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Sabie, Mpumalanga Province, South Africa

Organized and Sponsored by

SILVA Forest Services, Sedgefield, South Africa
The Global Fire Monitoring Center (GFMC)
International Wildfire Preparedness Mechanism (UNISDR – IWPM)
Major Hazard Agreement of the Council of Europe (EUR-OPA)
Fire and Rescue International, Greenstone, South Africa

THE REALITY OF INCREASING WILDFIRES AT A GLOBAL SCALE

As a result of the reality of climate change, unchecked vegetation/fuel accumulation and ignorance of fire-ecological requirements – particularly in the Mediterranean zone-biome – fire hazard levels have now reached alarming proportions in countries of Europe, Africa, the Americas and Australia particularly in the Mediterranean forests, woodlands, shrublands and grasslands. This is including the increased fire hazard levels in introduced, exotic, forestry plantations: Invasive or purposely planted. This also goes hand in hand with a prevailing lack of appreciation and understanding for the underlying causes that have changed the natural and cultural landscapes, resulting in an increase of extremely severe, uncontrollable wildfire disasters.

During the past few years, it was particularly in the Mediterranean zone-biome where wildfires were experienced at levels never observed there before, e.g. in Chile, Portugal in 2017, in South Africa in 2017 and 2018, and in Australia, Greece and the U.S.A. in 2018. However, we identified that these wildfires are also spreading beyond the Mediterranean and subtropical spheres, even in global zones where wildfires were never experienced before.

These wildfires confirmed the ineffectiveness of fuel management and fire prevention measures in many regions. If we are serious in our attempts to make these preventative attempts more effective, some drastic measures will be required to achieve this in the form of applying prescribed fire to construct regional buffer zones and reduce "hotspots" of fuel accumulation to manageable levels. These fire-protective buffer zones should also be placed mainly by means of following continuous lines in the landscape and be wide enough to restrict wildfire spread effectively. Such measures should also meet fire-ecological requirements as far as is practically possible, considering all available options.

We have identified that the increase in wildfires is not restricted to the Mediterranean biomes, as is confirmed by the reports we have been receiving up to this advanced fire-related training event. Closer to home, as early as during 2017/2018, the increase in wildfires has already spread into the area east of the South African Mediterranean biome, from the winter and constant rainfall climatic area into the summer rainfall area, from the Tsitsikamma region of the Eastern Cape Province, as far as the Port Elizabeth region and beyond, into the inland region of the Eastern Cape.

This increase in wildfires clearly points to a need to include extrapolation of the methodology we will cover during the course, to other regions in South Africa and to other countries and continents outside this country. Subsequently, it was already reported that extreme increases in the occurrence and size of disastrous wildfires now also are a problem at Global levels.

Climate change has been identified as a significant contributor to the spiral of increased wildfire events.

OBJECTIVES OF THE ADVANCED TRAINING PROGRAMME IN PRESCRIBED FIRE APPLICATION AND REGIONAL INTEGRATED FIRE PREVENTION

Before discussing these objectives, it is necessary to confirm that we accept that we do not have to re-invent the wheel. Subsequently, we do not have to hold another discussion on the role of controlled fire, as this subject has been receiving attention in numerous International Conferences, Workshops and scientific publications that have seen the light over the past few decades. It is clear that we should rather concentrate on addressing the rapidly growing challenges and need for action. Some important publications to read in this connection are:

- White Paper on Use of Prescribed Fire in Land Management, Nature Conservation and Forestry in Temperate-Boreal Eurasia. Various authors; edited and published by J.G. Goldammer, GFMC, Freiburg, Germany, 2008.
- The work towards Integrated Fire Management – Outcomes of the European Project Fire Paradox: Silva, J.S., Rego, F., Fernandes, P., Rigolot, E. (editors), 2010.

- Vegetation Fires and Global Change – Challenges for concerted International Action. A White Paper directed to the United Nations and International Organizations (A GFMC Publication, edited by J.G. Goldammer), with various author contributions, 2013.

For further reading about the subjects attended to for the course we are recommending the following two book publications:

- Ecological Studies 84. Fire in the Tropical Biota: Ecosystem Processes and Global Challenges. Edited by J. G. Goldammer. A Springer-Verlag Publication, 1990. 497pp.
- Wildland Fire Management Handbook for Sub-Sahara Africa. Edited by Johan G. Goldammer and Cornelis de Ronde. A publication of the Global Fire Monitoring Center (GFMC), Freiburg, Germany. 432 pp.

During the training session we will thus also cordially invite people from other global regions, to share their experiences with South Africans, as trainees and resource managers, to bring active life into international exchange. Subsequently the following will be addressed with this advanced training session:

- The unchecked fuel accumulation occurring and how serious these fuel loadings are. Subsequently, the assessment of such vegetation communities and fuel classification sets should be attended to and included in regional photoseries, developed and tested with the assistance of region-specific custom fuel model sets, fire hazard rating processes and illustrated maps. Such preliminary assessments will then provide prioritised direction for further developing and fire-use processes.[1]
- Developing, planning and structuring of the selected regional fire prevention procedures and protective buffer zones construction will now be the next objective.
- To arrive at, the optimum use, of prescribed burning programs to combat fuel accumulation and wildfire threats, and to develop continuous fire-protective lines and maintain fuel-free strips, with fire-use application areas inside buffer zones constructed.
- Introducing trainees to advanced prescribed fire application in natural- and man-made-, even-aged-, commercial forests: An introduction in specific planning, burning application and result assessment.
- Development of optimum regional fire prevention plans and prescribed burning schedules.
- Incorporation of wildfire areas, weed control programs and regional plan maintenance and incorporation of fire-resistance forests and scrub-forests within regional buffer zones.
- Extrapolation procedures of the above within Mediterranean- and other global- biomes, including the construction of fuel model sets and related programme developments thereof.
- Generally, to optimise the use of prescribed fire in fire dependant vegetation types, including in forests (including introduced exotic tree plantations), shrublands and grasslands.

[1] For the purpose of this course, examples of a region-specific set of photoseries, custom fuel model set and fire hazard rating classification will be provided. Very soon a specialist computer-based course will be presented in South Africa to train regional planning managers (i) in the development of a regional set of photoseries, (ii) provide an introduction in the use of 2-D fire behaviour simulation with BehavePlus, (iii) to develop and test a custom fuel model set, (iv) to develop and test a regional fire hazard rating classification with fire risk adjustments and (v) how to use BehavePlus to calculate the effectiveness of regional buffer zones.

1. THE STUDY AREAS

(A) The coastal area of the W. Cape Province, South Africa, which has now been classified as a "disaster region", situated in the local Mediterranean biome

I also refer here to Annexure A of this document to the key Mediterranean biomes distribution, with biome description summaries.

In the first section of this document I have provided a summary of reasons why the Mediterranean Zone-biome was selected for priority focus for the advanced training programme: All of these Mediterranean biomes suffered from extremely intense, large and difficult-to-control wildfires as never experienced before.

The coastal area of the SW Cape Province region was hit by serious wildfires during 2017 and 2018 and even more wildfires where experienced during January 2019. It is in this region that we have to search urgently for answers. However, the key issue to be urgently discussed soonest will be why "the wheels came off", although we already know this was as a result of a systematic change-over during the past four decades, from selected (but dedicated) controlled fire-use, to complete fire exclusion.

The fynbos shrubland is the main vegetation base here, and these species-rich plant communities are fire dependant in order to maintain their species biodiversity. This was determined over decades of dedicated research in the region. Likewise, the role of fire in other (minor) vegetation communities in this region was also determined, and we will discuss the reasons behind the wrong approaches to this fire-ecological misuse.

The main problem in the SW and S Cape regions is that most vegetation communities are fire dependant, and these fire-ecological requirements are simply not acknowledged. Therefore, the region is basically in a state of complete fire exclusion with out-of-control fuel accumulations.

Also to be addressed with this training programme will be the understanding of the basic solutions to overcome this serious fire exclusion problem in the Cape regions of South Africa, once the basic resistant to fire-use has been overcome by senior management level.

(B) The higher altitude (warm temperate) region of the Mpumalanga Province of South Africa, where the 2007 wildfires resulted in a complete turn-around of the approach to selected fire-use at integrated regional level

The so-called "Middle Veld" of the Sabie-Graskop escarpment region, has a prominent natural montane grassland base, crossed by wetland grassland along depression lines and watersheds, fragments of indigenous forests and scrub-forests, mostly found in the depressions of the Escarpment. Most of these vegetation communities are of a fire-dependant nature. In the grasslands, at higher altitudes (mostly above 1400 m.a.s.l.), a yearly grassland biomass production of 3to 6 tons/ha is the basic norm. Subsequently, grassland requires a 1 to 3 years fire rotation and fire has to be applied once the grassland base has been cured.

This region has been developed in an important commercial timber growing industrial area, planted mostly with exotic *Pinus* spp. These commercial tree plantations originated from fire-dependent origins, where fire exclusion was the norm for these tree stands. This was found to be giving rise to extreme fuel accumulations and subsequent high fire hazard.

To challenge this fire problem effectively, grassland and wetland fire burning programs were effectively supplemented with burning "under Pine tree canopies", and yearly about 1500 to 2000ha of these tree stands are now incorporated in region buffer zones on 2-year rotations. The addition of such prescribed burning programmes, did lead to a significant reduction of wildfires in the region, from the disastrous 2007 when most of the region was

burned over and tens- of thousands of industrial plantations and surrounding land were lost. From 2007 until today, only minor areas were burned over by wildfires.

For the purpose of this training programme, this region has been selected as a suitable example of how the challenge of increase wildfire can best be met.

(C) General

The basic differences between the Cape Mediterranean biome and the Mpumalanga "Escarpment" region can be summarised as follows:

Variable	SW and S Cape Region	Mpumalanga Escarpment Region
Rainfall Season	Winter to constant	Summer
Most prominent natural vegetation base	Fynbos shrubland	Montane Grassland
Fire need for maintenance of biodiversity?	Yes	Yes
Introduction of commercial, exotic trees?	Approximately 10% of land-use	Approximately 40% of land-use
Exotic tree growing spp?	Mainly *Pinus* spp.	*Pinus* and *Eucalyptus* spp.

It should also be noted that the natural vegetation of the region is today as far as possible burned according to fire-ecological requirements, around and within these commercial forest units, within strict nature conservation rules.

The Escarpment region of Mpumalanga has been identified as an area where optimum prescribed burning is applied today to meet the integrated regional fire prevention requirements, based on basic fire ecological principles as well as the need for regional fire protection. This is an ongoing process to maintain this important momentum, and fire managers are still thriving for improvement.

A comprehensive course handbook will be available for the participants to the course, which will include some very important references for further reading, which will highlight the substantial publication base available.

2. SUMMARY OF THE TRAINING PROGRAMME TO BE COVERED

(i) Assessing the local and international wildfire disaster status

- The South African and Global wildfire disasters recorded in the Mediterranean biomes during the past three years.
- Comparing the Western Cape and Mpumalanga regions.
- Trainees: Report back about the fire-status in their particular countries.

(ii) Basic principles of fuel- and related fire-dynamics

- Vegetation and fuel characteristics.
- Looking at fire-related dynamics.
- Construction and maintenance of regional fire prevention buffer zones
- Using fire hazard maps for top-down decision-making
- Making use of photoseries, custom fuel model sets and related computer-based tools.

(iii) Specialised fire application matters

- Optimum use of prescribed fire: formulating burning treatments rotations, application responsibilities and training requirements.
- Incorporating specific land-uses and fuel management measures
- Calculating effectiveness and minimum buffer zone specifications, options and management.
- Presenting an introduction to the State of the Art of under-canopy burning application.
- Incorporation of land exposed to wildfires into future integrated regional fire prevention plans.

(iv) Creating an Integrated Fire Prevention (IFP) base, including mapping of recent wildfires within such a region

- Planning integrated fire prevention (IFP) and incorporating recent wildfire areas, over time.
- Creating a regional vegetation-, photoseries- and fuel model base.
- Calculation and mapping a regional fire hazard classification with risk adjustments.
- Updating and maintenance of regional IFP plans.

(v) How to assess and structure regional fire and related weed protection systems

- This requires a "top-down approach", particularly with the assistance of satellite images, remote sensing and regional classification of within-region exotic weed assessment and mapping.
- Once the above assessments have been completed to formulate an action plan to tackle the identified weed problems, also with selection controlled burning
- To create and update yearly weed eradication action plans with the use of fire-use programs, clearly prioritised and updated yearly.
- Integration of fuel management practises into Regional Integrated Programs (such as montane grassland burning for grazing purposes), fire application within agricultural lands, fire-use for forestry operations and related fuel reduction (such as slash burning) also for nature conservation purposes, such as rotational wetland burning.
- Integrating the above burned areas in fire prevention systems.

(vi) ***Determining IFP priorities***

- How to apply such processes, one has to use the IFP structures on the dangerous wind side first under "no wind conditions", and then to main internal buffer zones, dangerous public roads etc. starting with the highest priorities.
- Working out separate priorities for different prescribed burning seasons, such as for under canopy burning (inside even-aged and natural tree stands), savanna, montane and wetland-grasslands.
- Identification and prescribed burning application of "hot-spot" areas (identified earlier) first, to safeguard most dangerous areas before the dangerous fire seasons begins.
- After recent extremely intense, large and difficult-to-control wildfires, to identify (a) the most dangerous remaining areas within and bordering such wildfire areas, and (b) provisionally determine most IFP program priorities when ready for prescribed burning application.

(vii) Creation of effective regional buffer zoning as well as how to apply prescribed fire according to regional priorities

- Regardless the above guidelines, prescribed burning must be applied to (a) create continuous protective buffer zones in the landscape effectively and systematically, and (b) to ensure that the most dangerous wind directions are best treated with fire first covering the within-buffer zone areas.

- Ensure that every suitable burning day is utilised to the full, working along a prepared fire-use priority list.
- Where property owners are responsible for buffer zone creation and fuel management maintenance, the owner(s) involved should regularly check with other property owners to ensure priority buffer zones are "operational" soonest.
- Ensure that the local authorities are also doing their part where they also have a regional task in this programme allocated. Where they are in control of buffer zones or part thereof, they must ensure that they lead by example.

3. FOLLOW-UP SPECIALIST TRAINING REQUIREMENTS

While this fire management course has been planned for 16–20 September 2019, two more follow-up courses have been planned for 2019 and 2020, namely:

- A computer-based "hands-on" course in the basic use of the 2-D BehavePlus fire behaviour prediction program to develop and test custom fuel model sets for a number of purposes, including the provision for suitable management resources.
- A specialist regional fire management course to work towards an effective regional integrated fire prevention plan with effective maintenance programs.
- Where required, to provide practical training in prescribed burning for instructors for a range of region-specific burning requirements in region-specific vegetation types ("training the trainers").

3. LOGISTICS

Arrival and accommodation:
The Lodge (with Conference facilities for the presentation of this course) is situated along the scenic Sabie River, in the attractive tourism center of Sabie. This is only 1.5 hours drive from Sabie to the world-famous Kruger National Park, and about one hour's drive from the Kruger Mpumalanga International Airport close to Mbombela (old name Nelspruit), to Sabie.

I have arranged accommodation and Conference facilities in a beautiful lodge, named "Ligna Lodge" in Sabie, with excellent conference facilities (see website www.lignalodge.co.za). For local participants requiring no accommodation for the course period, they can come to the Lodge to participate on the 16th of September 2019, where registration will take place between 08h30 and 09h00. The participants of the course should contact me at either my cell phone (+27 (0)825500430), or email (nderonde@dorea.co.za), to advise me of their intention to attend and register (at nderonde@dorea.co.za) latest 31st July 2019, so that I can advise Ligna Lodge management accordingly to ensure that they are advised in time, as the number of rooms and Conference facilities for the course is restricted. Early notice in this regard will be appreciated as this will make it possible to plan events more accurately.

Participants are also welcome to bring partners along not participating in the course proceedings, and if required, they can be assisted by the Lodge staff at the reception desk to visit scenic sites in and around the Sabie and Graskop area.

For those who want to rent their own car transport, they are welcome to do so at the KMI airport where all major rent-a-car companies are having offices (such as AVIS, Budget, Imperial and others). I suggest that the preferred company should be contacted through their website, to arrange such bookings early.

All participants requiring accommodation please do so through the Ligna Lodge web. To secure these bookings, quote "FIRECOURSE" under "comments", also to qualify for the reduced tariffs applicable, including the deposit for the registration fee and accommodation (DBB). Also please advise me of your intentions, latest 31st of July 2019 (earlier if possible).

The following fees for accommodation are applicable for the Ligna Lodge:

Type of accommodation required per day	**Fixed cost per day (SA Rand)**	**Est. total costs per day €***	**Est. total costs per day US$***
Per person sharing per day DBB**	R 920-00	€ 59-00	$ 66-00
Per room (single) per day DBB**	R 1050-00	€ 67-00	$ 75-00

*=The exchange rate as at 13 Febr. 2019, is one US$ = R 13-98, and one € = R 15-65.
**= Dinner Bed and Breakfast (also see further in text).

Course participants are responsible for their own accommodation reservations, booking and payments through the www.lignalodge.co.za website.

Alternative accommodation is available in Sabie and participants are welcome to explore websites should they wish to do so. The Course will be held at the Ligna Lodge, which is the most convenient for the course and where we negotiated special tariffs. Transport to and from the Ligna Lodge will then be at the participants' own responsibility.

Travel and other arrangements:
In most cases international participants will be arriving at Johannesburg (OR Tambo International airport) from their home destinations, Sunday 15 Sept. 2019, and then take a domestic flight the same day from JHG to Kruger Mpumalanga International airport (KMI) near Nelspruit (now called Mbombela) with the last flight 18h25 to arrive 19h20. There will be a shuttle from the Lodge to transport the participants to the Ligna Lodge in Sabie.

The course will start Monday 16th Sept. 2019 and will run over 4.5 days, ending Friday the 20th of Sept. 2019, at 12h00. Depending on when their returning international flight will leave from JHG, they will then leave either the evening of the 20th or morning of the 21st from KMI to JHG.

The Lodge shuttle will again provide tpt to KMI. The present costs to fly from JHG to KMI and back (return) is R 3272-00 (US$ 234-00, € 209-00).

Participants to the course are also welcome to stay longer in South Africa, as the Mpumalanga Province is a haven for tourists, particularly with the famous Kruger National Park nearby. The Ligna Lodge staff will assist participants with pleasure if assistance for this has to be arranged.

Other costs (Registration and Course fees) per person for 4.5 days:

Course attendance expenses:

(a) Costs of attendance pp pd = R400-00 (including fees for refreshments, tea, coffee as well as lunch), thus for 4 days, R 1600-00 (US$ 114-00, € 102-00).
(b) Registration fee (including the fee for course presentations, course material and handbooks pp pd) R 3100-00 (US$ 221-00, € 198-00).

Total cost for Conference pp R 4700-00 (US$ 336-00, € 300-00)*. A deposit will be required before the 31st of July 2019, to secure your Course attendance.

*=Transport costs for the field day (Morning of the 20th Sept. 2019) is still not known, and a small fee for this might have to be added to the total registration fee.

The outstanding registration and conference fees will be payable to the Ligna Lodge Monday 16th of Sept. 2019, between 08h00 and 09h00 at reception, during the registration session.

Detailed course program:
This program will be made available later announcements.
So far the first four days (16 – 19 Sept) will be lecturing and discussions based on the summary training program as provided above under par. 2.

Monday 16 Sept. will start with registration (08h30 – 09h00) and then opening presentations (09h00 to 10h00).

Tuesday 17 to Thursday 19 Sept. will be spent on full time lecturing and discussions.
Friday 20 Sept. (08h00 – 12h00) we will be visiting prescribed burning sites near Graskop and Sabie. Thereafter participants will be leaving for home.

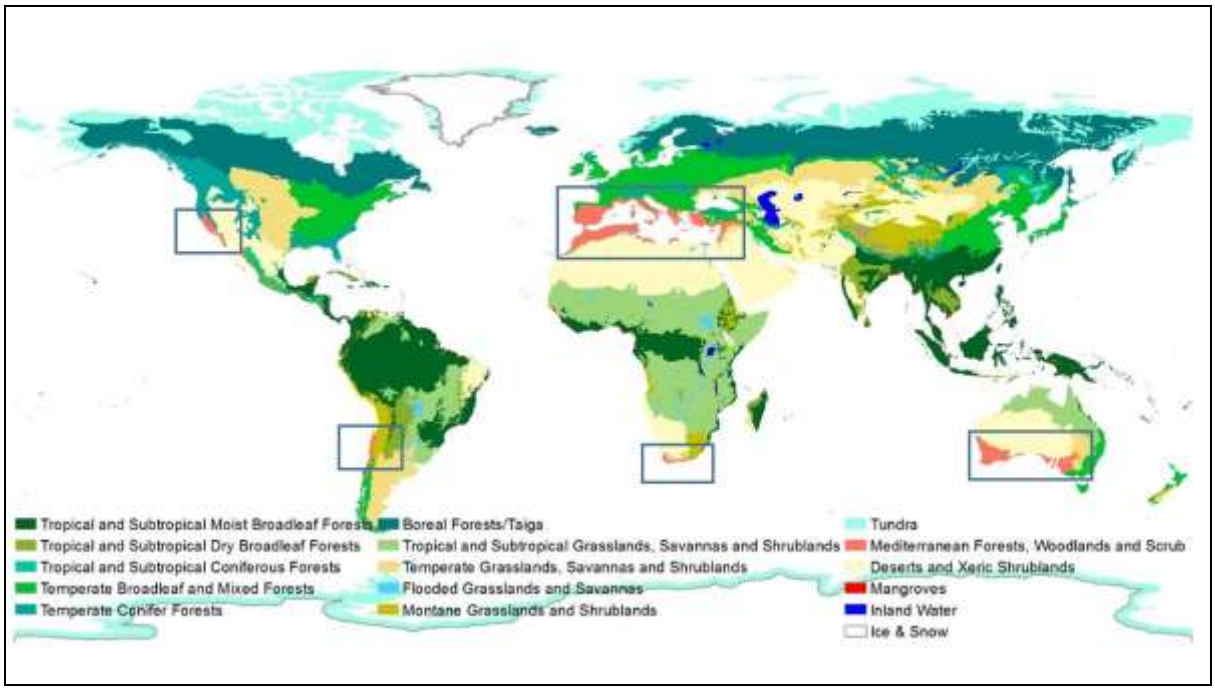
I am looking forward to meet you all.

Sedgefield, 18 Febr. 2019

Neels de Ronde

ANNEXURE A

MEDITERRANEAN BIOMES: CHARACTERISTICS AND THE ROLE OF FIRE



Changing fire regimes are observed throughout the Mediterranean Zone Biomes in Europe, Africa, the Americas and Australia.

South Africa

This biome is prominently covered by a fire-prone shrubland (fynbos) in the mountains and along the south-western and southern coast, of the Western Cape Province of South Africa. These areas are species-rich, unique, floristic vegetation communities, where fire plays a vitally-important role in the maintenance of biodiversity. Its species richness (> 8000 species) contributed to describing the biome as a separate (though smallest) plant kingdom.

Two smaller biomes where identified as minor fynbos sub-biomes, which are (i) Renosterveld on the (mostly) sandy soils of the drier climate, and (ii) Strandveld along the coast, having more fire-avoiding species in its floristic composition. The fynbos shrubland biome was then also the dominating vegetation in the SW Cape Province of South Africa, where the worst wildfires (2017 and 2018) were experienced.

On the plateau of the Garden Route region, commercial even-aged Pine forests - in a mixture with low profile scrub forest and fynbos shrubland – also contributed significantly to the land burned over by the 2017 and 2018 wildfires.

Natural montane and coastal forests can be regarded as the second-most important vegetation community of the region. The montane (high) forests are not fire-dependent, although the scrub-forests growing on the drier sites, experience some patchy fires at times.

Chile

Mediterranean type of vegetation can be found in Central Chile, where it is mainly found in the form of evergreen vegetation, which is mostly non-fire dependent. Examples such as *Nothofagus* forests also fall in his group. However, most of the land in Central Chile has today been established as commercial Pine forests, which originated from the USA, and are fire-dependent. The latter main

species planted in Chile, was *Pinus radiata* causing the most damaging wildfires in Chile during e.g. 2017.

Western and S-Central Australia

The Mediterranean biome in this region is falling within the *eremian* vegetation zone, mostly with a natural *Eucalyptus* forest cover, which is fire-dependent. Some commercial *Pinus* trees also form a significant source of wildfires, where fuel is many time allowed to accumulate uncontrolled. Most of the natural vegetation cover in this biome was cleared for agricultural purposes, only leaving behind the remnant natural vegetation on infertile or inaccessible localities.

The arid areas in these regions are mostly covered by shrub savannas and tussock grassland, both fire-dependent, and both thus needing fire to maintain biodiversity. However, for relatively long periods of time, their slow biomass increase on these poor soils was the main reason, why such accumulations sometimes go unchecked. Subsequently, it is in particular the native *Eucalyptus* forests (with other natural vegetation remnants) which normally suffered an historic lack of fire-use to check fuel levels, that caused most fuel to contribute substantially to recent wildfires, such as during 2018.

Western California

Chaparral shrubland is most commonly found along the western coast of this region, where its disturbance by humans – notably by fire exclusion – caused most of the extreme wildfires experienced recently, as the shrublands and forests there are also fire-dependent to maintain species biodiversity. Both Chaparral shrubland and natural forests caused very serious wildfires during the past few years. A further contributing factor leading to the extreme wildfires experienced was the unchecked Urban-Interface status within fast-growing residential areas.

Regarding fire hazard levels, fire-use was mostly excluded from the Chaparral shrubland which increased fire hazard levels uncontrollably. Subsequently, this fire exclusion was the main cause for the increases in extreme fire hazard levels and number of homesteads burned down.

The Mediterranean Basin

Generally speaking, the whole landscape within and around the Mediterranean Sea, has many types of natural shrublands which are all fire-dependent, such as *arbustos* (Portugal), *tomillaris* (Spain), *garrigue* and *maquis* in France, *macchia* and *orgariga* in Italy and *phregana* in Greece.These characteristic shrubland-types normally occur in a mosaic with natural *Pinus* forests, mostly growing in their natural habitat-origin with both the shrubland and forests being fire-dependent to maintain biodiversity.

Exotic *Eucalyptus* was established in some Mediterranean countries, such as in Portugal. However, these stands were not properly thinned and cleared from excess forest floor material under the mature trees, and clear felling slash was not prescribed burned either. The unchecked species fuel loading subsequently caused some extreme wildfires, with serious loss of lives and properties, where this introduced “exotic weed” now spread uncontrolled in some regions.

Overgrazing (or lack thereof), can both be regarded as contributing factors to the status of grassland loading and curing status, as it is today. The degree of bush encroachment also increased with grazing absence, which is normally indirectly caused by population shifts as a result of changes in the socio-economic conditions. This decrease in population densities in rural areas correlated adversely in a number of countries within the Mediterranean basin.