

# Smoke-Stimulated Germination in the New Forest

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University  
of Exeter

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# Fire in the Ecosystem

Arrested succession – heathlands require management.

Unmanaged heath reverts to woodland over time.  
Burning, grazing, and mowing can halt this succession.

Vegetative regrowth does not add genetic diversity, but germination does.

Management strategies that encourage germination are beneficial.



Post-fire conditions can be beneficial to plants:

- Less competition
- Less shade
- Increased nutrients (ash and char)

Small periodic fires can reduce the danger posed by future fires.

- UK's most flammable ecosystems
- Lowering fuel load
- Bare ground = fire break

Increased germination leads to:

- Increased genetic diversity
- Improved ecosystem resilience

Both smoke and heat can impact germination:

- Extreme heat can rupture seed cases
- Smoke contains karrikins, water-soluble compounds that aid germination





*Deschampsia flexuosa*



*Erica cinerea*



*Erica tetralix*



*Calluna vulgaris*



*Eriophorum angustifolium*



*Vaccinium vitis-idea*





*Molinia caerulea*



*Rumex acetosella*



*Ulex europaeus*



*Cytisus scoparius*



*Sphagnum fuscum*



*Ulex gallii*



# The Project

- Looking for fire adaptations in UK heathland plants.
- Does smoke exposure encourage germination?
- Comparing seeds from multiple sites with a range of burning histories.



- Exploring the impact of controlled burning.
- Testing impact of aqueous and gaseous smoke.
- Testing smoke solutions from different fuels/mixes.

| Jan | Feb | Mar                   | Apr | May | Jun                             | Jul                          | Aug                         | Sep                     | Oct | Nov | Dec |
|-----|-----|-----------------------|-----|-----|---------------------------------|------------------------------|-----------------------------|-------------------------|-----|-----|-----|
|     |     |                       |     |     |                                 | <i>Vaccinium vitis-idaea</i> |                             | <i>Calluna vulgaris</i> |     |     |     |
|     |     |                       |     |     |                                 |                              |                             | <i>Erica cinerea</i>    |     |     |     |
|     |     |                       |     |     |                                 |                              |                             | <i>Erica tetralix</i>   |     |     |     |
|     |     |                       |     |     |                                 |                              | <i>Deschampsia flexuosa</i> |                         |     |     |     |
|     |     |                       |     |     | <i>Eriophorum angustifolium</i> |                              |                             |                         |     |     |     |
|     |     |                       |     |     |                                 |                              | <i>Molinia caerulea</i>     |                         |     |     |     |
|     |     |                       |     |     |                                 | <i>Rumex acetosella</i>      |                             |                         |     |     |     |
|     |     |                       |     |     | <i>Cytisus scoparius</i>        |                              |                             |                         |     |     |     |
|     |     |                       |     |     |                                 |                              |                             | <i>Ulex galii</i>       |     |     |     |
|     |     | <i>Ulex europaeus</i> |     |     |                                 |                              |                             |                         |     |     |     |

# Methods

- Seed collection
  - Gathering from multiple sites.
  - Placed in separate labelled paper bags in a drying cabinet.
  - Considering for moss spores: collection in plastic containers, storage in the fridge. (Yusup et al., 2022)
- Creating smoke solutions
  - Multiple solutions will use different fuels.
  - Most effective concentrations will be chosen by concentration-response assay.
  - Method informed by Coons et al., 2014.
- Germination experiments on agar with smoke solutions
  - Seeds germinated on agar in temperature-controlled propagator with fixed day/night cycle. (Vandvik et al., 2014)
  - One group exposed to smoke solution; control group will receive just water.
- Germination experiments with smoke and soil
  - Mimicking previous experiment with gaseous smoke and seeds planted in soil.
  - Expecting similar results.



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- Drying cabinet, and smoke solution setup, Green Smith.

**Thank you for listening.**

Any questions?