Post-fire variation of coarse woody debris in oak-pine Mediterranean forest

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Woody debris (WD) → Great Ecological Importance

- Ecosystem biodiversity
- Wood productivity

Mediterranean ecosystem

- Oak-pine matoral and forest
- Structured by disturbance
- Fire = most important disturbance
- Fire recurrence = 70 years (mouillot & al, 2004)
Problematic

Dynamics of WD in a oak-pine Mediterranean forest ?

Role in disturbance frequency ?

**Hypothesis**:

Woody debris load should be dependant on the dynamics of abundant early sucessional tree species
Hypothesis

Woody debris load should be dependant on the dynamics of abundant early successional tree species

- WD load varying with leaving biomass of pine
- Data of biomass and necromass
- Short life of Aleppo pine (senescence after 100 years without disturbance)
- Chronosequence > 100 years

Method: several plots with varying time since last disturbance

- Increasing of WD load with increasing pine mortality
Study area

- South of France
- Meso-mediterranean
- Pine-Oak forest
Study area

- Only biomass data
- Biomass and necromass
Dendrochronology used to estimate age structure of pine population

Assumption: Oldest cohort of pines = date of the last disturbance

High regeneration of Pinus halepensis after fire
Sampling design

Each plot = 1 ha, 10 subplots of 100m$^2$

Line intersect method for fine WD
(Adapted from Van Wagner 1982)

Tree biomass (m$^2$.ha$^{-1}$)

Large WD (m$^3$.ha$^{-1}$) + 5 decay classes
(sollins 1982)

10m

Each plot = 1 ha,
10 subplots of 100m$^2$
Sampling Method

- Measurement of large logs and snags
- Measurement of WD
Results
Intermediate plots < oldest plot
(test post hoc)

Differences between ages
(Kruskal test, P < 0.05)

Total Woody debris

Load (m³.ha⁻¹)

Time since last disturbance

50 70 85 95 130
Fine Woody debris

Trend = Increasing

No significant difference

Trend = Increasing
Large Woody debris

Differences between ages (Kruskal test, P < 0.05)

Intermediate plots < oldest plot (test post hoc)

Load (m³.ha⁻¹)

Time since last disturbance
Increasing variability of WD load

Heterogeneity of ecosystem increasing with time without fire
What about Aleppo pine biomass dynamics?
High stem number about 25 years after disturbance

Follow high mortality

Increasing WD load

Decline of Pine after 80 years

Increasing WD in old plots
Decline of pine in old plots replaced by oak.

From 80 years after fire

Senescence of pine Responsible for load of high WD
Conclusion

25 years
High pine recruitment
Tree biomass = pine

High load of WD by pine competition

50 years
Decaying = Decreasing WD

80 years
High load of WD by pine senescence
Tree biomass = oak

130 years

WD dependant to Pinus halepensis dynamics
Conclusion / Perspectives

• WD dependant on the dynamics of short living tree (Aleppo pine)
• Risk of fire ~ load of WD (Shang 2004)
• Increasing risk of fire after 100 years
  – Great load of WD
  – Great level of decay

Sampling WD on younger plots (2 to 30 years old)
Thanks for your attention

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