

The Occurrence of Fungal and
Plant Species at Seven Sites in
the Black Hills of South Dakota

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Past Studies

- Few Fungal Studies

A. Gabel, E. Ebbert & K. Lovett, 2004

A. Gabel and E. Ebbert, 2004

Past Studies

- Few Fungal Studies
- Variety of Vegetation Studies

Thelenius, 1972

van Bruggen, 1996

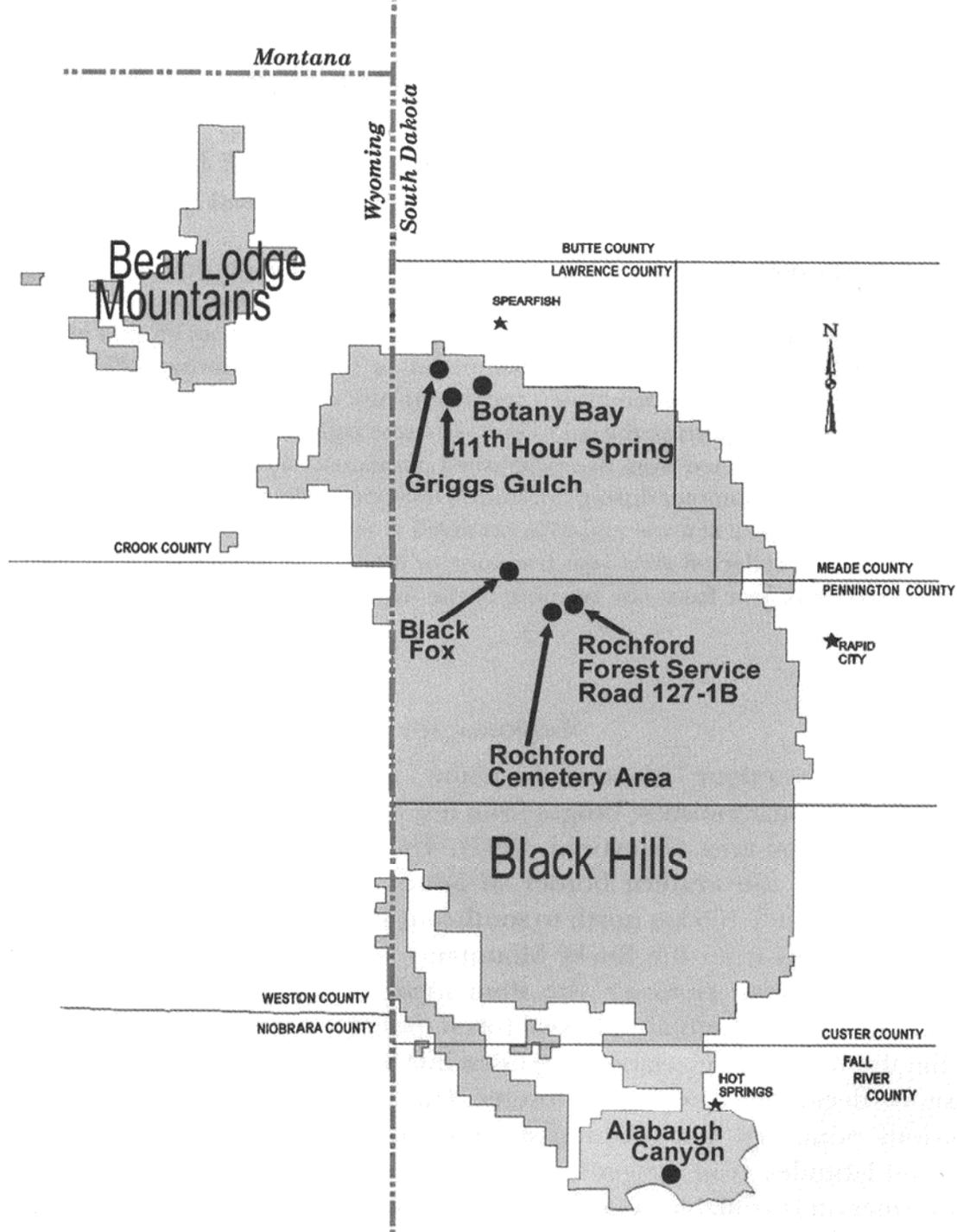
TNC Community Inventory (Marriott et al.,
1999)

Past Studies

- Few Fungal Studies
- Variety of Vegetation Studies
- No Comparisons of Vegetation and Fungi

Methods

- Seven permanent sites
 - Alabaugh Canyon
 - Black Fox Bog
 - Botany Bay
 - Eleventh Hour Spring
 - Griggs Gulch
 - Rochford Cemetery Area
 - Rochford FS Road 127



Alabaugh Canyon

- Dry
- East-facing slope
- Ponderosa pine and Rocky Mountain Juniper grassland

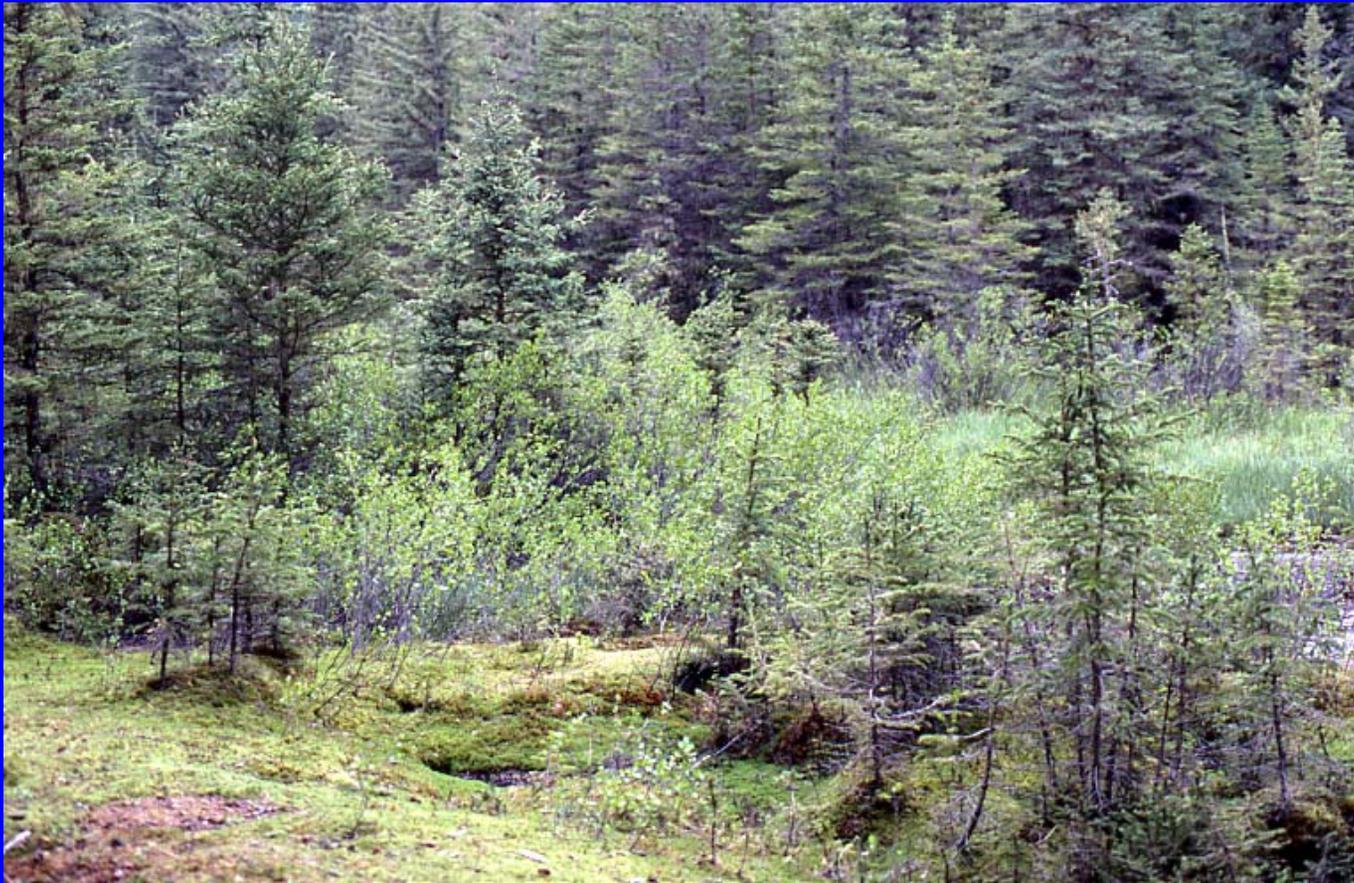
Alabaugh Canyon



Black Fox Bog

- Wet
- Black Hills spruce, bog birch, willows and *Sphagnum*

Black Fox Bog



Botany Bay

- Moist, but no flowing water
- Narrow canyon off Spearfish Canyon with Black Hills spruce, ponderosa pine, ironwood, trembling aspen and paper birch

Botany Bay



Eleventh Hour Spring

- Moist in spring, dry in late summer
- Trembling aspen, bracken fern, ponderosa pine

Eleventh Hour Spring



Griggs Gulch

- Intermittent stream
- Wooded canyon with Black Hills spruce, ponderosa pine, trembling aspen, ironwood, bur oak, and paper birch

Griggs Gulch



Rochford Cemetery Area

- Moderate moisture
- Ponderosa pine, trembling aspen, grassland

Rochford FS Road 127

- North facing moist slope
- Black Hills spruce, trembling aspen, ponderosa pine

Rochford FS Road 127



Methods

- Seven permanent sites
- Fungal surveys since 1998 (5), 1999 (+1), 2000 (+1)
- Plant surveys since 2002

Results

- Fungal species
 - 226 species from seven sites

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 - 226 species from seven sites
 - 297 species reported from Black Hills
 - (76% represented at seven study sites)

Results

- Plant species
 - 368 species from seven sites

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- Plant species
 - 368 species from seven sites
 - 1000 to 1200 species reported in the Black Hills (Hayward, 1928; McIntosh 1949; Dorn 1977; van Bruggen, 1996; = 32% - 37%)

Site Comparisons

(Jaccard's Similarity Coefficient)

Lowest similarities

	Fungi	Plant
Alabaugh vs. Black Fox	9	6
Alabaugh vs. Botany Bay	8	7

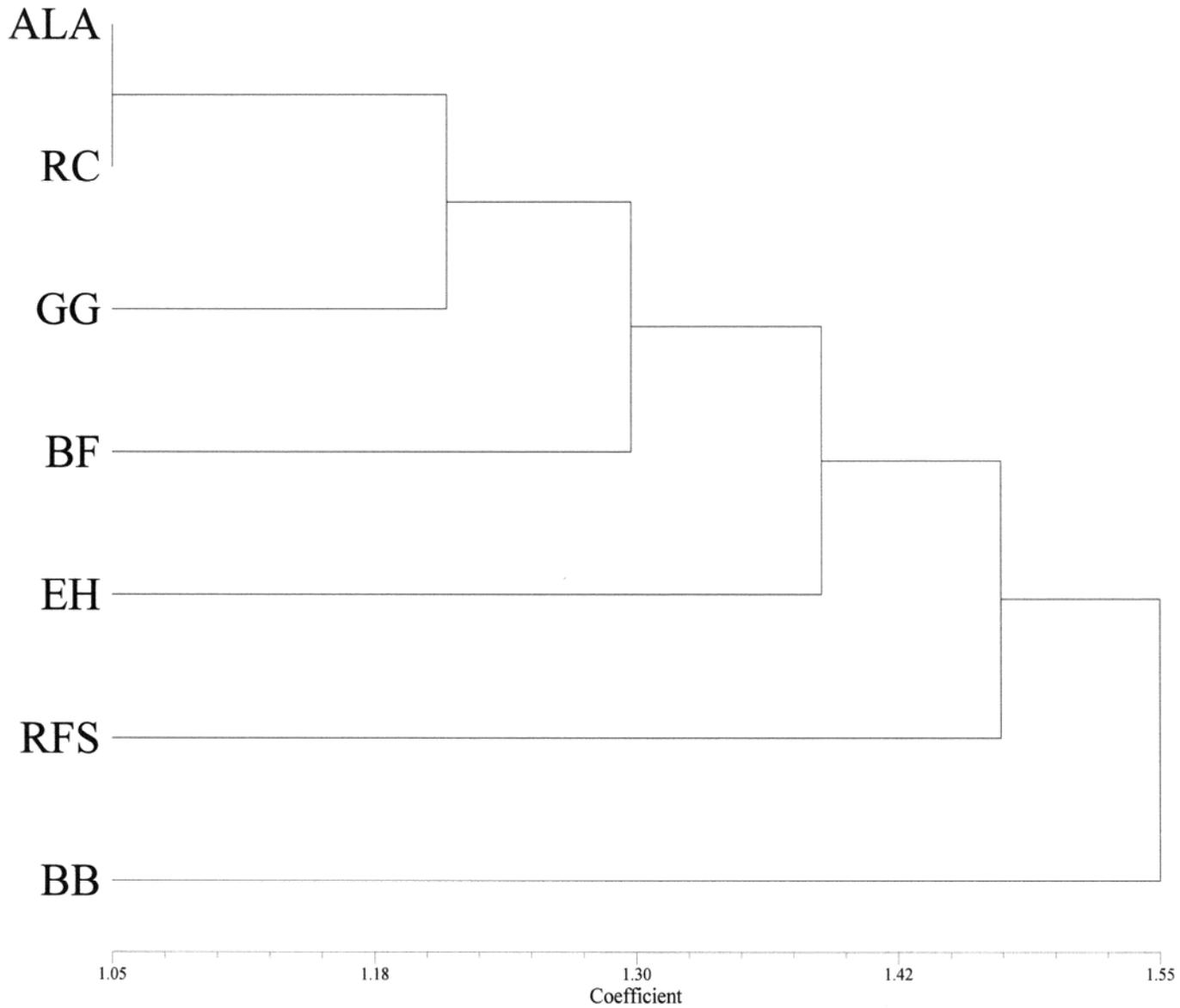
Site Comparisons

(Jaccard's Similarity Coefficient)

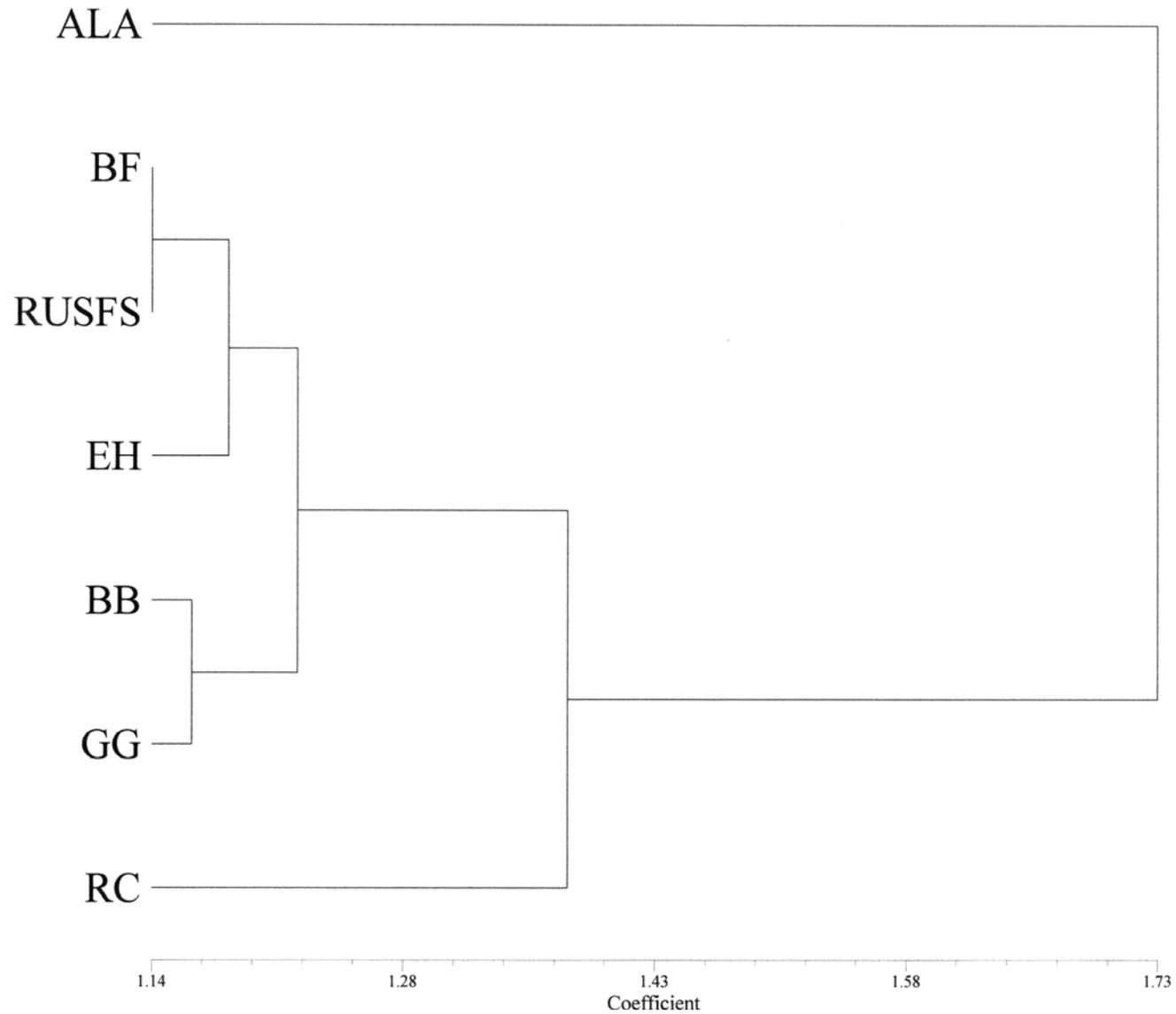
Highest similarities

	Fungi	Plant
Botany Bay vs. 11 th Hr	29	27
Botany Bay vs. Griggs	21	41

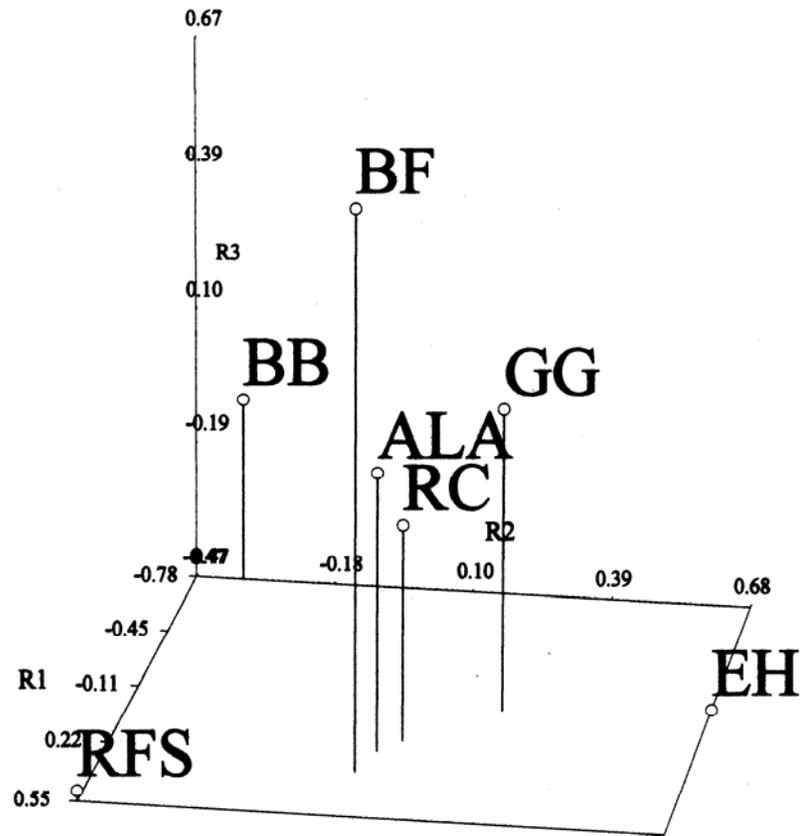
Cluster Analysis of Fungi Sites and Species



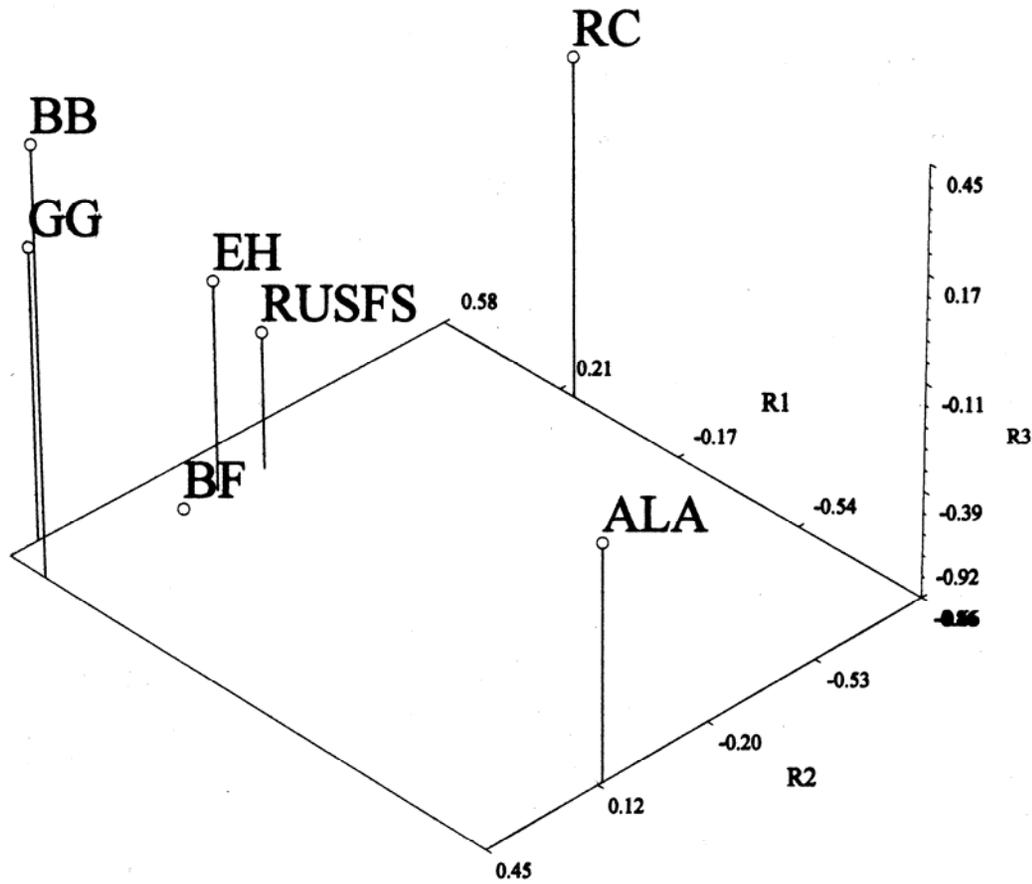
Cluster Analysis of Vegetation Sites and Species



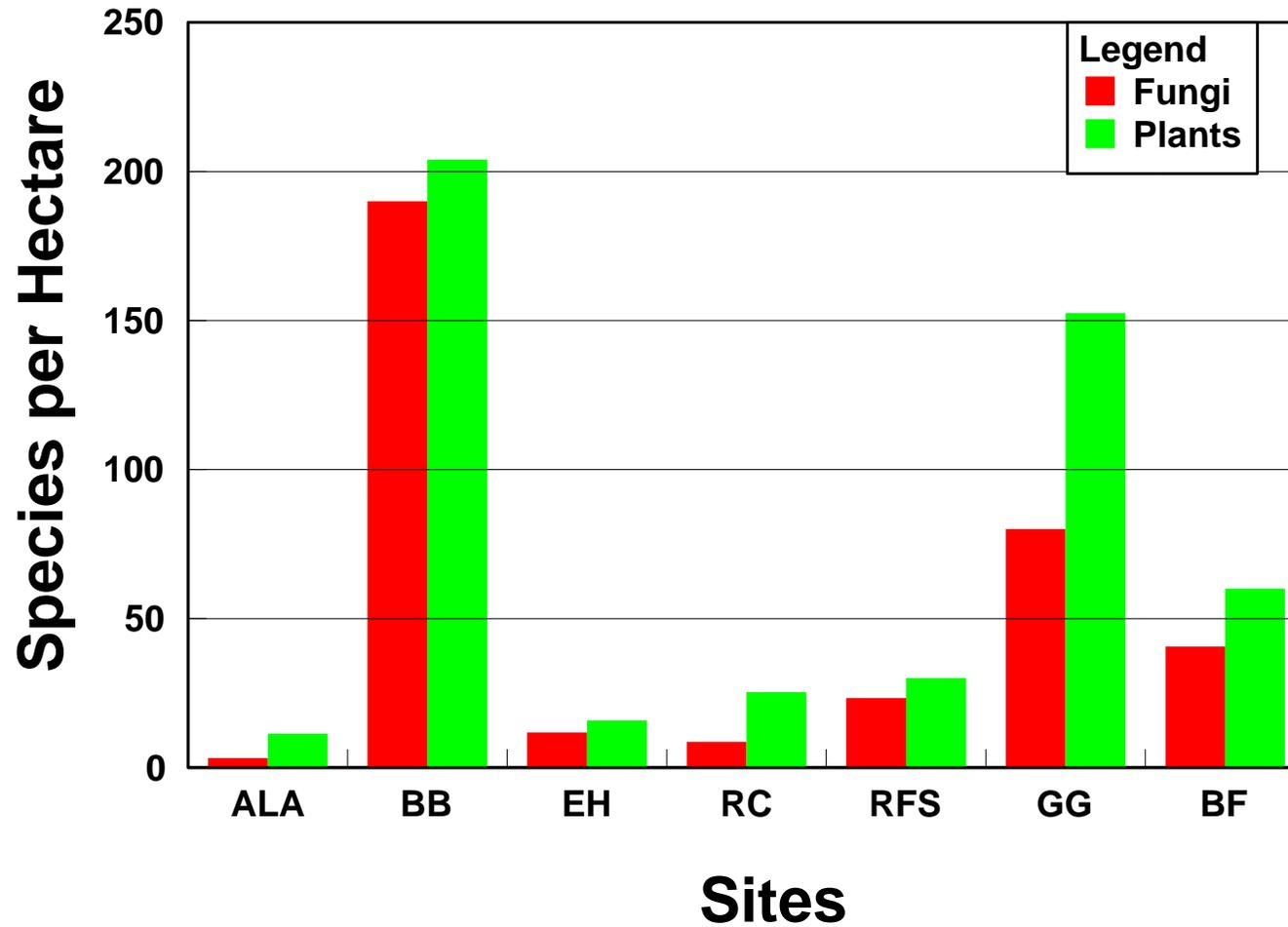
PCA of Fungal Sites and Species



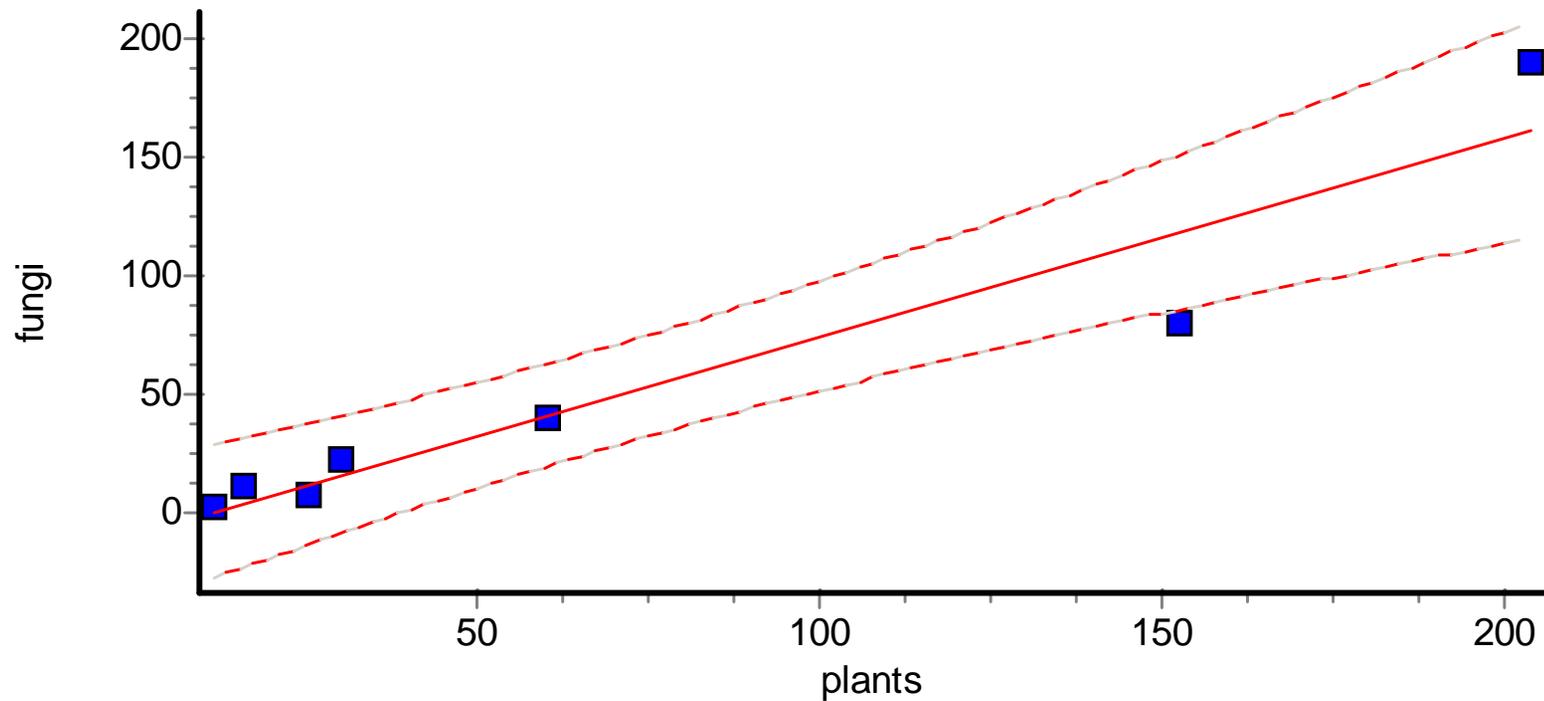
PCA of Vegetation Sites and Species



Number of Species per Hectare at Each Site



Correlation of Species Numbers ($p = 0.0009$)



Correlations

- No correlation between normal (1970-2000) precipitation at nearest weather station and number of fungal species.

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- No correlation between normal (1970-2000) precipitation at nearest weather station and number of plant species.

Precipitation at Sites

- Precipitation at three sites measured weekly for one growing season
- No significant difference was present between site and nearest weather station

Species present at all sites

- No fungal species were present at all sites

Species present at all sites

- No fungal species were present at all sites
- Eight plant species were present at all sites

Discussion

- Some species of fungi are mycorrhizal

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- Some species of fungi are mycorrhizal
- Some species of fungi are non-mycorrhizal

Discussion

- Many of the fungal species in the study areas are potentially mycorrhizal.

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- e.g. *Pinus ponderosa* has numerous potential mycorrhizal associations

Discussion

- *P. ponderosa* :
 - *Boletus edulis* RFS
 - *Chroogomphus vinicolor* RC
 - *Gomphidius subroseous* GG
 - *Hebeloma crustuliniforme* BF, RFS
 - *Hygrophorous sp.* ALA, RC, RFS
 - *Lactarius hibbardae* BF
 - *Russula sp.* ALA, BF, EH, GG, RC,RFS

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- Is a critical number of individuals of a host species necessary to establish a mycorrhizal relationship?

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- Is a critical number of fungal propagules necessary to establish a mycorrhizal relationship?

Discussion

- Many mycorrhizal fungi are generalists.
- Other factors (not just fungi or plants) are responsible for species present.

Discussion

“Sites with valuable vegetation are not necessarily rich in fungi and sites with an abundance of very rare fungi can occur among vegetation of little interest.” (Jalink and Nanta, 2001)

Acknowledgements

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