Forest fire probability mapping in Serbia using logistic regression

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Forest protection system against fire in Serbia needs:

- Forest fire danger rating system
- Early detection of forest fire
- Rapid response
- Restoration of the burned area
Forest danger rating system—Why?

Allocation of resources

Intense observation

Early detection

Reduction in burned area
Early detection of forest fire - Why?

- Rapid response
- Reduction in burned area
Rapid response - Why?

- distance to the settlement
- distance to industrial facilities
- distance to roads
- distance to water intake

Information system
Restoration of the burned area - Why?

Multi risks!

Forest fire → Insect outbreaks → Deforestation → Torrent → Floods
Wildland Fire Danger Rating and Early Warning Systems

William J. de Groot
Natural Resources Canada – Canadian Forest Service, Sault Ste. Marie, ON, Canada

B. Michael Wotton
Faculty of Forestry, University of Toronto, Toronto, ON, Canada

Michael D. Flannigan
Dept. of Renewable Resources, University of Alberta, Edmonton, AB, Canada
TABLE 11.1 Characteristics of Common Weather-Based Fire Danger Rating Systems and Indexes

<table>
<thead>
<tr>
<th>Fire Danger System or Index</th>
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<th>Application Locations</th>
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Why FWI!?

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<th>Precipitation quantity in the past 24 hours (mm)</th>
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<th>DMC</th>
<th>DC</th>
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Data updated: 13:35 07.11.2017

FFMC - Fine Fuel Moisture Code
DMC - Duff Moisture Code
DC - Drought Code
ISI - Initial Spread Index
BUI - Buildup Index
FWI - Fire Weather Index

More information.

- Very Low and Low.
- Moderate.

Bačka: Moderate
Banat: Moderate
Srem: Low
Beograd: Low
Zapadna Srbija: Low
Šumadija: Low
Pomoravlje: Low
Istočna Srbija: Very Low
Jugoistočna Srbija: Moderate
Jugozapadna Srbija: Low
Kosovo and Metohija: Moderate

Click here for more information.
Retrospective analysis of forest fire in Serbia

- Historical data (Location & Dates)
- Calculation of all FWI components for 25 weather station
- Creation of maps for each FWI component and each fire day
- Collection of interpolated data about each fire event from the maps

Generating of topographic data for each fire event:
1. aspect
2. altitude
3. inclination

Generating of data vegetation type:
1. Broad-leaved
2. conifers
3. mixed
4. shrubs
5. Pastures, etc

Generating of data about the anthropogenic effect:
1. Distance to road
2. Distance to settlement
3. Population density
4. Distance to arable land, etc

Database about the forest fire
# Regional statistics

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<th>Belgrade</th>
<th>Šumadija and western Serbia</th>
<th>Southern and Eastern Serbia</th>
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<td>Type of forest fire</td>
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### Regional statistics

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Digital elevation model with a resolution of 3 ArcSEC
Raster of aspects
Raster of inclination
FWI raster of interpolated data using method of Kriging
Prediction model

**Matching criteria:**
1. 5 years average FWI

**Matching method:** Propensity score matching

**Tested variables that contribute to the fire occurrence:**
1. Distance to road
2. Population density
3. Distance to settlement
4. Aspect (exposition)
5. Average altitude

**Prediction accuracy**
75.0%

*Forest fire occurrence probability map*
Thank you for your attention!
Flammability (Xanthopoulos et al. 2012)

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Forest fire occurrence probability

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Legenda

- Granica šumskih područja

Verovatnoća ugroženosti od požara

- Veoma mala
- Mala
- Umerena
- Velika
- Veoma velika

SCALE
0 - 60 kilometara
Legenda

- Granica šumskih područja

Verovatnoća ugroženosti od požara
- Veoma mala
- Mala
- Umerena
- Velika
- Veoma velika

0 15 30 60 kilometara
Calibration and risk assessment in other countries
nivo rizika na osnovu FWI

- nizak
- umeren
- visok
- vrlo visok
- ekstremalan

Klasa Požara
- <1 ha
- 1-2 ha
- 2-5 ha
- 5-10 ha
- 10-20 ha
- 20-50 ha
- 50-500 ha
- >500 ha

kalendarska godina
Legenda

- Kamere
- Šume - Vidljivo
- Šume - Nevidljivo
- Putanje drona
Konceptualna šema prikupljanja i dobrade podataka o vremenskim uslovima i FWI sa komponentama