Determining high risk vegetation communities and plant species in relation to climate change in the Australian alpine region

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Climatic change

Climate change already occurring with 30-40% less snow in last 50 years

- 2020 worst case scenario $+1^\circ C = 39\%$ reduction in snow cover
- Predictions for snow cover duration (days)

![Graph showing changes in snow cover over time](image)

Current 2070 worst case
What is at threat - Flora = 205 native species (21 endemic), 12 communities based on duration snow cover, winter and summer temperatures, soil depth and moisture
Functional traits

- Stress alpine endemics
- Competitive Subalpine species
- Ruderal (disturbance) weeds

Ruderal weeds
Relationship of traits with...
We are using functional traits to
- identify species better adapted to less snow cover (less stress), more invading subalpine and weed species (increased competition), and more frequent fires, trampling by tourists and grazing (more disturbance)

So we can help...
- managers prioritize fire management, weed and feral animal control and summer tourism

Traits: specific leaf area, dry and fresh leaf weight, leaf area, canopy height, phenologic parameters and lateral spread
So how far have we have....

Completed field work - trait data for 77% of species
Compared traits among growth forms (analysis completed),
distributions (analysis completed) and communities (analysis completed)
Now using 20,000 records of plant and environmental data to assess:
Which species and communities sensitivity to
(i) Climate (Started analysis)
(ii) Fire (Analysis complete)
(iii) Tourism (Analysis complete)
(iv) Grazing and drought (raw data ready)
(v) Feral animals (raw data ready)
Traits vary with species distribution
broad ranging natives different to others
But patterns not that strong....

Normalise
Resemblance: Euclidean distance

2D Stress: 0.09

Distribution
* Endemics
▲ Narrow
▲ Broad
+ Weeds

Leaf area
Fresh weight
Dry weight
Canopy
SLA
% dry matter
Traits vary with growth form
Shrubs different to rest
as would be expected....
Traits: fire and recovery

Climate change = more fires
Higher altitude, lower historical fire frequency, lower level of fire adaptation in flora

• Prior to European use – fires infrequent.
• Last 150 years – increase in back burns, bushfires
• Future - dramatic increase in high fire risk days

How do species/communities recovery after fire
Fire = Disturbance pulse

Climatic gradient

Increasing competition

Feldmark burnt

TAH burnt

Feldmark unburnt

TAH unburnt

Canopy height

Leaf area

Leaf dry matter content

Specific leaf area
Preliminary analysis – traits vary with:

- Climatic stress
- Disturbance
- Competition

But complex responses...

Next: complete analyses, write report and papers (>6)