

An «Extremes» perspective on AIM

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Introduction

- I speak both as program leader of «Extremes» and as ecological modeler/analyst.
- I refer often to NFI (LFI), but also a bit to the other inventory schemes such as LTFER (LWF).
- I do not say much about “variables to measure”, rather on the design of measurements...

Am I interested in AIM, and why?

- Yes of course 😊!
- ...and why?:
- Simply because an improved AIM will hopefully:
 - still deliver of well-sampled (designed) and accurate information on forest status and trends for analysis and modelling
 - allow for better assessment of the processes behind forest growth, regeneration and mortality
 - allow for better assessment of impacts at the scale of events (not at the scale of long-term trends only).
 - enhance the interaction of LFI and LWF as powerful monitoring programs

What is needed to assess the impact of extremes?

Dead pine trees, VS



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Forest fires, California

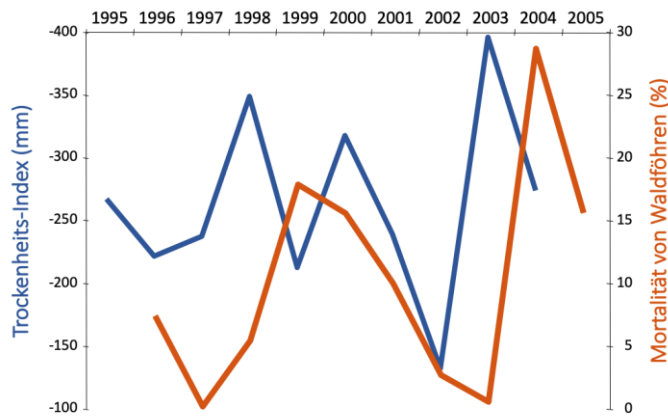


photo.sf.co.ua

Bark beetle outbreak, Harz, DE



dpa, www.sueddeutsche.de



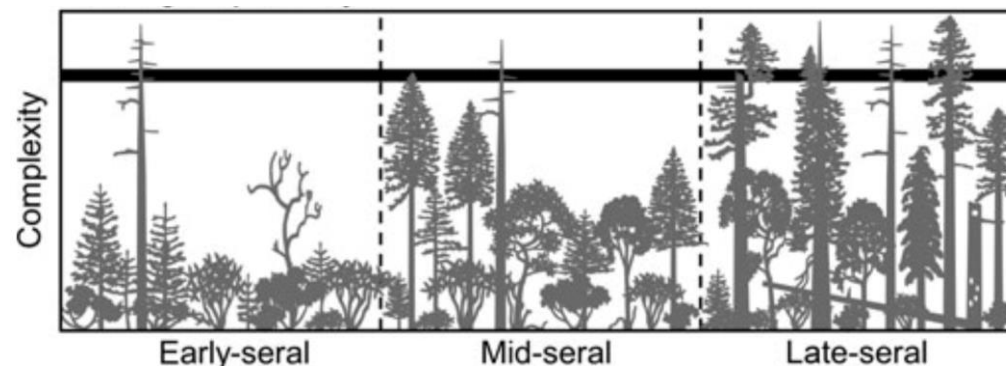
Rigling et al., 2013

Assessing impacts of extremes requires

- Annual or intra-annual measurements...
 - ... at sufficient spatial density that are
 - ... ecologically well stratified across Switzerland
- Better representation of regeneration and mortality
 - Sufficient sampling density (timing of events is known)
 - Sufficient representation of ecological gradients
- Some analyses are with space as focus, but many analyses are done in environmental space:
 - how do forests respond to events along ecological gradients
 - In what environments does an extreme event affect forests,
 - etc.

Key questions

- How do forest trees **grow, regenerate, and die** in response to contemporary and (extremely) changing environmental conditions.
- How do **forest ecosystems** change in their **composition** and in their interactive **processes** respond to environmental (and social) drivers in different environments (locations?) of Switzerland...
- Where in Switzerland will we expect what changes in response to **ongoing environmental and social changes**.
- etc.



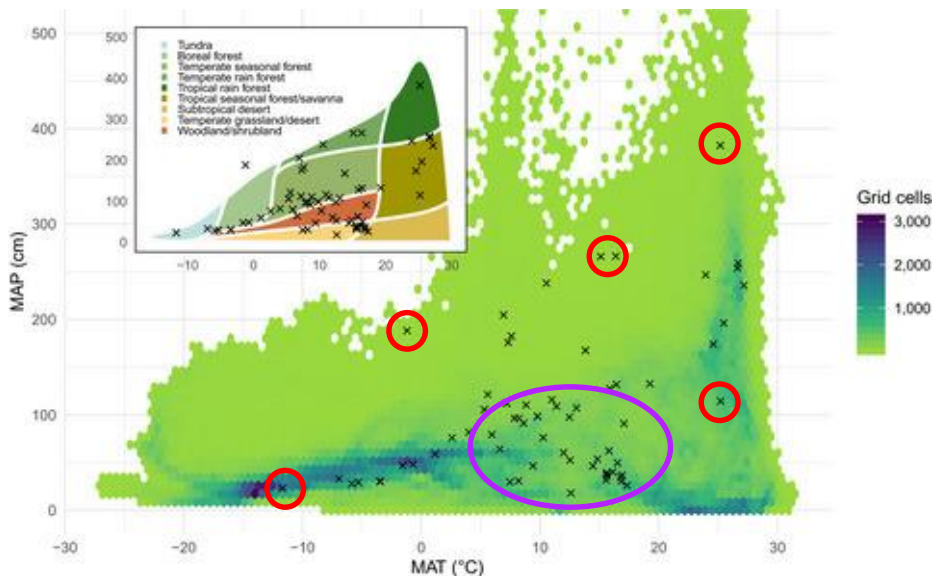
Donato et al. 2011

Important consequence

- The design of LFI represent geographic space, not environmental space, although many (most) analyses refer to environmental conditions (“*in warm, low altitude, dry sites → forest respond this or that...*”).
- Upscaling from plots to the landscape benefit from a sound representation of the environment, especially in environmentally diverse regions.

Important consequences

- I understand that the basic design is a spatial representation, fine, keep it as that.
- If a subset of the NFI is to be sampled annually (which I «extremely» hope), then **I strongly suggest to balance spatial with environmental stratification!**
- Do NOT just thin the spatial design! Stratify by environment!



*Spatial thinning may remove points from environmental conditions that **are strongly undersampled** while other regions are **sampled well***

Important consequences

- I would not suggest to add new sites...
- but **subsetting NFI not spatially, but environmentally stratified for annual measurements** by analyzing the distribution of NFI plots along two or three major gradients (soil humidity, summer mean temperature, nitrogen/pH).
- Maybe it is possible to **combine a spatial and environmental stratification** as it is e.g. done in BDM (not done well there ☹️)



Summary of points

- «Extremes» and ecological modellers/analysts need/suggest:
- Annual measurements on a subset of LFI plots
 - Better measurement of mortality and regeneration
 - Environmental stratification of annual measurement sites
 - Annual measurements should be on sufficiently many plots!
 - Sound/improved collaboration with LWF/Sanasilva (make forest monitoring a single joined effort)!
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- Additionally: we need a «*WSL taskforce Rapid Monitoring*» of extreme events. Predefined budget, designs, etc.
 - Otherwise we lose lots of potential additional benefits from individual rapid responses

Thank you!