The Impact of Multiple Wildfires on Sagebrush-Steppe Communities:

Implications for Restoration

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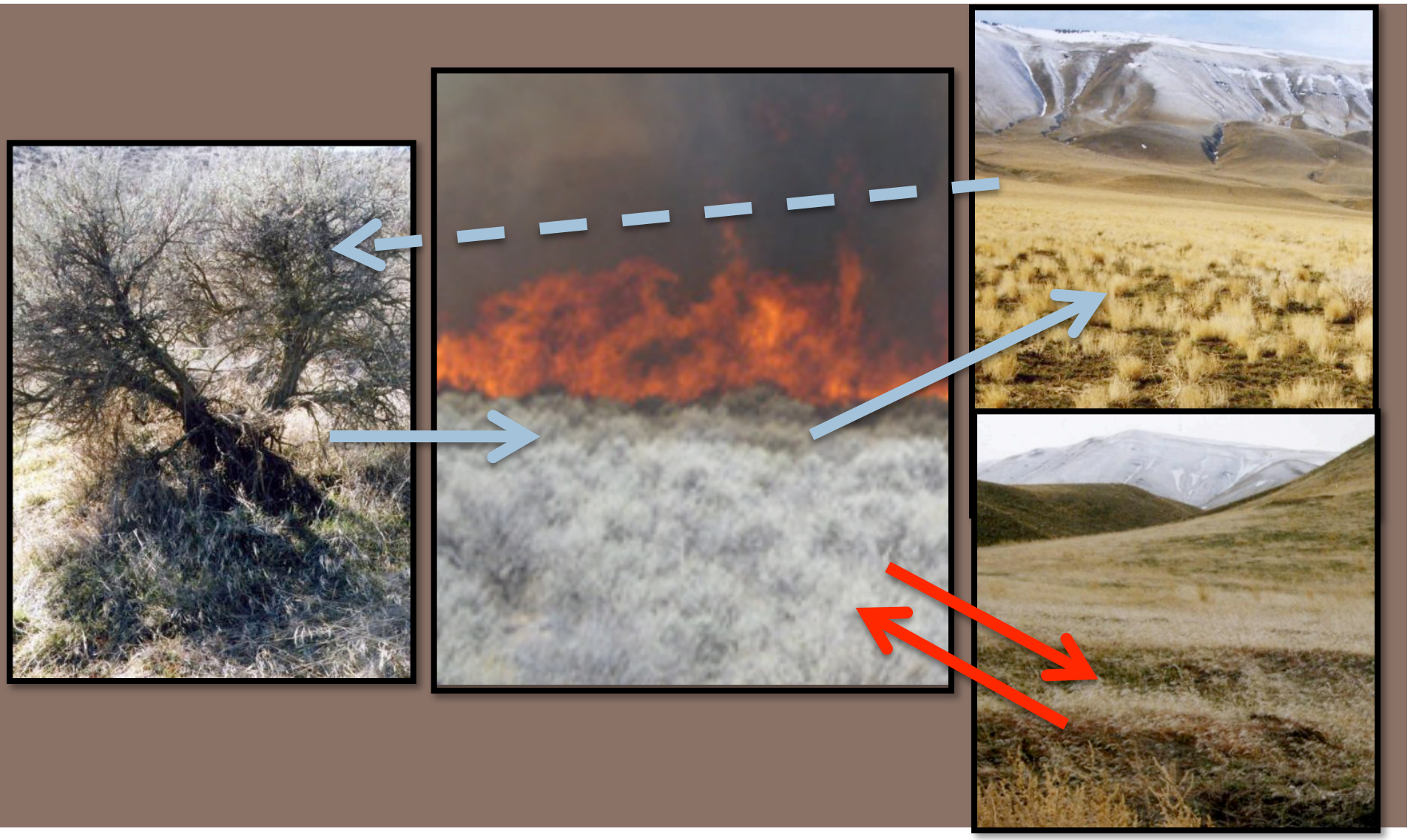
Joint Fire Science Program

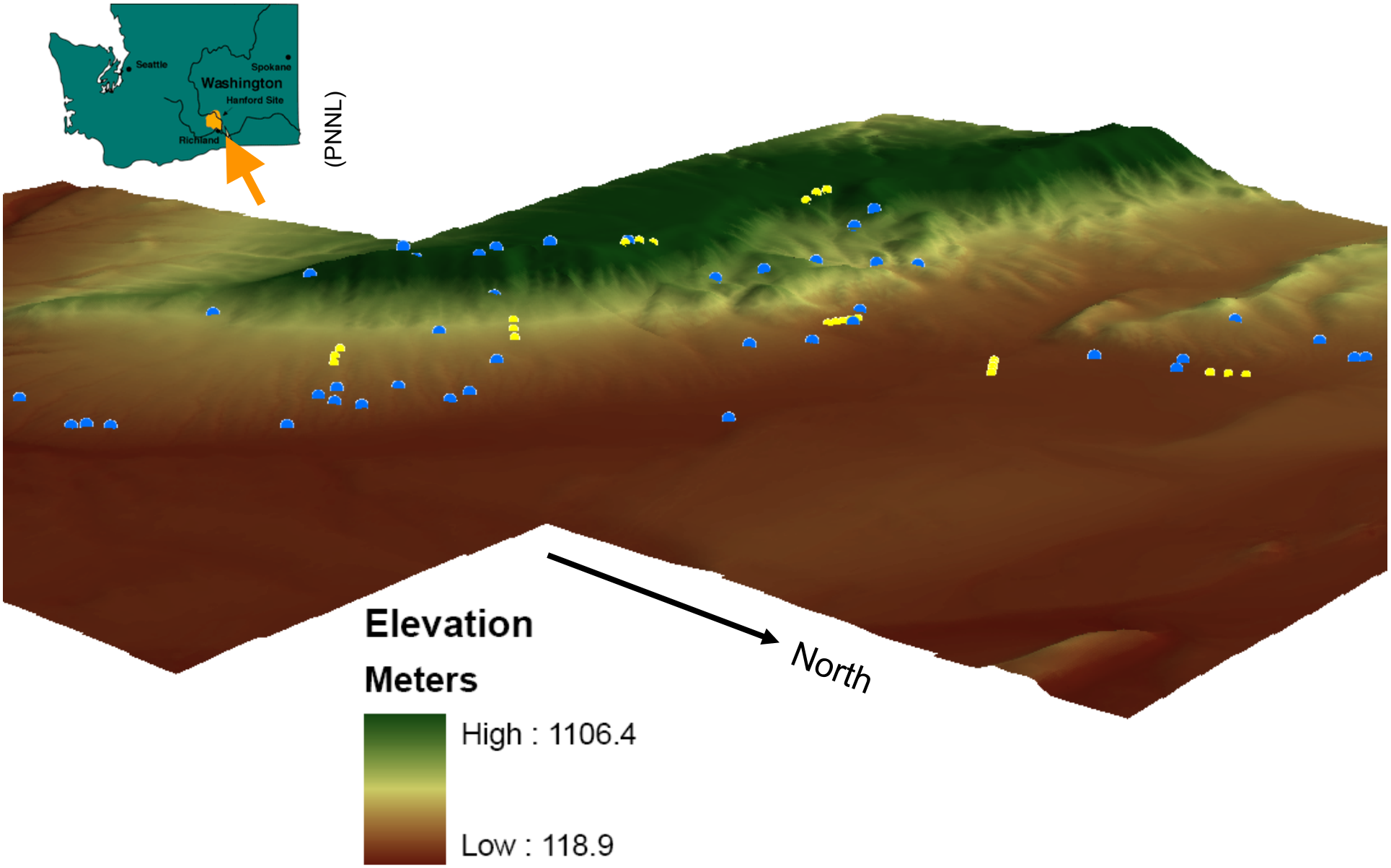
Sagebrush Shrubsteppe

Source: INL

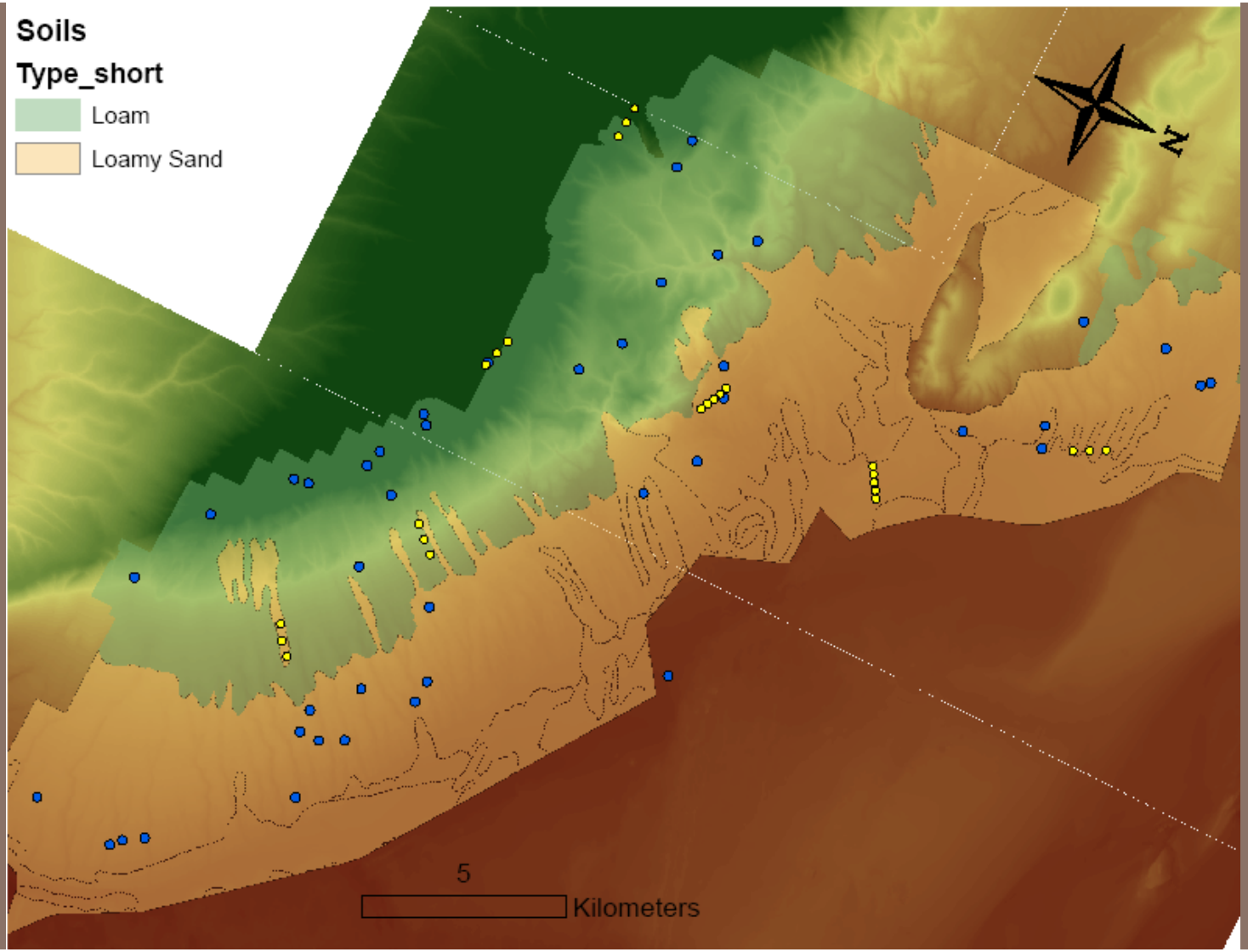
Successional Trajectories



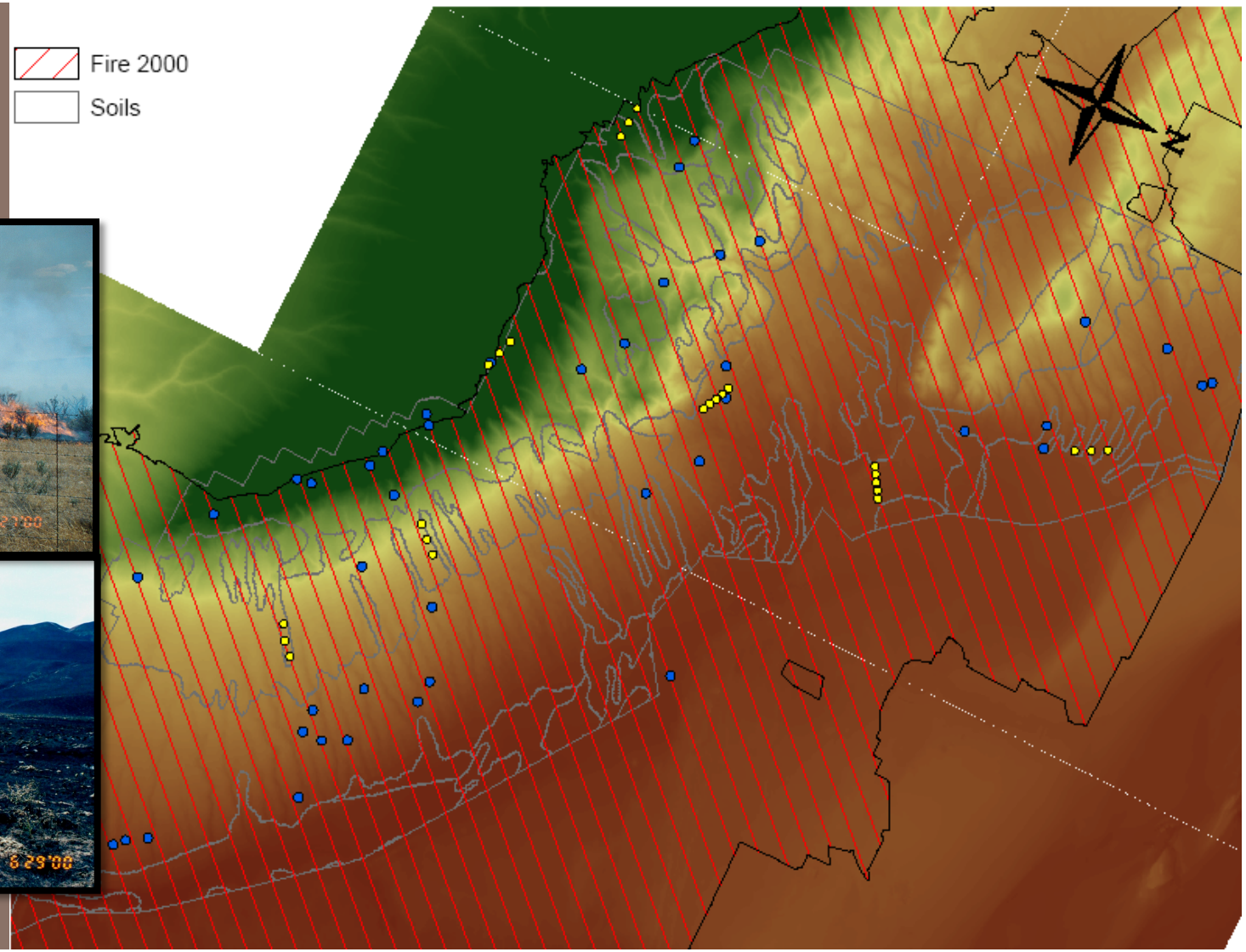
Arid Lands Ecology Reserve (ALE)



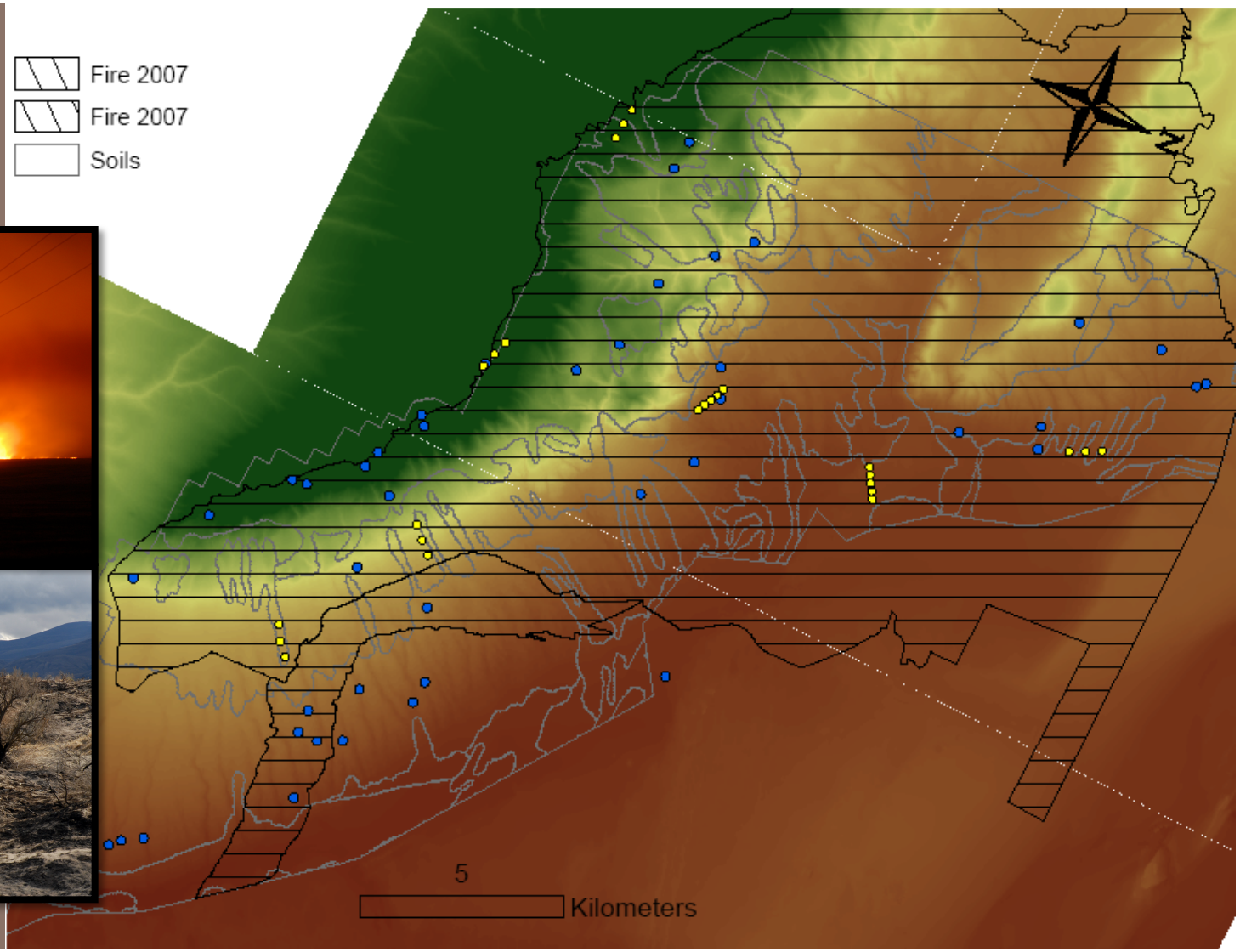
Vegetation Differs by Soil Type



2000 – 24 Command Fire



2007 – Wautoma and Milepost 17



Questions

- Are the communities responding similarly to repeated fire?
- How should restoration treatments differ among communities?

Methods

Plots

- 40 plots, 5m x 20m
- Data from:
  - 1994
  - 2001-2004
  - 2009

Transects

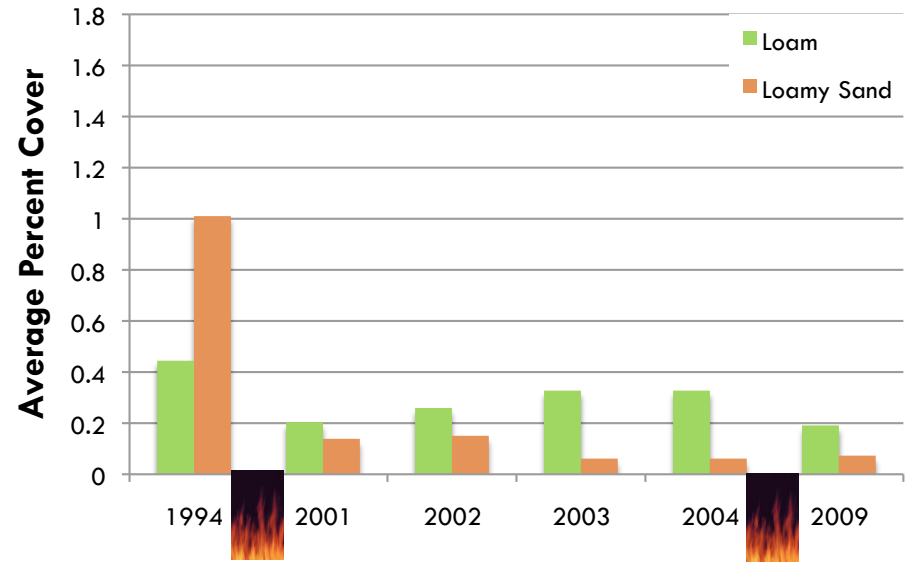
- 100m long with quadrats every 5m
- Data from:
  - 1996
  - 2001-2004
  - 2009

Analysis

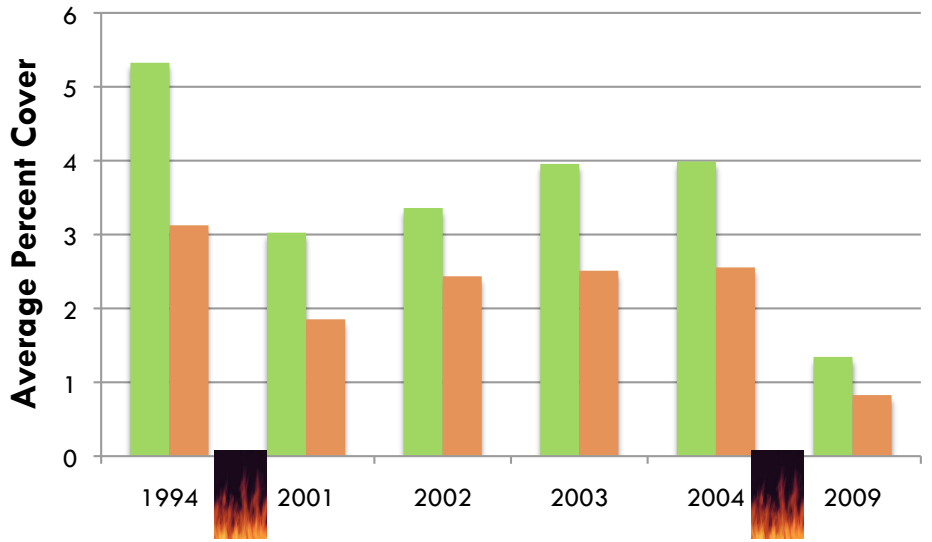
- Cover by functional groups
  - Perennial / Annual
  - Native / Invasive
  - Shrub / Grass / Herb
- Separation among communities
  - 1994 or 1996, 2002, 2009
  - Nonmetric Multidimensional Scaling

Perennial Shrub and Grass Cover

Shrubs

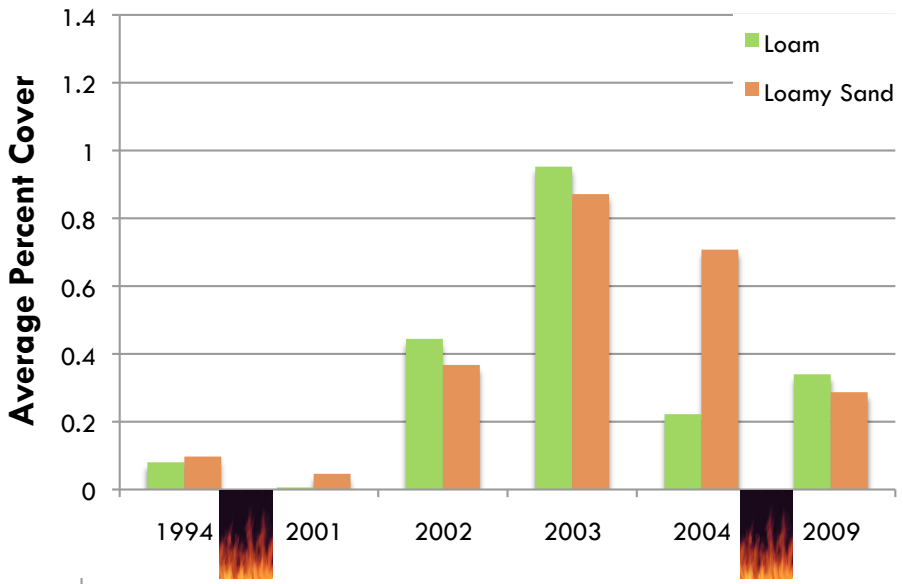


Grasses

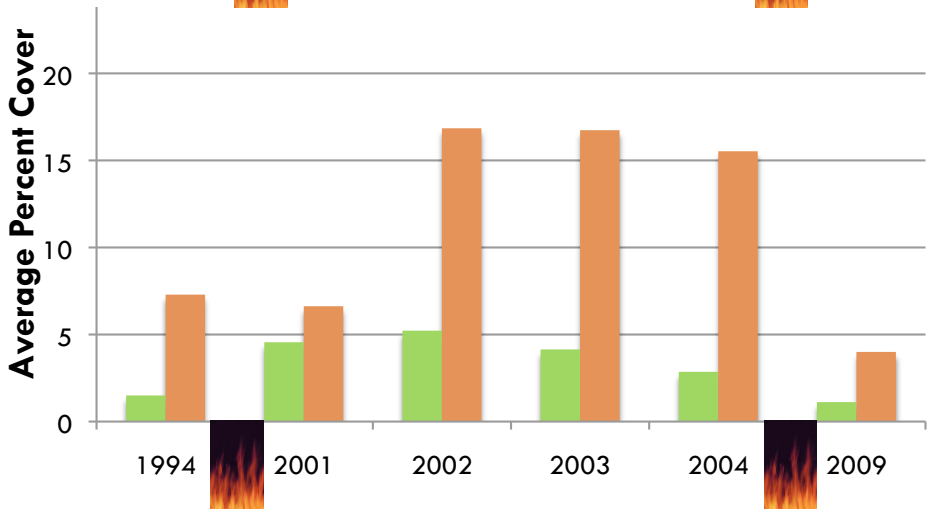


Invasive Annual Forbs and Grass

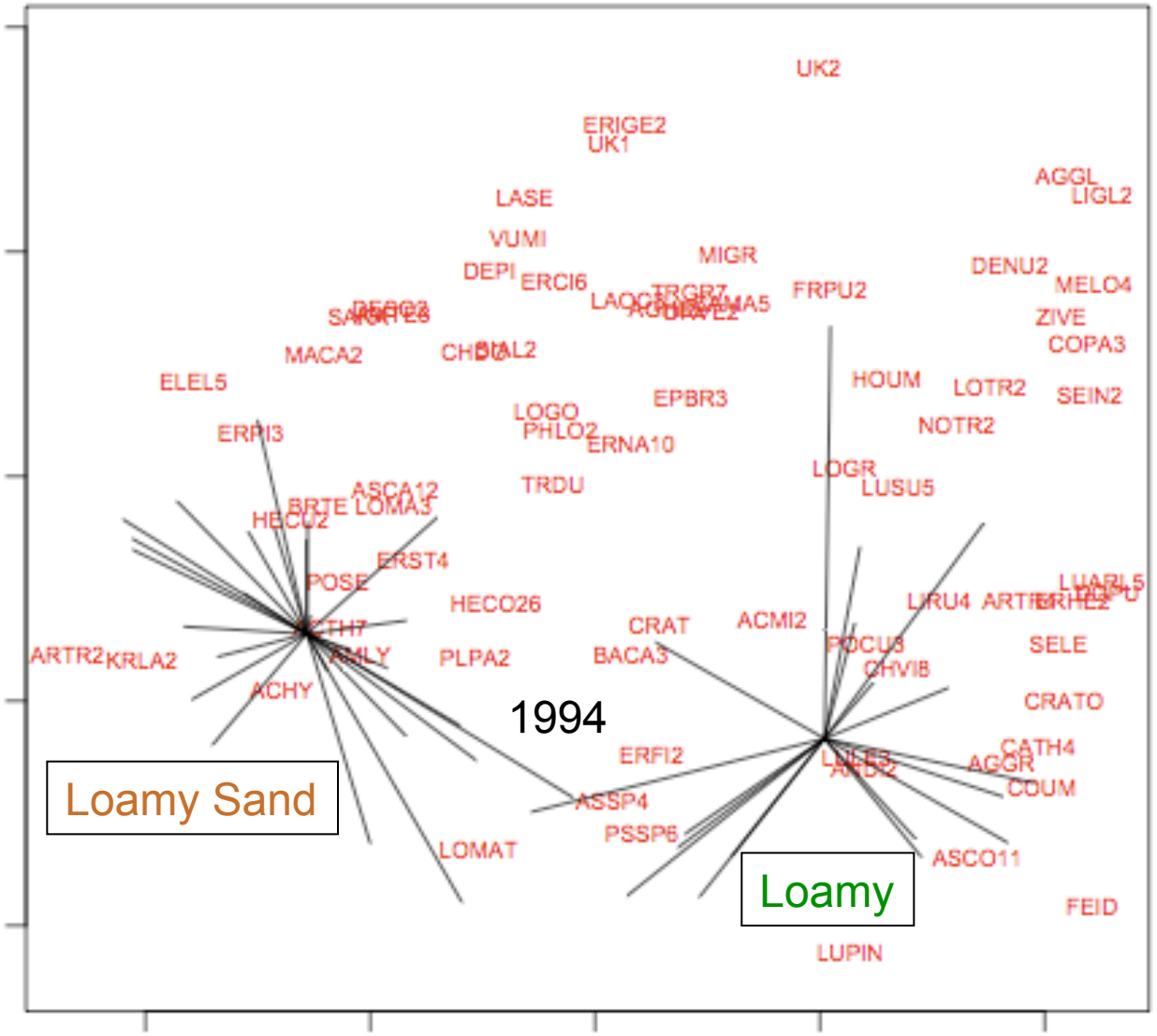
Forbs



Bromus tectorum



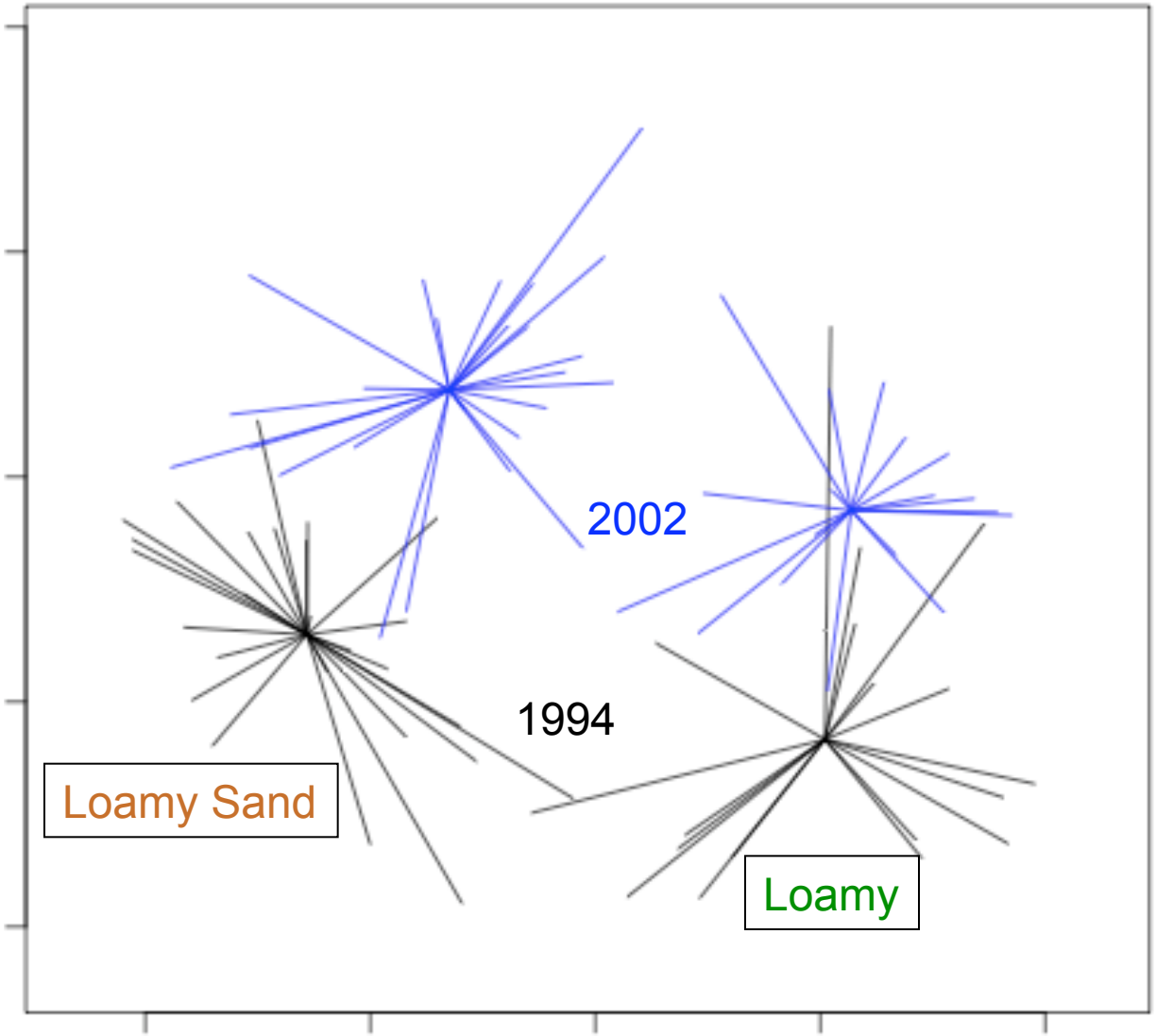
Pre-Fire



NMDS “spiders”

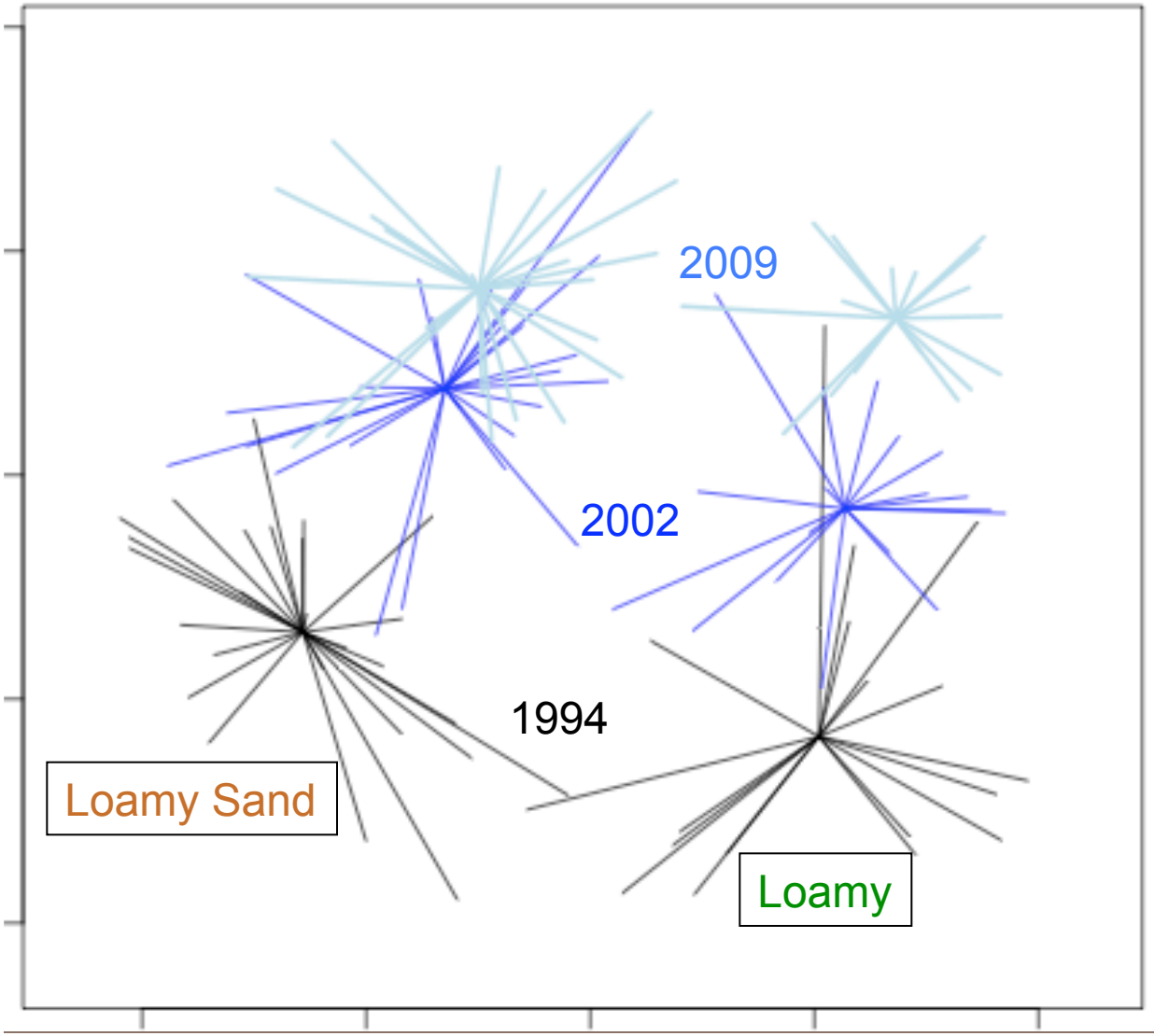
- Distance between points or species codes indicates similarity in composition and abundance
- Plots on soil types are connected to centroids
- Most variation is explained on first axis

After One Fire



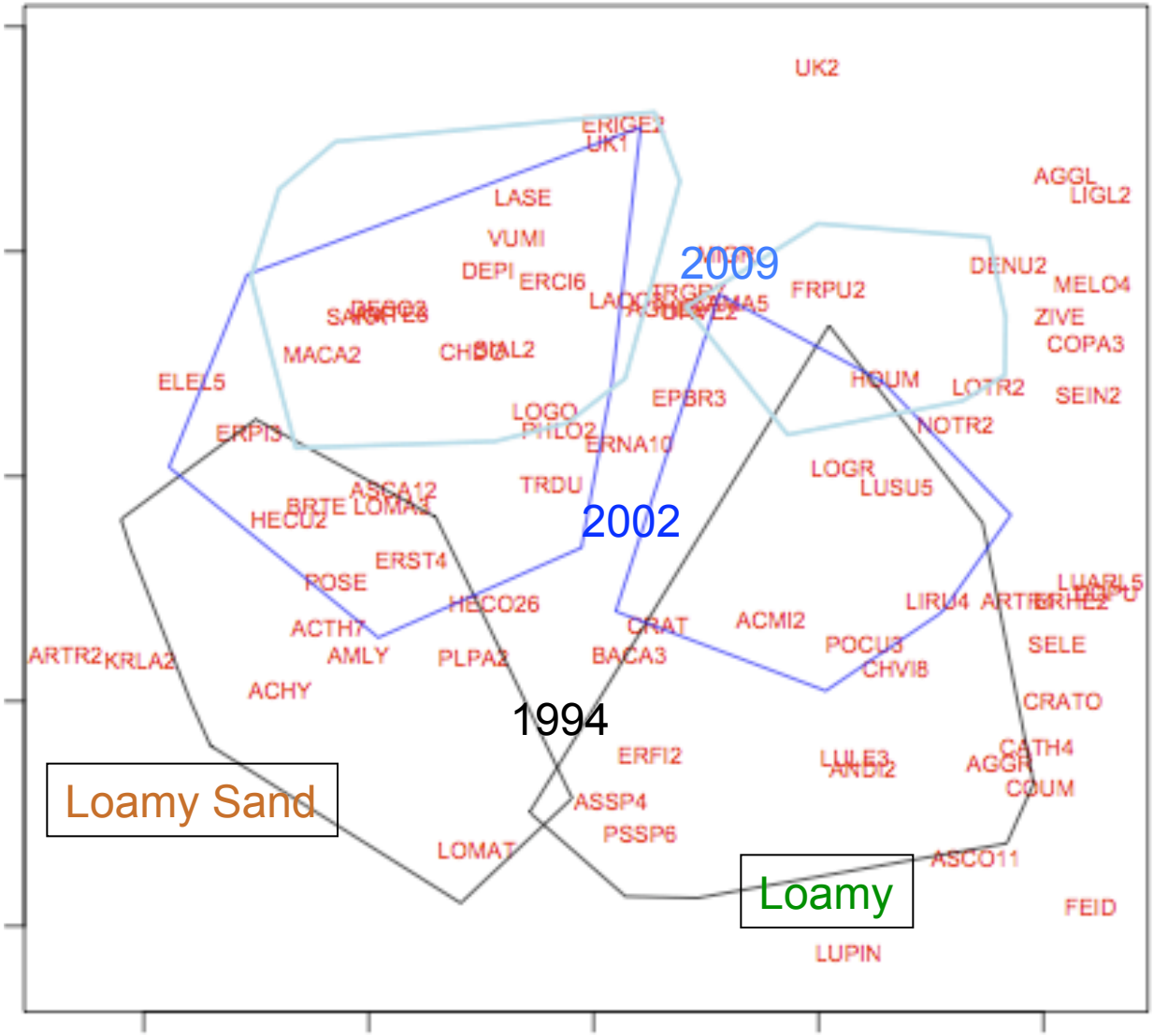
- Community in loamy sand changes more than community in loamy soil.
- All sagebrush burns off of plots in loamy sand

After Two Fires



- Loamy sand Community in loamy sand changes less than loamy community
- Neither community is returning to initial composition/abundance
- There is continued separation in communities

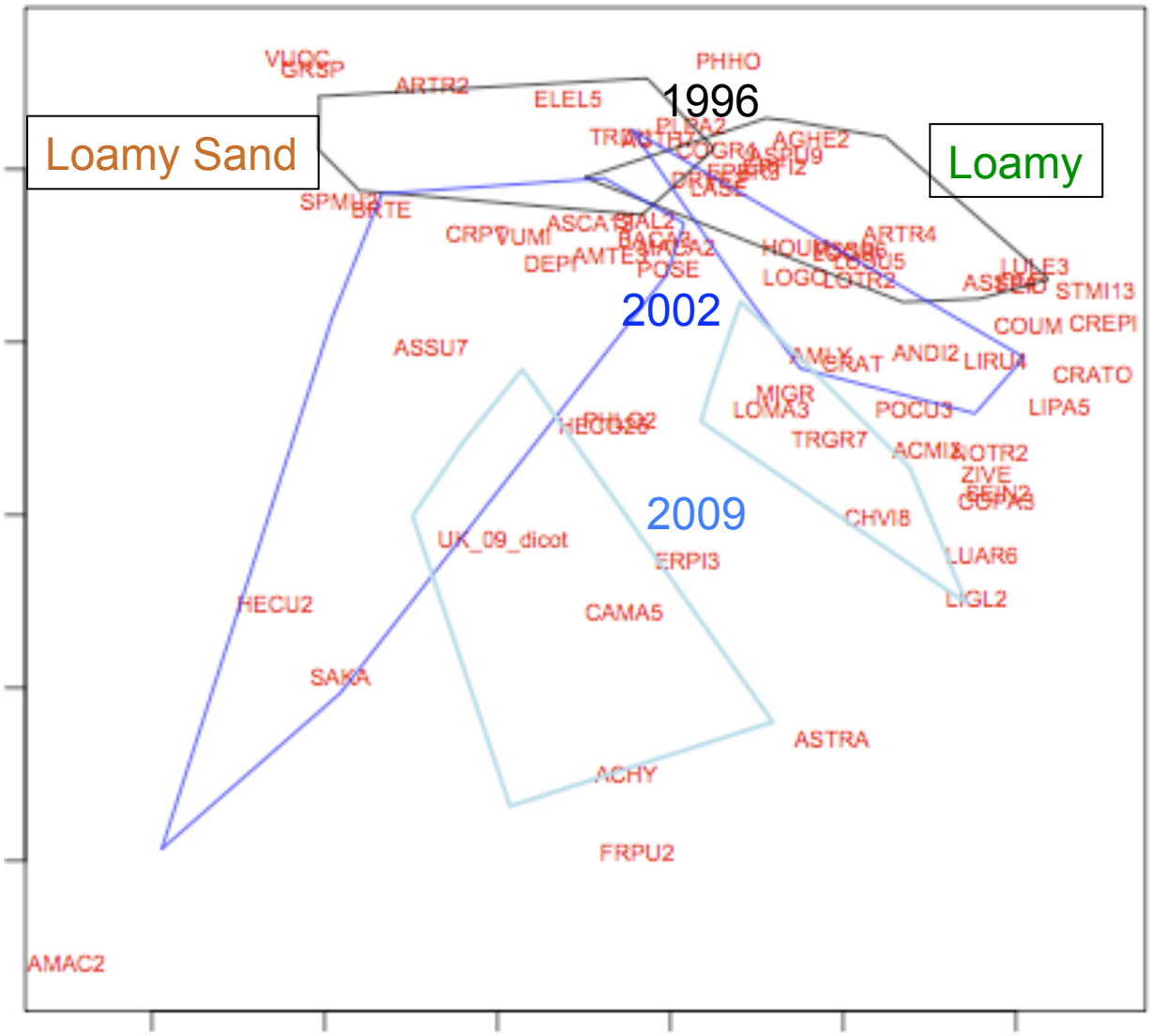
Plots shift 1994-2002-2009



NMDS “Hulls”

- Loamy Sand communities dominated by annual species
- Loamy communities become more similar to each other
- Loamy communities lost a lot of cover, but not richness

Transects Show Similar Shifts After Two Fires (1996-2002-2009)



NMDS “hulls”

- Communities become more dissimilar from each other after the second fire.
- Loamy communities do not change as much

Implications for Restoration







Loamy Community

1996 2001 2004 2009

- Steep; difficult access
- Short growing season
- Good degree of native species
  - Threetip sagebrush resprouts
- Minimal restoration needed

Sandy Loam Community

1996 2001 2004 2009

- Cheatgrass – expect future fires
- Sandy soil – low soil moisture; wind
- Low degree of native species

- FWS isn't planting sagebrush in these areas

Sandy Loam/Mid Elevation

1996 2001 2004 2009

- Good degree of native species
  - Native grasses
- Many invasives
  - Patchy distribution
- Appropriate sites for restoration

Recent Restoration Activities

- Cheatgrass control
- Protect Sagebrush islands (fire retardant)
- Species mixes for sandy and loamy soils
  - Aerial vs. drill application



Conclusions

- Communities differ in response to fires
- Restoration must reflect these differences
  - The sandy soils at middle elevations need the work – they are being invaded but also still have pretty good cover of native species



http://depts.washington.edu/firesale/

Climate

- Precipitation – total October - March