation period: 2012-2014
- ✓ Study area: the entire Lebanese territory

## Project's goals and objectives






**Primary goal of research:**

To improve knowledge and understanding among land managers, university students, local community groups, and municipalities about the nature and risks of wildfire in Lebanon's WUI.

**Main research objectives:**

To investigate the feasibility of developing a wildfire-climate model for Lebanon that simulates the interactions among climate change, expansion of human development into wildland areas, and wildfire risk in the WUI;

**Main educational objectives:**

To develop the capacity of the community of interest to assess and manage wildfire risk in the WUI under alternative climate change and residential development futures;

To incorporate the research results into educational products that increase understanding and knowledge of wildfire risk to the broader community

## Background and rationale of the project (1)






- ✓ Fire is an integral part of the Mediterranean
- ✓ The Mediterranean is an absolutely anthropogenic landscape
- ✓ The physical geography of the Mediterranean renders it an ideal landscape for burning (highly flammable)
- ✓ For thousands of years fire regimes in the Mediterranean have been set directly and indirectly by humans

## Background and rationale of the project (2)

Among the main limitations as per the National Strategy of fire management (No.52/2009):

- ✓ A common database on forest fires is still missing. Data, when it exists, is scattered, non-homogenous and difficult to process.
- ✓ Research on forest fires is weak.
- ✓ The analysis of the actual direct and indirect effects of forest fires is at a very preliminary level,
- ✓ An integrated approach is needed both in forest planning and management of forest fires.
- ✓ Lack of a clear management approach on forest fires issues.
- ✓ Fighting forest fires is in most cases seen as a reaction to a natural catastrophe, independently from the actual root causes and forest management practices.

## Background and rationale of the project (3)

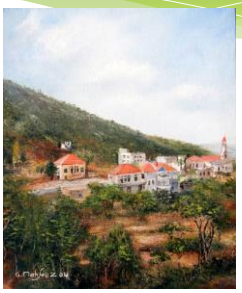
- ✓ Lebanon's National strategy for forest fire management emphasized the need for a shift towards an enhanced capacity of stakeholders in Lebanon to assess and manage wildfire risk in light of future climate change
- ✓ The need for studies and researches to support and promote the improvement, know-how sharing, monitoring and dissemination of knowledge on wildfire risk and fire management under a climate change scenario among all relevant actors.
- ✓ This project is expected to pave the way to a better assessment and management of Wildfire Risk in the Wildland-Urban Interface in Lebanon by benefiting from the US experience and building on what has been achieved elsewhere in this regard.

## Fire danger in Lebanon

- ➢ Between the past and present
- ➢ Increase in fire occurrence and burned areas

## Between the past and present

Change in agricultural habits



ghassanmahfouz.com

- Less wood and shrub collection
- Disappear ance of old paths
- Under-grazing

## Disappearance of traditional agricultural industries

Disappearance of traditional clay production, molasses, silk production

Marginalization of land

Ghazir - circa 1893 - Lebanon

Ghazir surrounding mountains - Present

## Impenetrable thick scrub vegetation

Mitri, G. (2004)

Dense forest fuel

Thick biomass

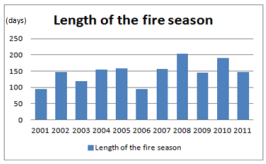
## Average annual precipitation from 200 mm to 1100 mm - Dry season: 7 to 8 months

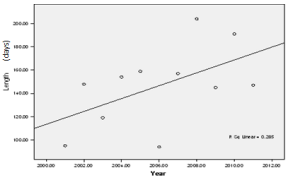
Land cleaning by fires: a direct cause of forest fires

# Increase in fire occurrence and burned areas

- Relatively large scale wildfires affecting Lebanon's forests
- Increase of frequency, intensity and extent of fires

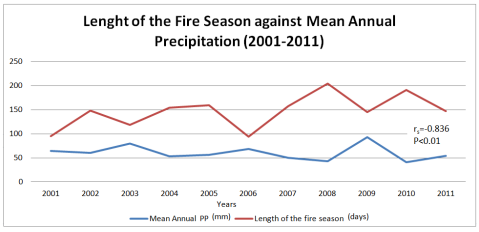
# Trends in fire occurrence




Temporal variation in the length of the fire season (left), and a scatter plot of the variation (right) - (Salloum and Mitri, 2012)

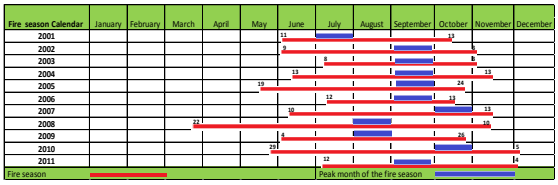
# trends in fire occurrence




Salloum and Mitri 2014

# Fire seasonality

- Average **start date** of the fire season is **June 14,**
- Average **end date** of the fire season is **November 12**
- Length of the fire season has exhibited an increase over the past decade
- Average **peak month** is **September**
- The largest number of fires that took place during a peak month was in October 2007
- The current forest law refers to a fire risk period between July 1 and October 31.
- Time to re-define the dates of the of the fire risk period?




Fire season calendar (Salloum and Mitri, 2012)

## A changing world

The relatively recent increase in forest fires can be attributed to:

1. land-use changes (rural depopulation results in increasing land abandonment and consequently, fuel accumulation, shrub-burning to recover areas for cattle feeding); and
2. climatic warming (which is reducing fuel humidity and increasing fire risk and fire spread)


## Land use changes

Lebanon has experienced:

1. depopulation of rural areas
2. decreases in grazing in different rural areas
3. increases in the urbanization of green areas

These changes in traditional land-use and lifestyles have implied the abandonment of large areas of agricultural land, which has led to the recovery of vegetation and an increase in accumulated fuel.


## Urban sprawl: increased risk in the wildland-Urban Interface

Most recently, there has been an increasing claim for wildland (places where people can live or spend their holidays).

This becomes more obvious near cities and large urban settlements

This situation is generally known as Wildland Urban Interface (WUI).

The WUI is described as the line, area, or zone where structures and other human developments meet or intermingle with undeveloped wildland or vegetative fuels (United States Department of the Interior, 1995).

## Wildland Rural Interface, the agricultural Interface

The agricultural interface can be defined as an interface where farms, crops, and orchard, irrigated or non-irrigated, are exposed to forest fires.


## Weakening of agricultural activities in Lebanon

In the last decades, a weakening of the agricultural activities has been observed.

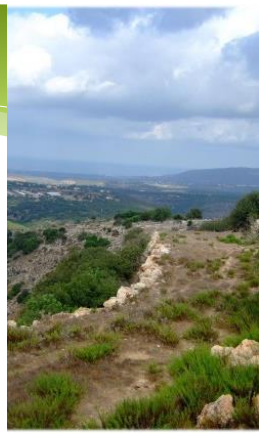
Cultivated lands have been regressed.

Fertile lands have been rapidly overgrown by garrigue.

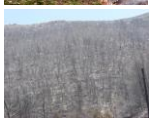
The border of land that had existed between the urban areas and the forest massifs does not exist anymore.

There has been an incessant expansion of the vegetation between both parts.

This has caused a new form of danger which assembles both: the forest fire danger as well as the urban fire danger.



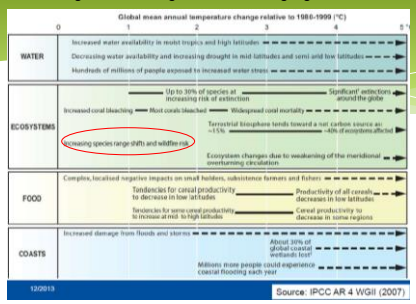
## Large scale and recurrent fires



A serious threat to:

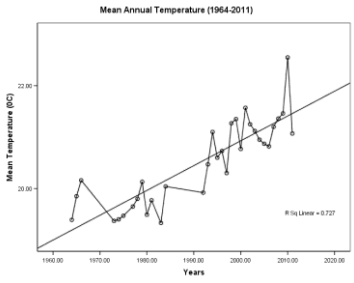
- Human lives
- Private property
- Infrastructure
- Environmental quality
- Natural resources

## Climate change is worsening the situation: highlights from IPCC 2007



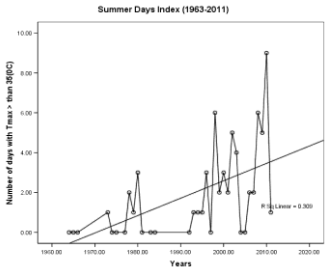

- Extreme event and forest fires
  - Heat weaves / Large scale fires
  - Drought periods / Forest dieback
  - Heavy rainfall / Soil erosion, soil water scarcity & Floods

## Increase in mean annual temperature




(Salloum and Mitri, 2012)

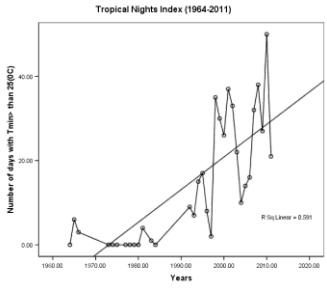
## Increase in Summer Days Index




The Index is defined as the number of days per year when maximum temperature is greater than 35$^0$C

(Salloum and Mitri, 2012)

## Increase in the Tropical Nights Index

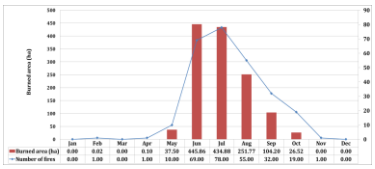



The Index is defined as the number of days per year when minimum temperature is greater than 25$^0$C

(Salloum and Mitri, 2012)


## State of Lebanon's wildfires

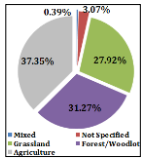
Based on the 2008 and 2009 reports produced within a collaborative framework between the Department of Ecosystems at the Ministry of Environment and the Biodiversity Program at the Institute of the Environment, University of Balamand".

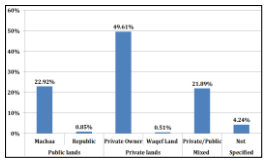



Monthly distribution of fire occurrence and fire affected areas in 2009

# State of Lebanon's wildfires

Based on the 2008 and 2009 reports produced within a collaborative framework between the Department of Ecosystems at the Ministry of Environment and the Biodiversity Program at the Institute of the Environment, University of Balamand".

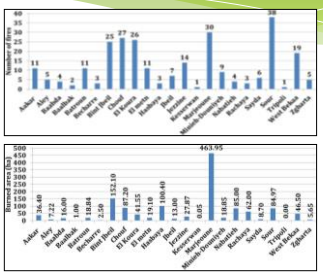



Landuse of fire affected areas (left) and ownership of fire affected areas (right)

# State of Lebanon's wildfires

Based on the 2008 and 2009 reports produced within a collaborative framework between the Department of Ecosystems at the Ministry of Environment and the Biodiversity Program at the Institute of the Environment, University of Balamand".







Distribution by Kadaa of fire occurrence (upper), and burned areas (lower)

# State of Lebanon's wildfires

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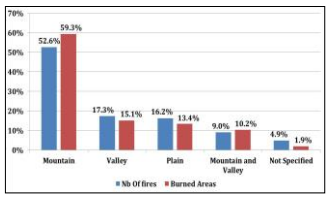


Land type affected by fires

# State of Lebanon's wildfires

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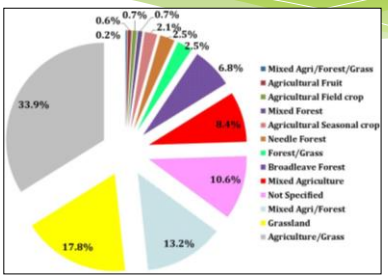


Distribution of fuel type affected by fire

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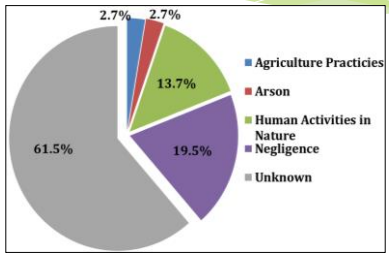


Distribution of main fire causes

# State of Lebanon's wildfires

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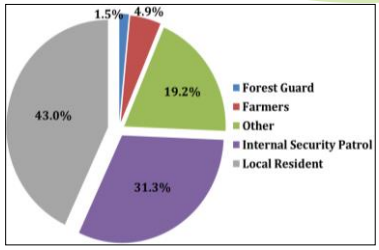
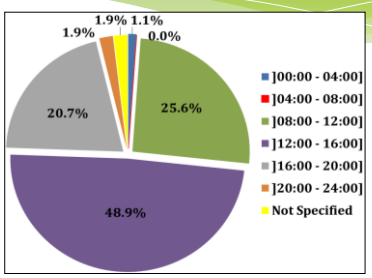



Fire reporting individuals/agencies

# State of Lebanon's wildfires

Based on the 2008 and 2009 reports produced within a collaborative framework between the Department of Ecosystems at the Ministry of Environment and the Biodiversity Program at the Institute of the Environment, University of Balamand".




Distribution of temporal fire occurrence

# State of Lebanon's wildfires

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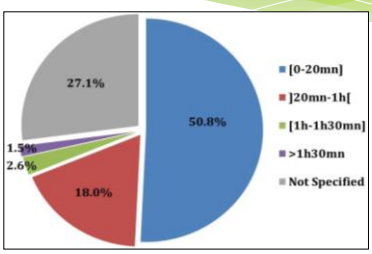


Times for intervention after reporting fires

## State of Lebanon's wildfires

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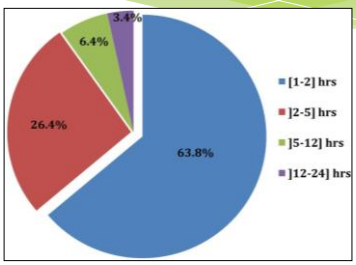
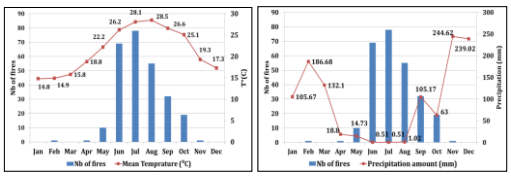



Fire duration

## State of Lebanon's wildfires

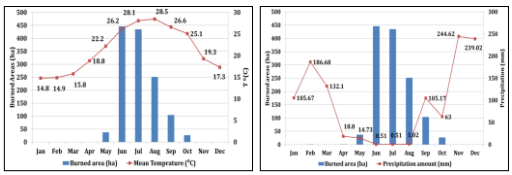
Based on the 2008 and 2009 reports produced within a collaborative framework between the Department of Ecosystems at the Ministry of Environment and the Biodiversity Program at the Institute of the Environment, University of Balamand".




Fire occurrence in function of monthly mean temperature (left) and monthly mean precipitation in 2009 (right)

## State of Lebanon's wildfires

Based on the 2008 and 2009 reports produced within a collaborative framework between the Department of Ecosystems at the Ministry of Environment and the Biodiversity Program at the Institute of the Environment, University of Balamand".




Burned areas in function of monthly mean temperature (left) and monthly mean precipitation in 2009 (right)

## Thank you

Partnerships for Enhanced Engagement in Research (PEER)

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Partnerships for Enhanced Engagement in Research (PEER)

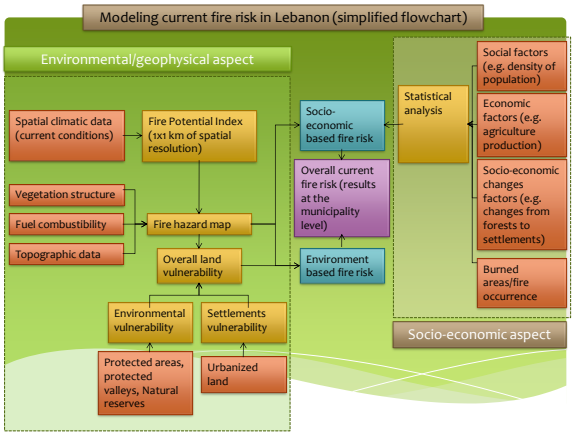
MONTANA STATE UNIVERSITY

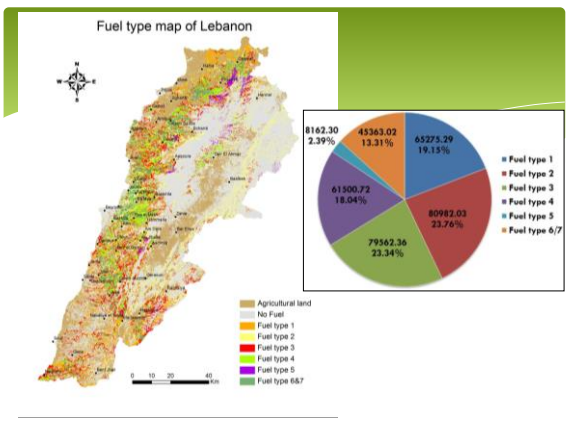
"Towards a better assessment and management of wildfire risk in the Wildland-Urban Interface (WUI) in Lebanon: gaining from the US experience" (2012-2014).

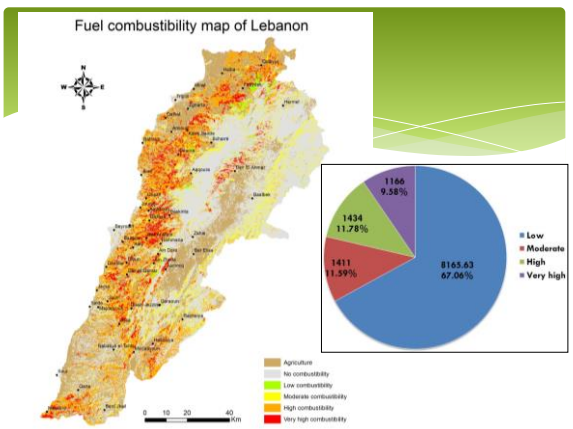
## Project's main results

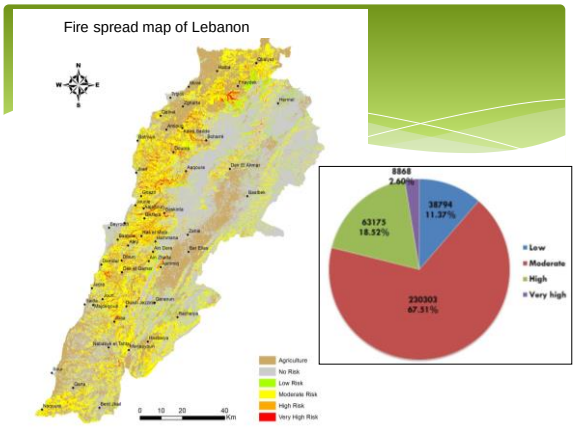
**Closing Conference – August 7th, 2014**
University of Balamand

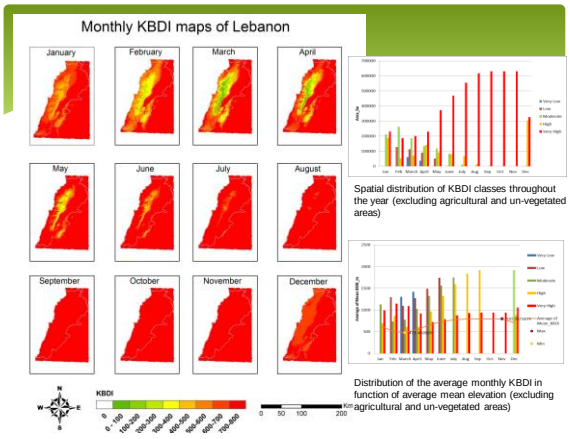
George Mitri, *Ph.D.*



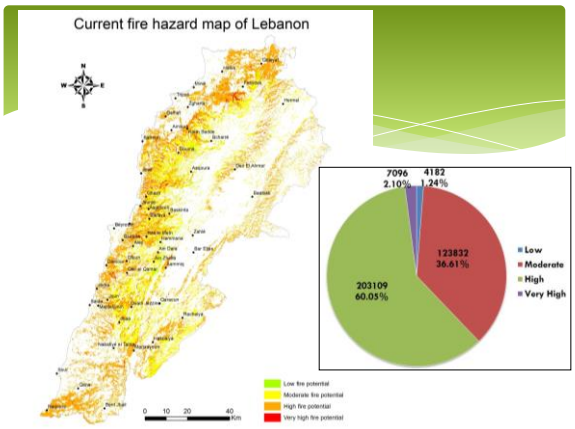



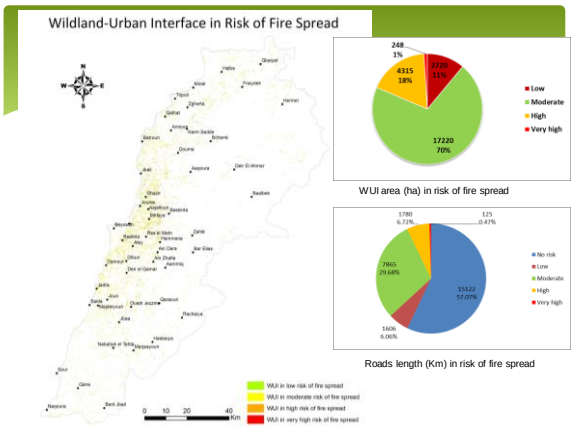



Spatial distribution of KBDI classes throughout the year (excluding agricultural and un-vegetated areas)

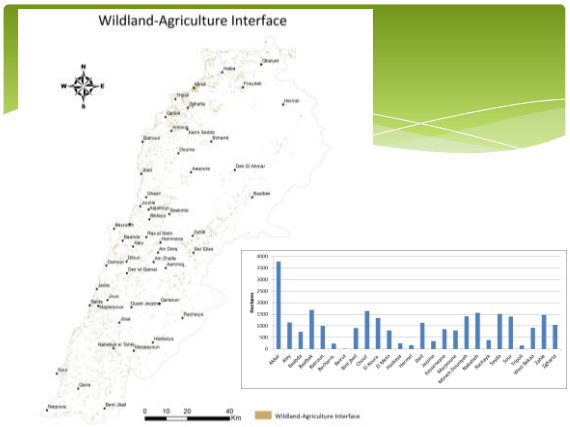
Distribution of the average monthly KBDI in function of average mean elevation (excluding agricultural and un-vegetated areas)

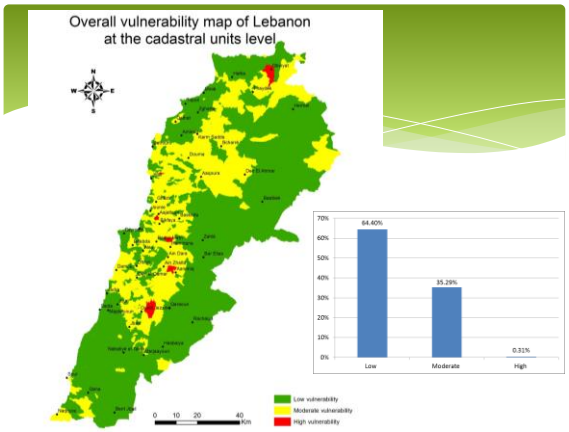


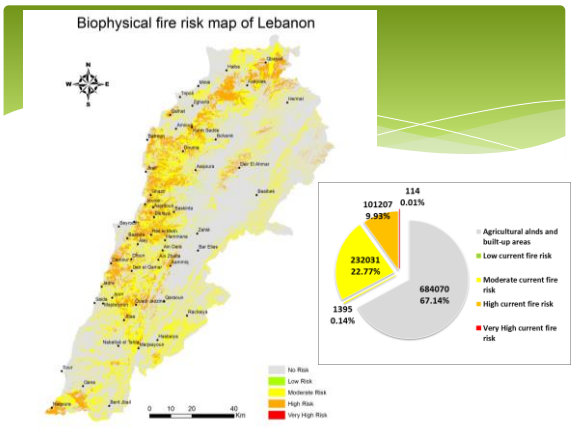



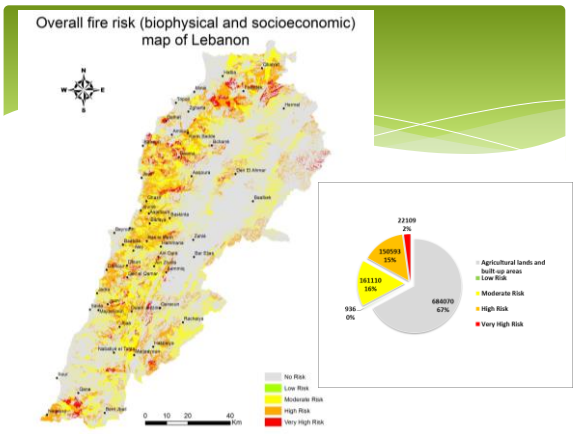

WUI area (ha) in risk of fire spread

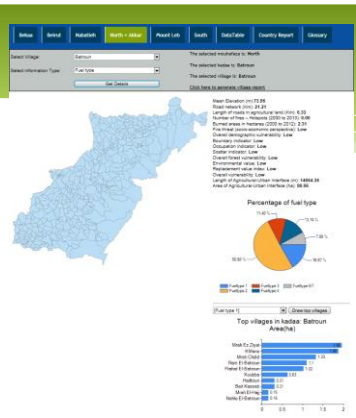
Roads length (Km) in risk of fire spread


Wildland-Agriculture Interface
Wildland-Agriculture Interface


Overall vulnerability map of Lebanon at the cadastral units level
64.40%
35.29%
0.31%
Low
Moderate
High
Low vulnerability
Moderate vulnerability
High vulnerability


Biophysical fire risk map of Lebanon
114
0.01%
101207
9.93%
232031
22.77%
684070
67.14%
1395
0.14%
Agricultural alnds and built-up areas
Low current fire risk
Moderate current fire risk
High current fire risk
Very High current fire risk
No Risk
Low Risk
Moderate Risk
High Risk
Very High Risk

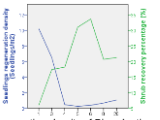

Overall fire risk (biophysical and socioeconomic) map of Lebanon
22109
2%
150593
15%
161110
16%
936
0%
684070
67%
Agricultural lands and built-up areas
Low Risk
Moderate Risk
High Risk
Very High Risk
No Risk
Low Risk
Moderate Risk
High Risk
Very High Risk



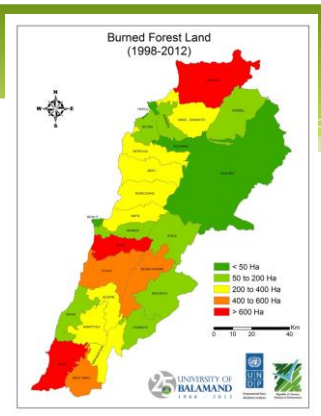

Burned areas 1999-2012

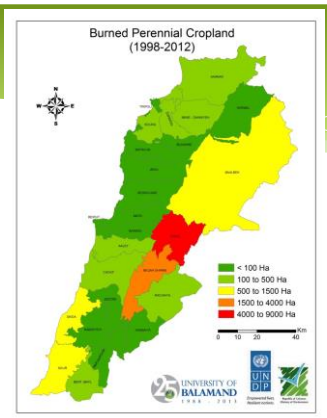
Fire severity assessment

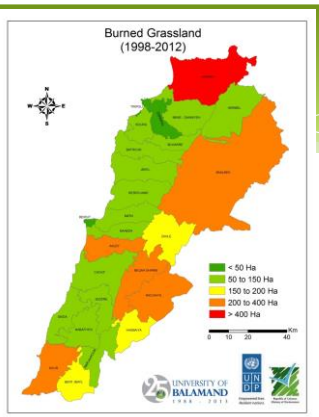
Forest regeneration and vegetation recovery

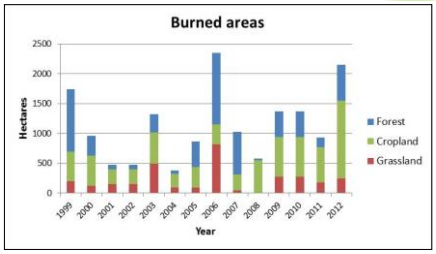


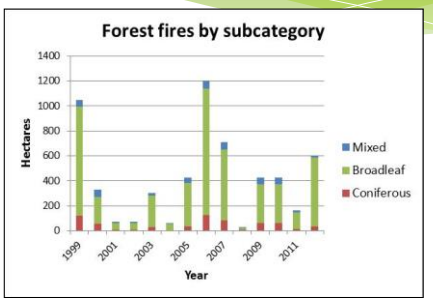
Rate of regeneration density of Pinus brutia seedlings and shrubs recovery after fire

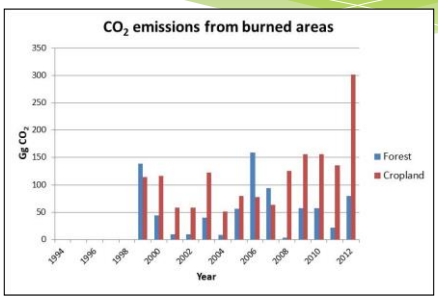


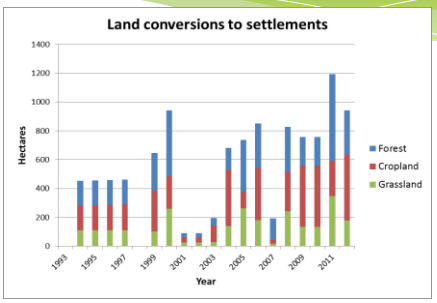



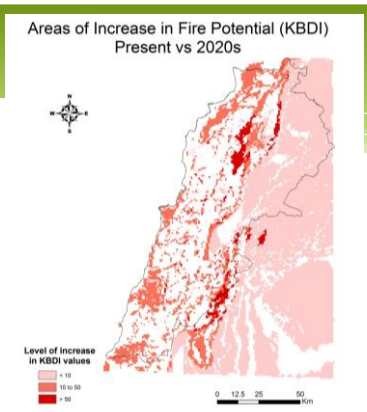

Burned Grassland
(1998-2012)
< 50 Ha
50 to 150 Ha
150 to 200 Ha
200 to 400 Ha
> 400 Ha
0 10 20 40 Km
UNIVERSITY OF BALAMAND


Burned areas
Hectares
2500
2000
1500
1000
500
0
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Year
Forest
Cropland
Grassland


Forest fires by subcategory
Hectares
1400
1200
1000
800
600
400
200
0
1999 2001 2003 2005 2007 2009 2011
Year
Mixed
Broadleaf
Coniferous

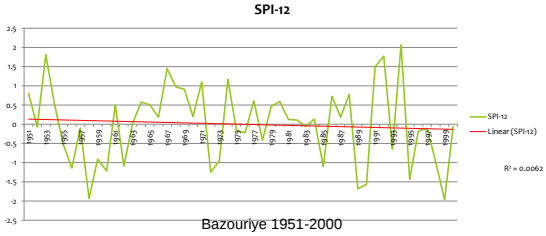

CO2 emissions from burned areas
Gg CO2
350
300
250
200
150
100
50
0
1994 1996 1998 2000 2002 2004 2006 2008 2010 2012
Year
Forest
Cropland




Standard Precipitation Index

| SPI | Index Value | Class |
|---|---|---|
| Non Drought | SPI ≥ 2.00 | Extremely Wet |
| | 1.50 ≤ SPI < 2.00 | Very Wet |
| | 1.00 ≤SPI <1.50 | Moderately Wet |
| | -1.00 ≤ SPI < 1.00 | Near Normal |
| | -1.50 ≤ SPI < -1.00 | Moderate Drought |
| | -2.00 ≤ SPI < -1.50 | Severe Drought |
| | SPI < -2.00 | Extreme Drought |




Bazoulye 1951-2000

# Thank you

Partnerships for Enhanced Engagement in Research (PEER)

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Mireille Jazi, M.Sc.
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## www.balamand.edu.lb/wildfire

Project Reference:
Project: "Towards a better assessment and management of wildfire risk in the Wildland-Urban Interface (WUI) in Lebanon: gaining from the US experience". This project is managed by the Biodiversity Program (BP) at the Institute of the Environment (IOE), the University of Balamand (UOB) and funded by the Agency for International development (USAID) in agreement with the US National Academies of Science (NAS) within the Partnership for Enhanced Engagement in Research (PEER).

*"This document is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Biodiversity Program at the Institute of the Environment and do not necessarily reflect the views of USAID or the United States Government"*

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