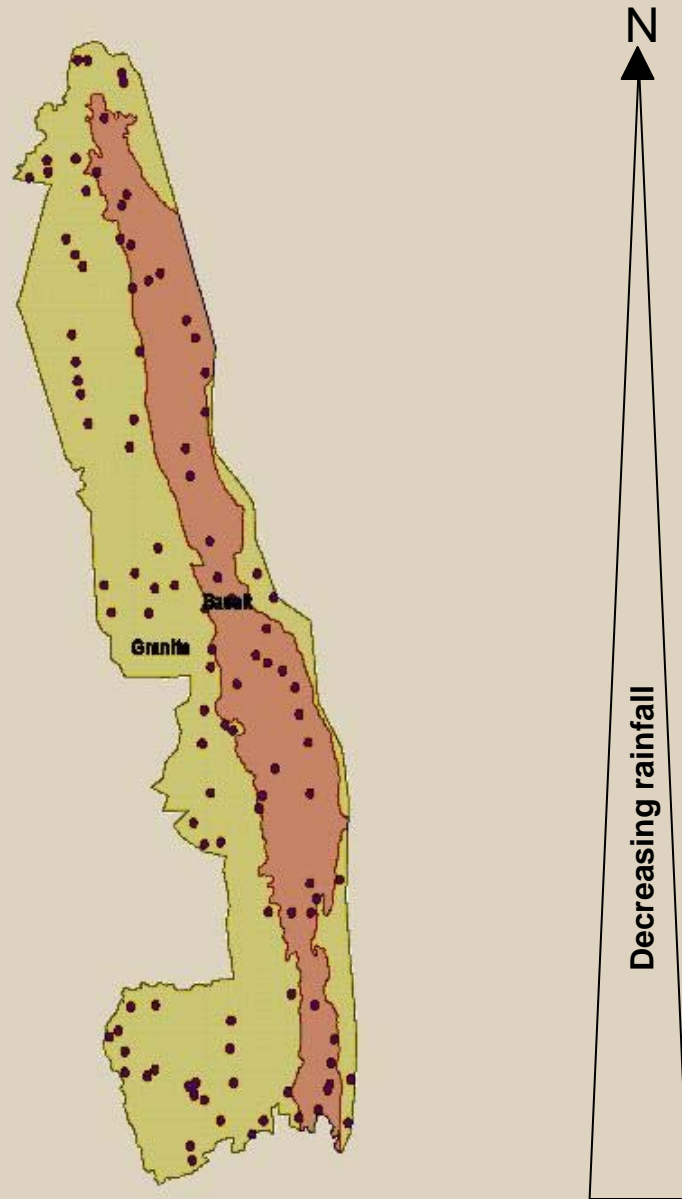
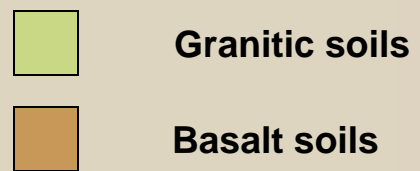


**Micro- and macro- nutrient profiles of soils and plants across
KNP- implications for herbivore dynamics**

**Jayashree Ratnam, Mahesh Sankaran, Niall Hanan,
Rina Grant, Nick Zambatis**

Sampling locations in KNP (N=108)



Methods

Data Collection

Soil and plant samples collected from each of 101 sites across KNP in the dry (2003) and wet seasons (2004).

Soil samples from each site are averages of 2- 5 cores (Depth 15 cm).

Plant samples at each site were from two-three dominant tree species at the site and all grasses for a generic value for “grass”.

Lab Analyses

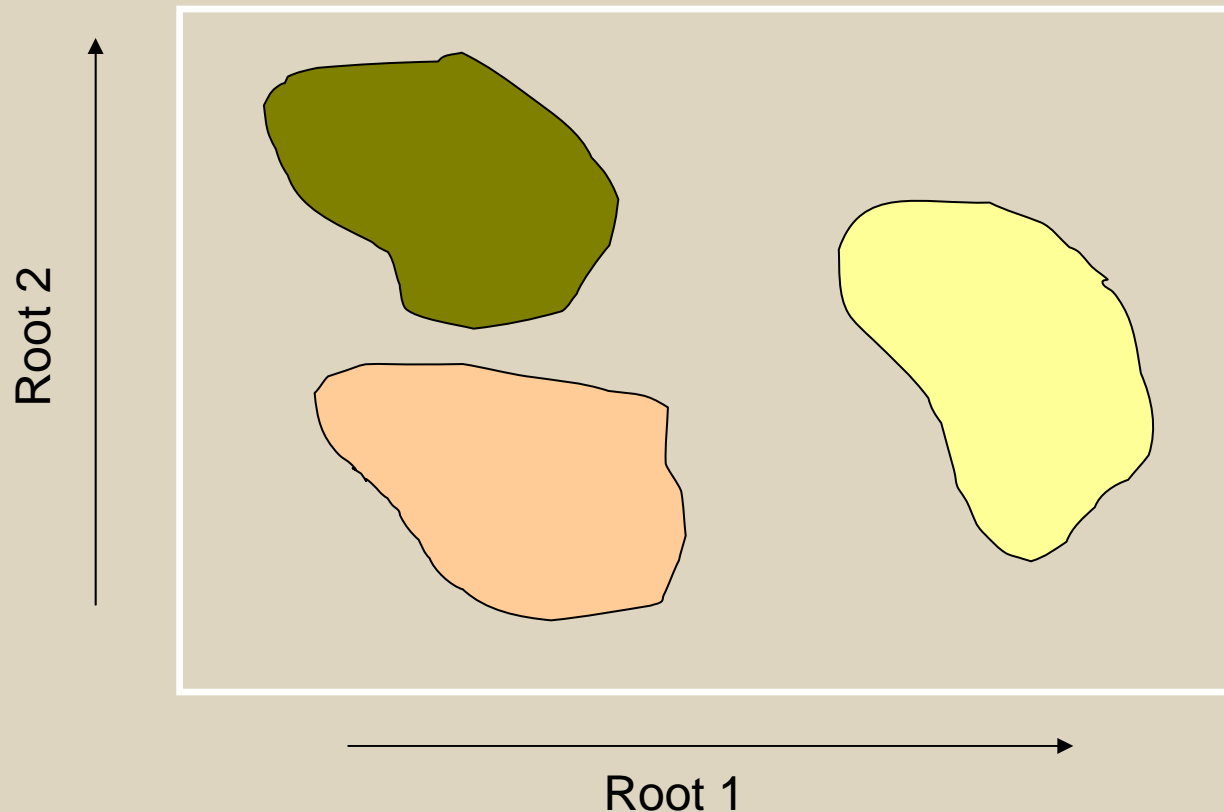
Soils analyzed for texture, total C,N, P, trace nutrients, and assayed for anaerobic Nitrogen mineralization potential. Plants dried and analyzed for total C,N,P and trace nutrients.

Methods (continued)

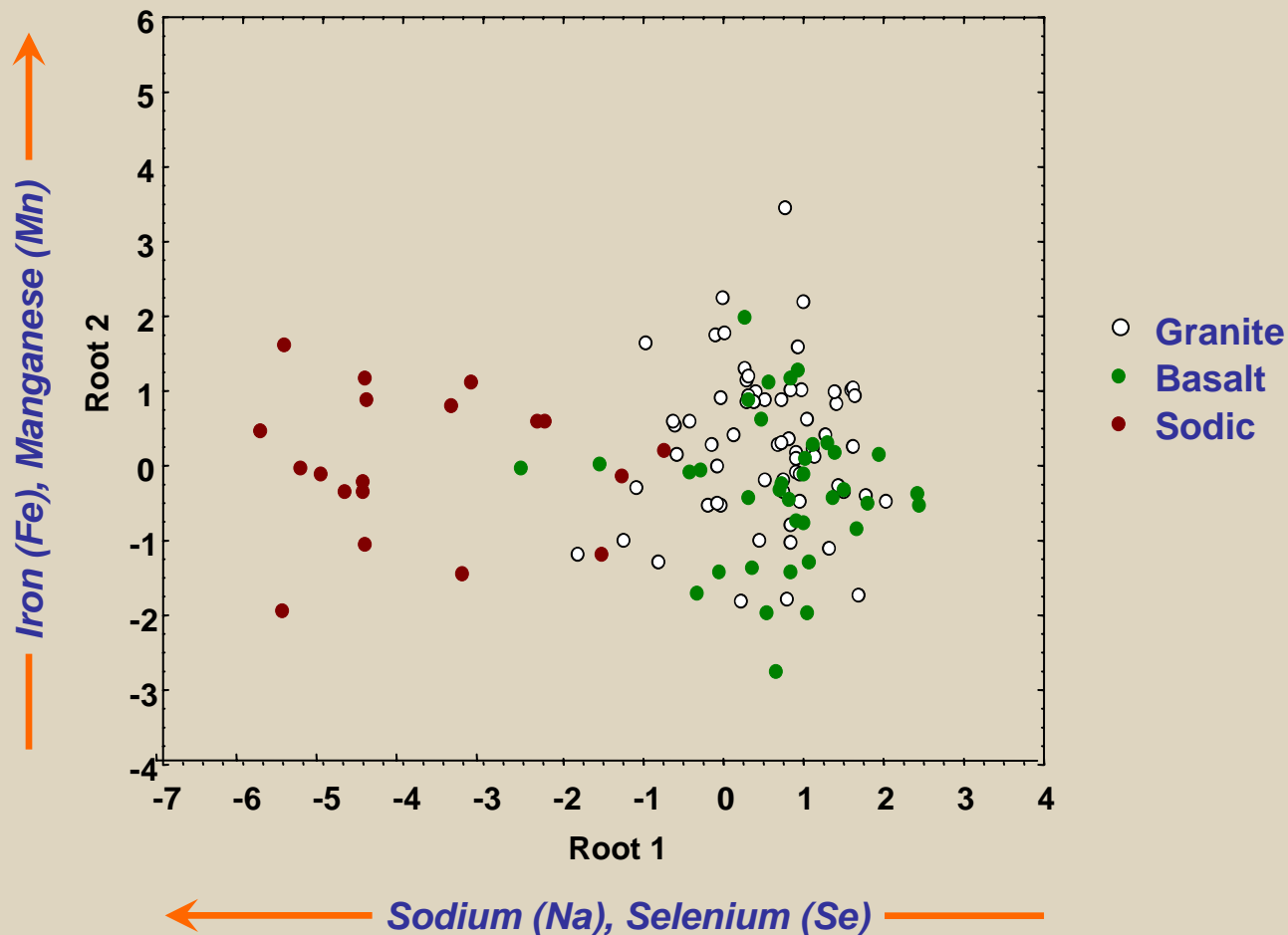
Statistical Analyses

Discriminant analyses of the macro- and micro- nutrient profiles (19 nutrients) to see if it was possible to distinguish between

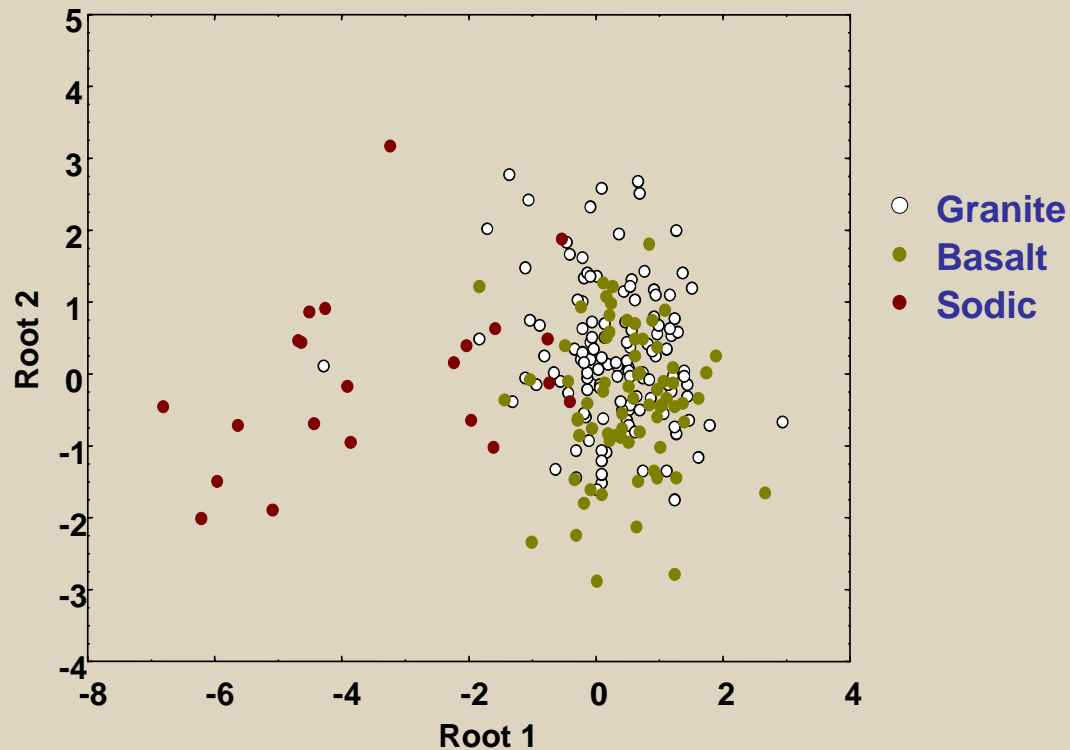
- 1) Soils- granites, basalts, sodic sites
- 2) Different plant functional groups- fine and broad leaved trees, grasses
- 3) Plants of a functional group on different soil substrates



Discriminant plots of soil nutrient profiles by geology



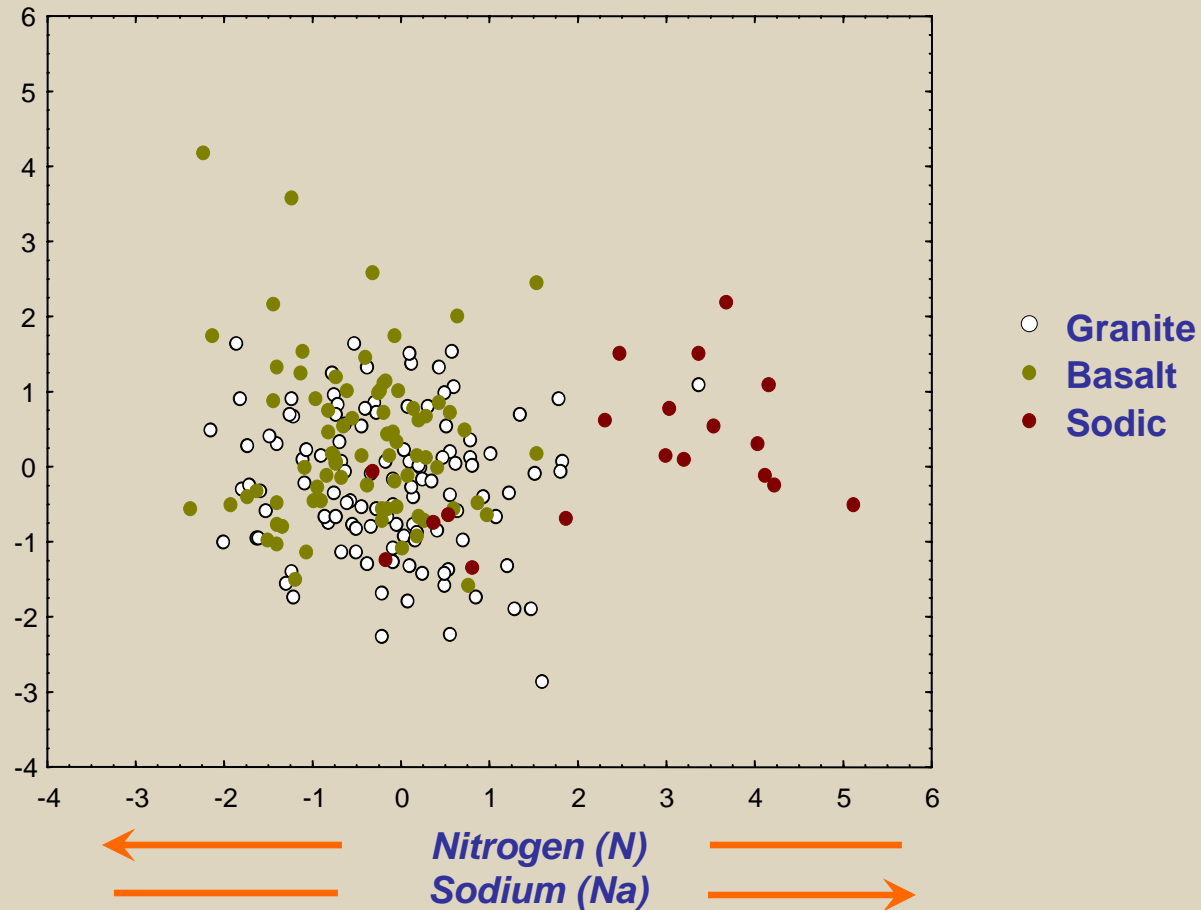
Discriminant plots of grass leaf nutrient profiles by geology



← Sodium (Na), Selenium (Se), Iron (Fe), Sulphur (S), Boron (B) →

- Grasses from sodic sites were significantly elevated in Sodium, Selenium, Iron, Sulphur and Boron relative to those from non-sodic sites.
- There were no discernible differences between grasses from granites versus basalts.

Broad-leaf tree nutrient profiles by geology

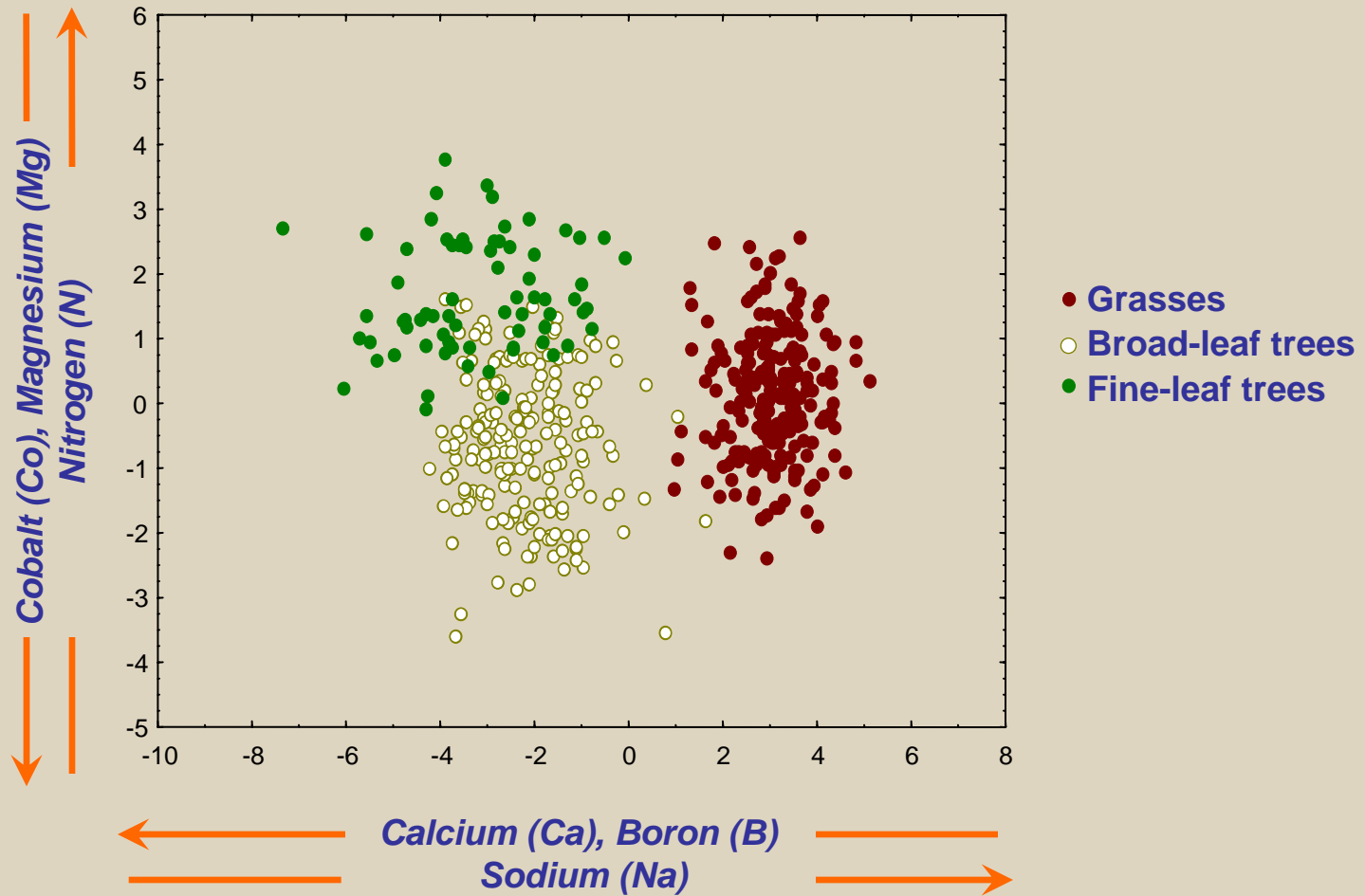


- Broadleaf trees from sodic sites had high sodium and low nitrogen relative to trees from non-sodic sites.
- There were no discernible differences in broadleaf trees from granites versus basalts

So,

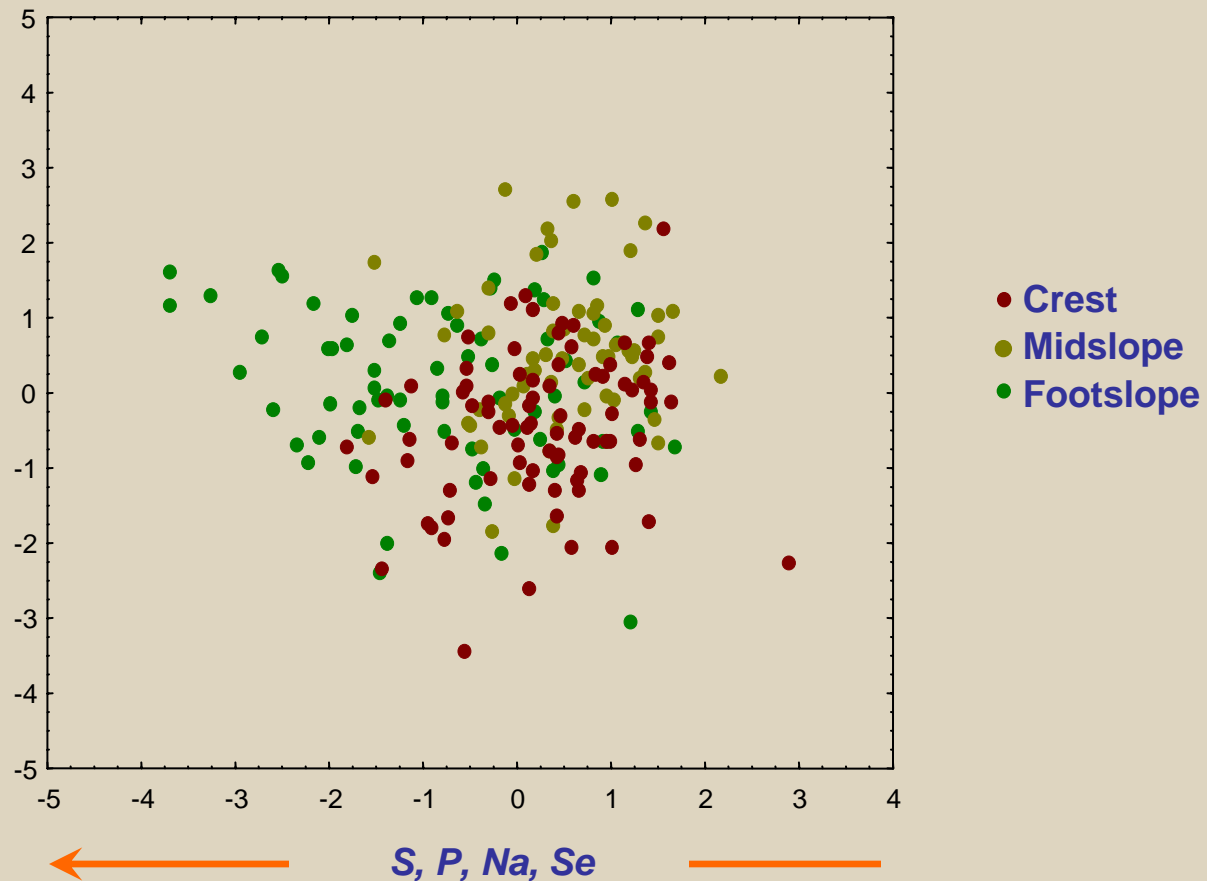
What are other sources of variation in plant nutrient landscapes across KNP?

Discriminant Plot: Nutrient profiles of plant functional groups



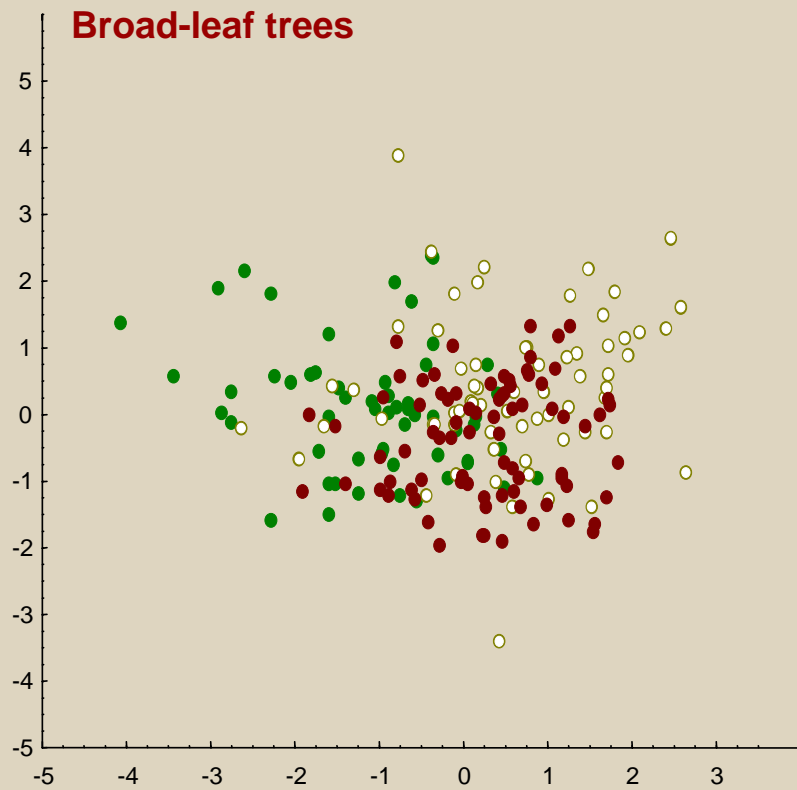
- Grass leaves are high in Sodium, low in Calcium and Boron relative to trees.
- Leaves of fine-leaved trees are high in nitrogen, and low in Magnesium and Cobalt relative to broad-leaved trees.

Discriminant Plot: Nutrient profiles of grasses by catenal position

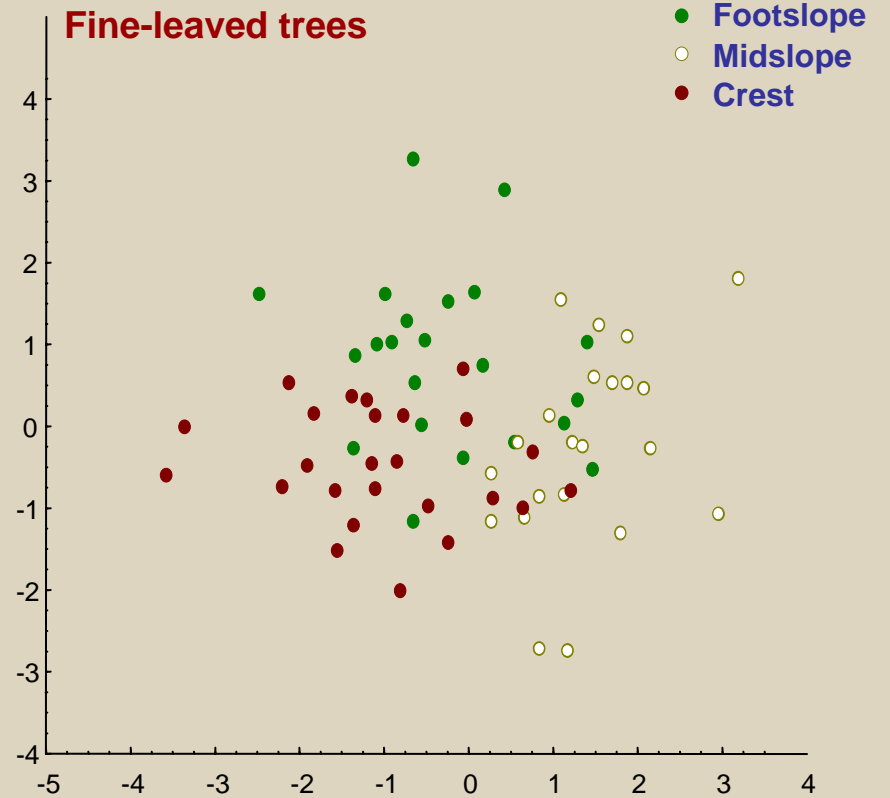


- Grass leaves from footslopes at the bottom of soil catenas are high in S, P, Na, and Se relative to grasses from mid-slopes and crests

Nutrient profiles of broad and fine leaved trees by catenal position



← P →
← Mn, Co →



← Na →
← Sr →

Landscape scale patterns in soil and plant nutrient Profiles in KNP

Granites and basalts do NOT differ from each other either in the nutrient profiles of their soils (top 15 cm) or in the nutrient profiles of plant functional groups (grasses and trees).

IMPLICATION: The high abundances of mammalian herbivores reported on basalts cannot be attributed to high nutritional quality of forage

Sodic and non-sodic sites differ from each other in the nutrient profiles of both soils and different plant functional groups.

Importantly, sodic soils, grasses and trees have elevated levels of Sodium and Selenium relative to the rest of the landscape

IMPLICATION: Sodic sites dotted across the landscape provide essential nutrients Na and Se for herbivores and may be important determinants of herbivore spatial distribution.

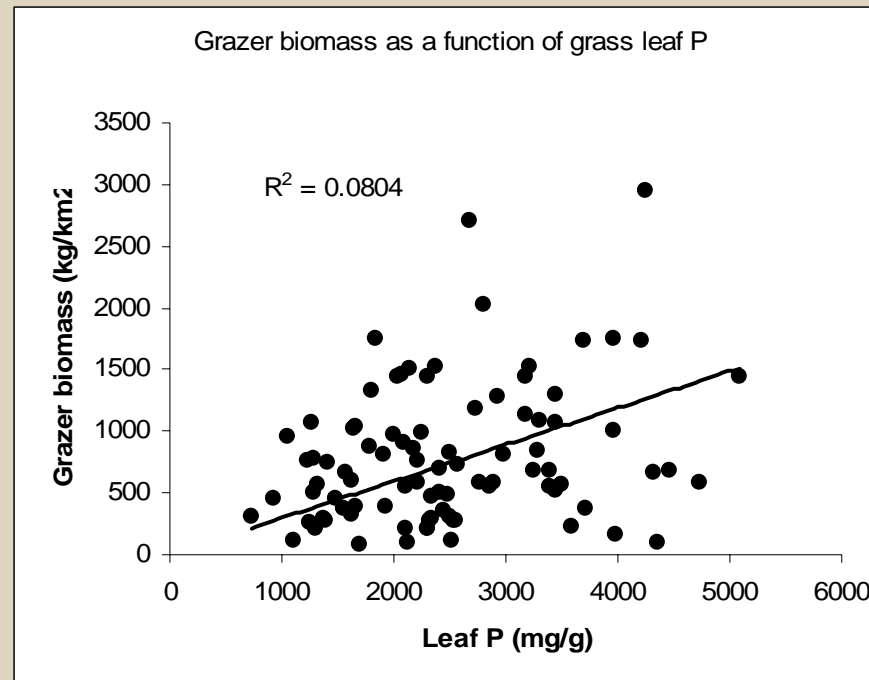
Patch scale patterns in plant nutrient landscapes in KNP

Most of the variation in plant macro-nutrient and micro-nutrient landscapes in KNP occurs at small “patch” spatial scales of a few to a 100 meters and stems from

- Variation between the major plant functional groups
- Variation within functional groups
 - across soil catenas
 - across sodic and non-sodic sites

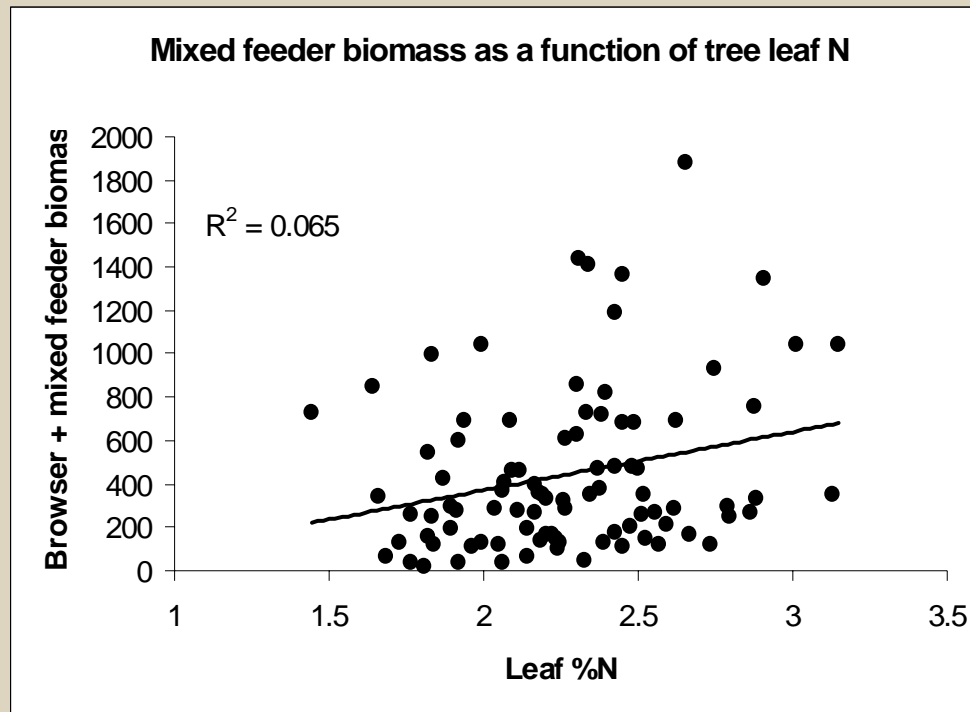
IMPLICATION: Nutrient quality variation more likely to drive herbivore movements at smaller rather than larger spatial scales in this landscape.

Site scale correlations of plant nutrients to grazer biomass



There was a similar weak but significant correlation of grazer biomass to Leaf Zn

Site scale correlations of plant nutrients to mixed-feeder biomass



There were also weak but significant correlations of mixed-feeder biomass to leaf Na and leaf Fe.

Acknowledgements

Jenna Rettenmayer
Joyce Dickens
Eric Peterson
Dan Reuss

Bob Scholes
Mary Scholes
Joe Craine

Harry Biggs
Thembi Khosa
Angela Gaylard
Holger Eckhardt
Guin Zambatis

Corli Coetsee
Louise Rademan
Navashni Govender
Glynn Alard
Walter Kubheka

Johan Baloyi

Funded by
National Science Foundation