Determining restoration potential of alien-invaded Cape Flats Sand Fynbos;

a comparison of different alien clearing treatments

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Introduction

- CFR has high biodiversity and levels of endemism
- Lowlands and mountains are ecologically distinct in their vegetation.

Threatened lowland habitats

- Lowlands highly transformed and fragmented
- Remnants mostly invaded by alien species [1]
- Restoration of degraded habitats vital to approach biodiversity targets [2]

1. Rebelo et al. 2006
2. Rebelo et al. 2011

Restoration of Fynbos ecosystems

- Duration and density of invasion affects restoration potential [1].
- Certain Fynbos structural components persist better than others [2]
- Concept of thresholds to restoration [3]

1. Holmes et al. 2000, Gaertner et al. 2012
2. Holmes 2002
3. Briske et al. 2006; Groffman et al. 2006

Cape Flats Sand Fynbos vegetation

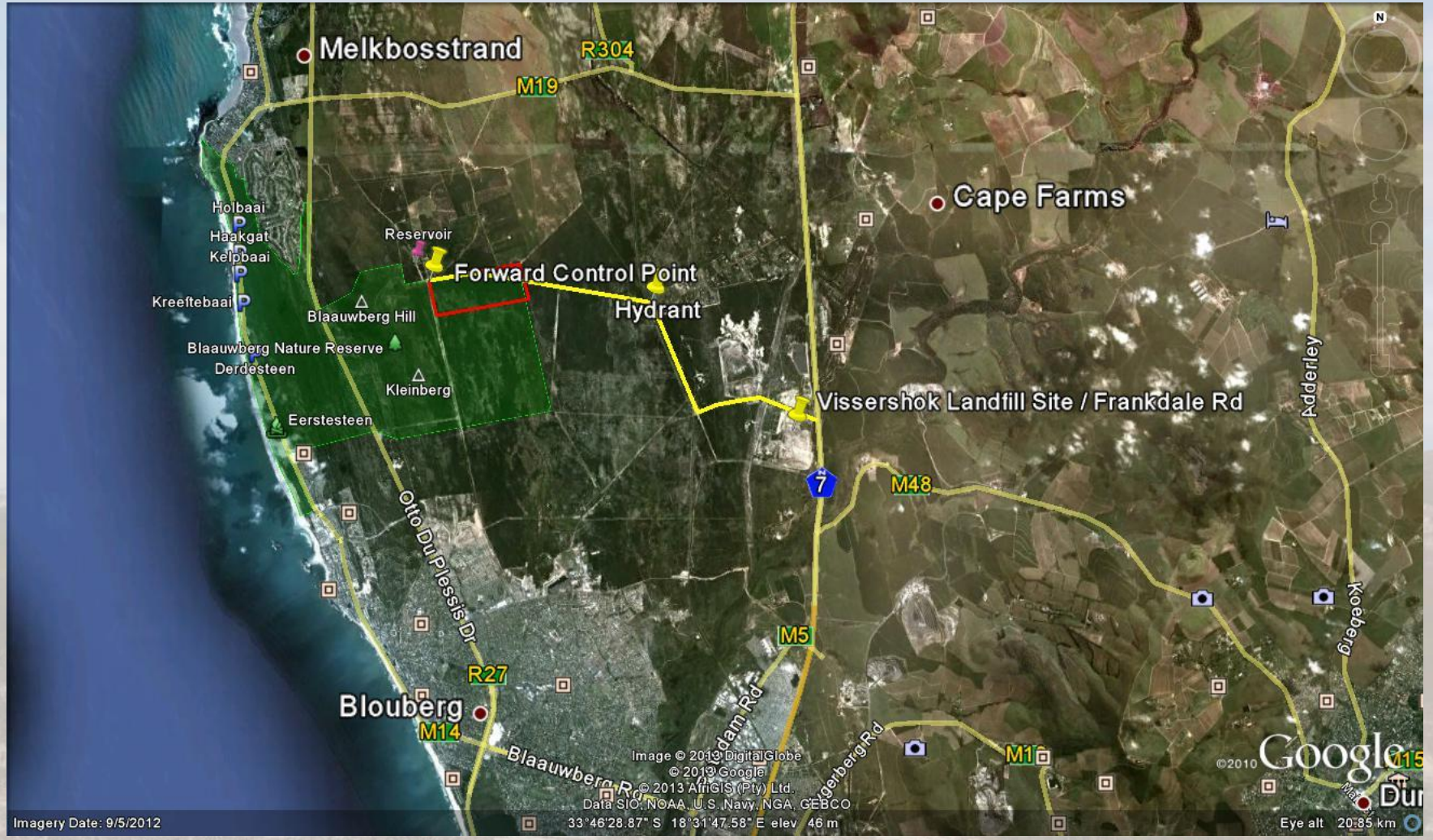
- Cape Flats Sand Fynbos (CFSF)[1] critically endangered vegetation type, only 16% remains[2], mostly in degraded condition
  - high number of endemics (16)
  - very high number of RDL species (100+)

1. Rebelo et al. 2006
2. Rebelo et al. 2011

Blaauwberg Nature Reserve

- Largest remaining area representative of CFSF - thus major conservation potential.
- Site was mostly invaded by *Acacia saligna* prior to 2012; restoration necessary

Blaauwberg Nature Reserve



Reference site: Friends patch

Reference site: Papkuil Outspan

Rationale for this study

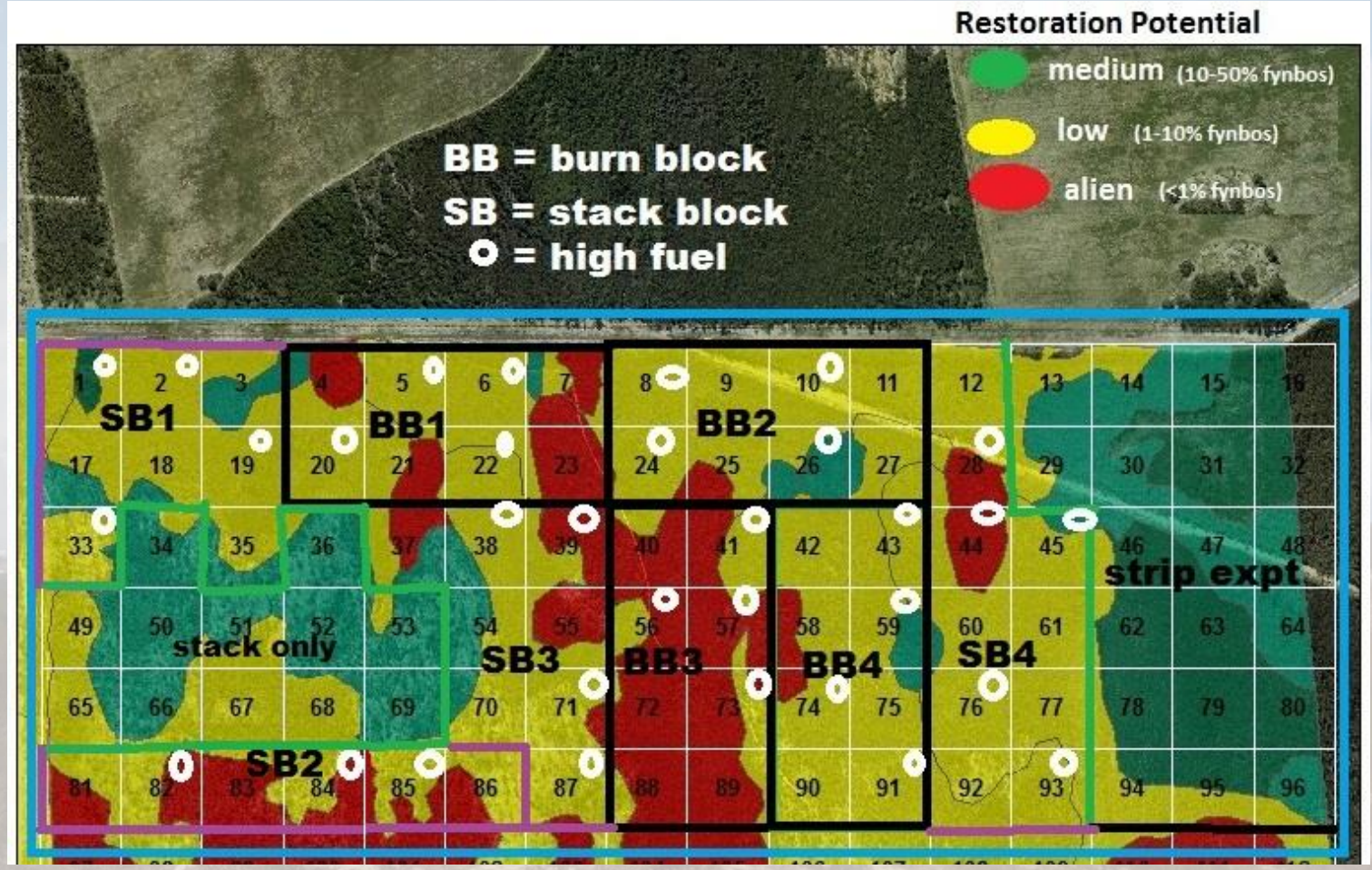
- Standard clearing methods may not be most effective to conserve threatened biodiversity
- Better methods are needed for clearing Acacias from vast areas of sandveld on West and South Coast in the CFR.

Objectives of this study

Determine the best method to control invasive species which also facilitates establishment of a functional native vegetation community

1. Fynbos recovery following alien clearing
   - **Passive restoration**, only alien clearing
2. Reintroduction of key vegetation components
   - **Active restoration**, clearing and sowing seed

Plot layout and treatments



Stack Block

Restoration experiments

Burn Block

Restoration experiments

Burn Block post-burn

Vegetation recovery following different alien clearing and burning methods

- 5x10m plots
- Pre-burn survey
  - Acacia density
  - Acacia seed bank
  - Indigenous vegetation diversity and cover
  - Indigenous seed bank
  - Soil chemistry

Passive restoration

Vegetation recovery following different alien clearing and burning methods

- Post-clearing monitoring
  - Indigenous species richness
  - Seedling density
  - % cover of each species
- Determine species diversity and vegetation structure across restoration site and compare between treatments and with reference site

Passive restoration

Reference site survey

- Replicate plots surveyed at Papekuils Outspan
- Mature vegetation
  - climax structure
- Burnt vegetation
  - wildfire at same time as BB controlled burn
  - Vegetation recovery rate

Reference site survey

Reintroduction of key Fynbos structural component species

- Seed collected from the site and neighbouring unprotected land
- Key structural components
  - Protea overstorey, ericoid shrubs: resprouting and non-sprouting, restioid shrubs
- Monitor vegetation as for passive restoration

Active restoration

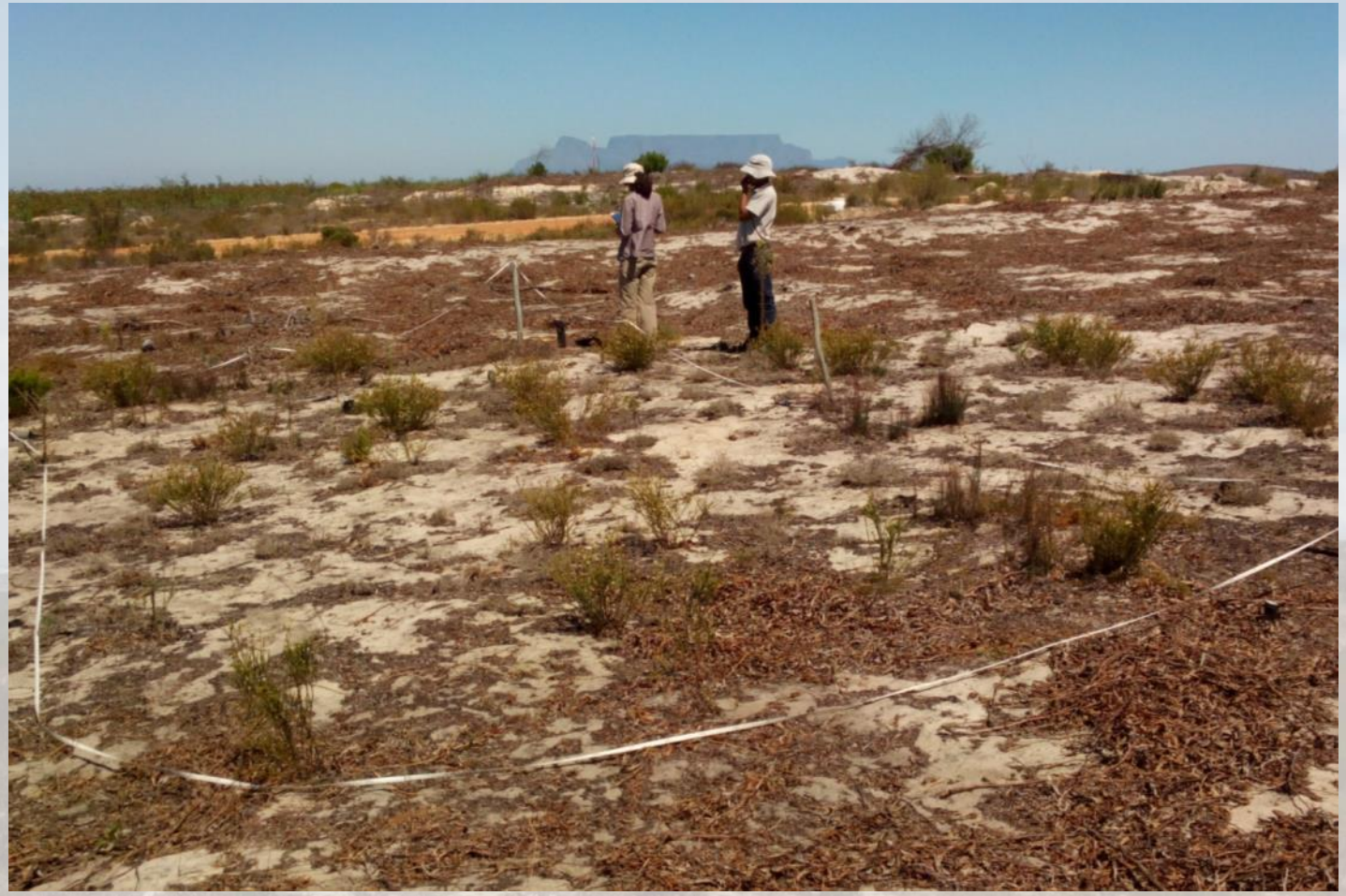
Passive Restoration SB plot

3 years post-clearing

Passive Restoration SB plot

October 2013

March 2015



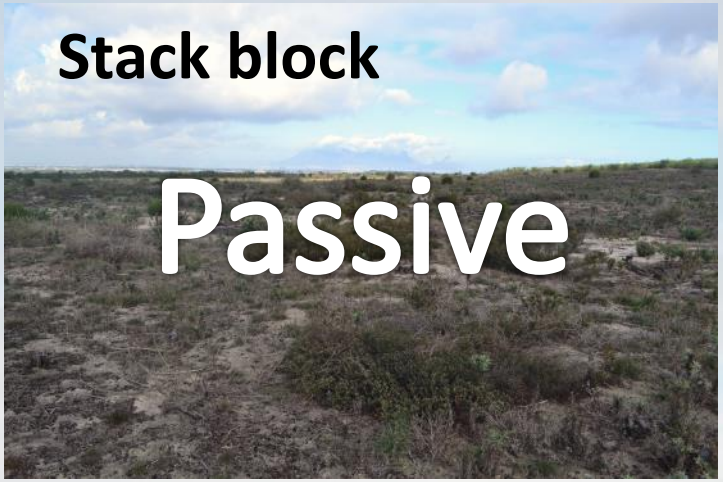
Passive restoration BB plot March 2016

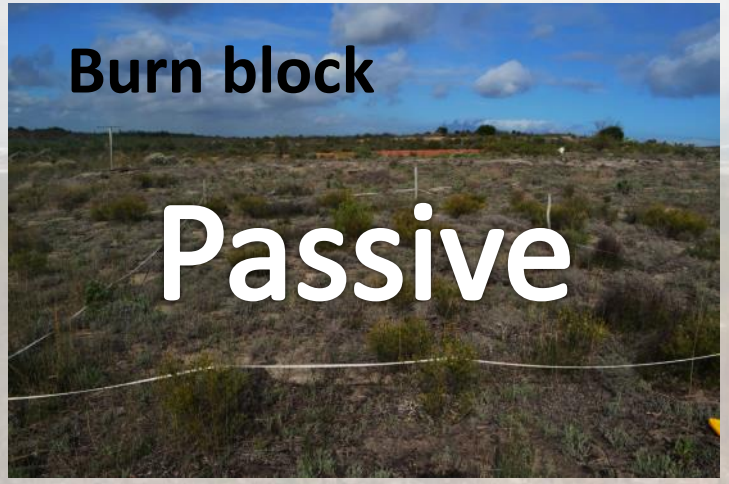
3 years post-fire

Active Restoration – Fynbos mix

3 years after sowing

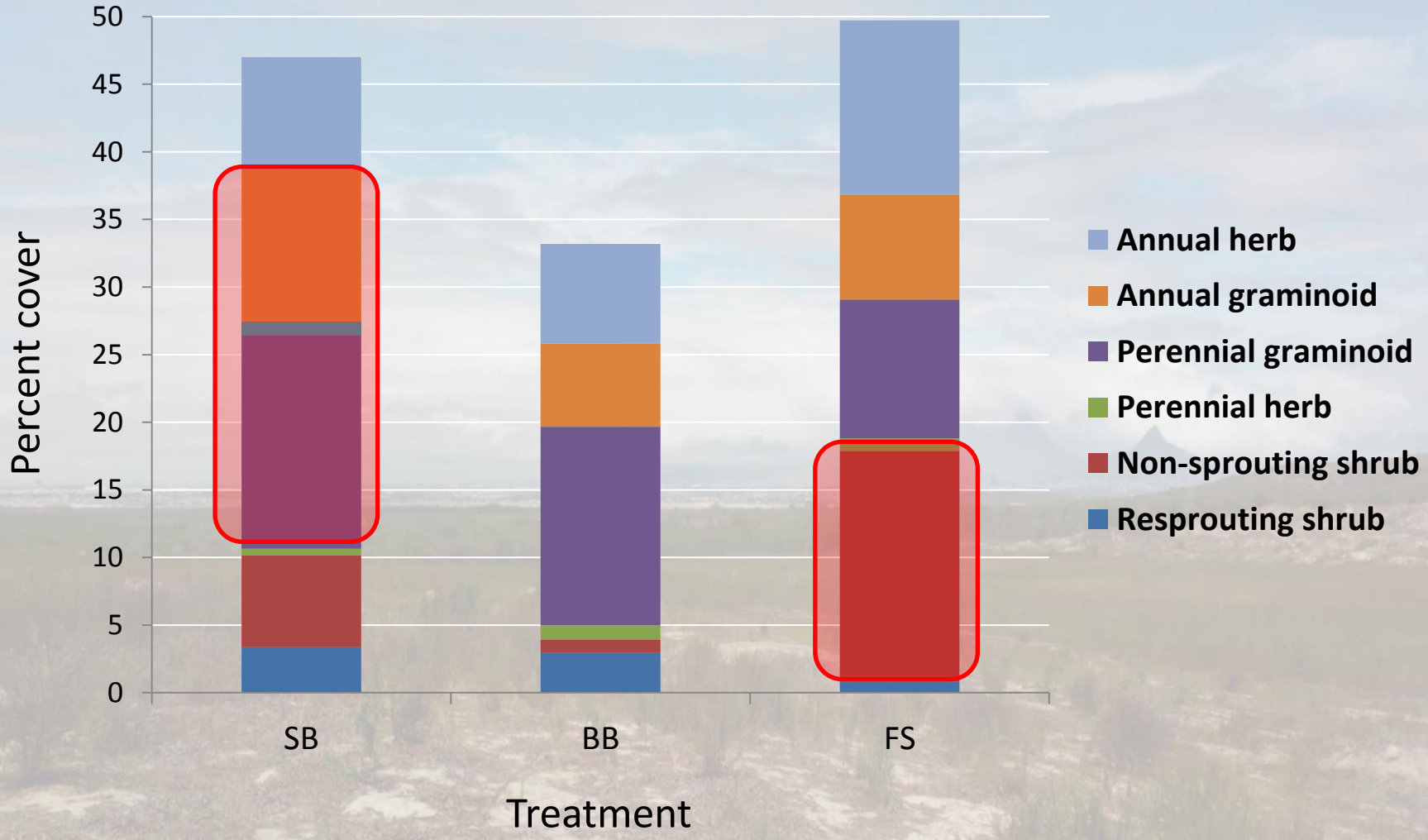
Restoration treatments



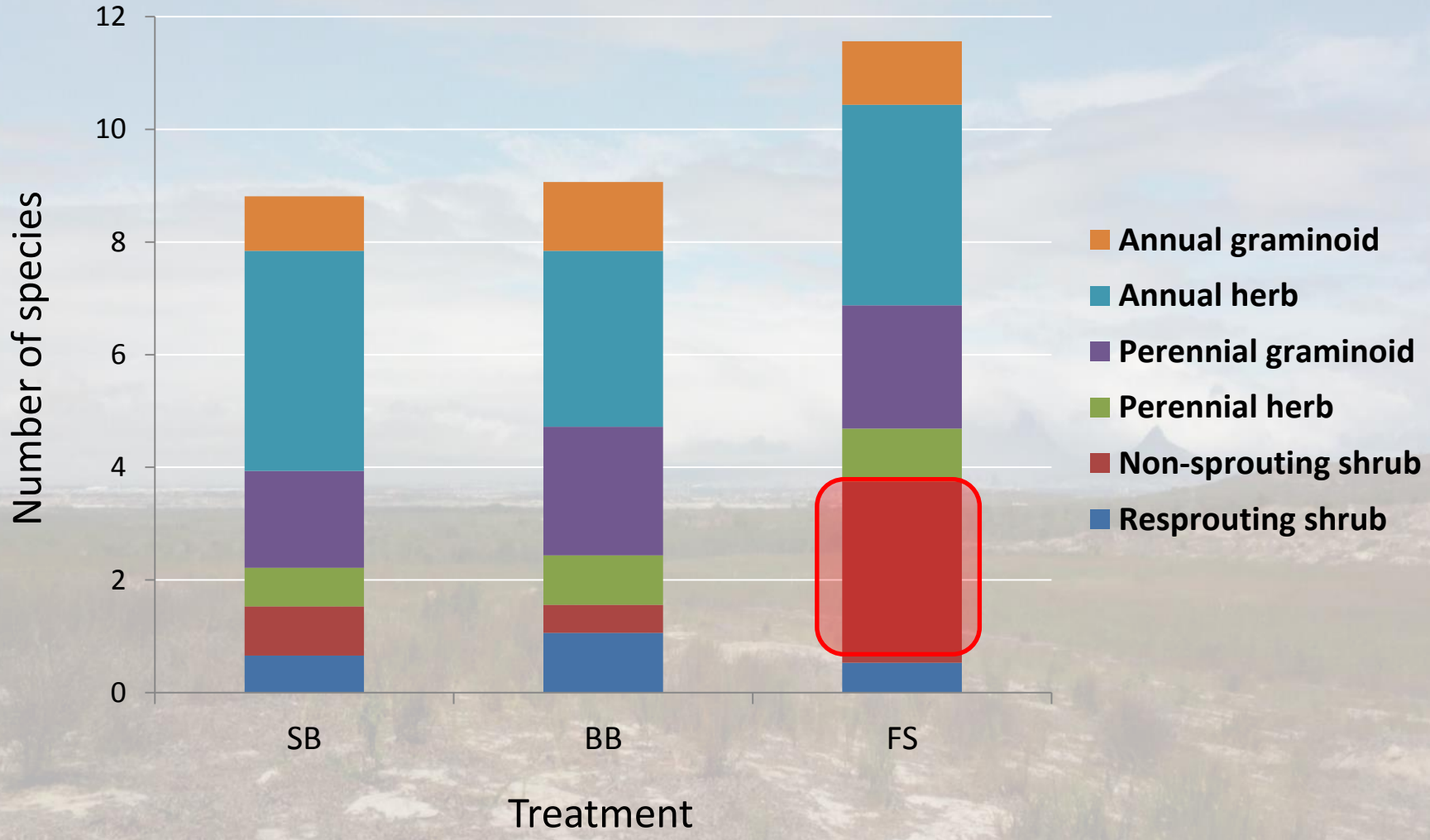


3 years post-clearing

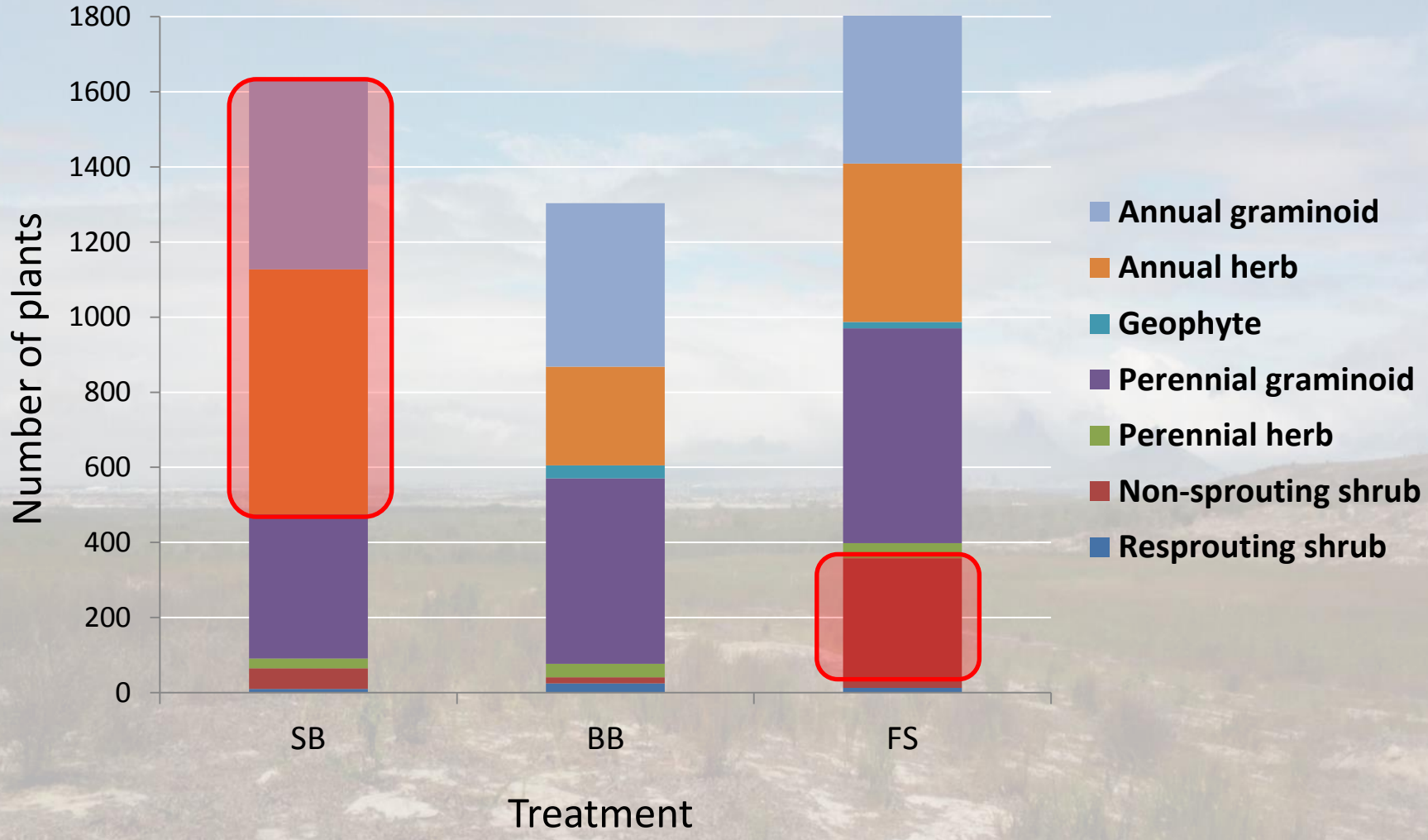
Cover of vegetation growth forms under different restoration treatments



Average species richness under different restoration treatments



Seedling density under different restoration treatments



Follow-up sowing experiment

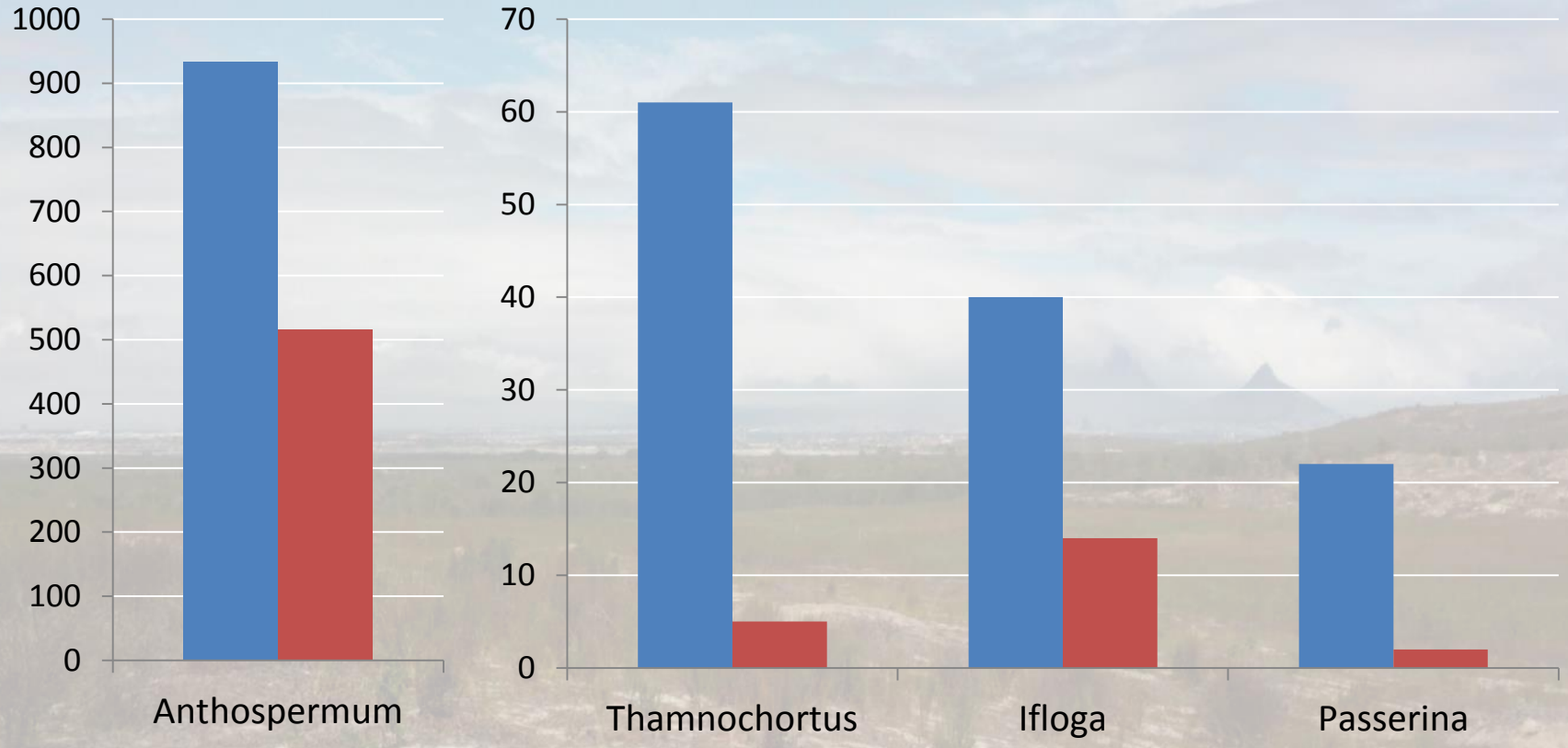
- Seed collected from 27 species within or close to the site
- Samples divided in two for each plot and one pre-treated, 12 species for heat and smoke and 15 just smoke.
- 10 plots sown adjacent to monitoring plots in BB area.

Active restoration

Follow-up sowing experiment

2 years after sowing

Number of seedlings of selected species in treated (blue) and untreated (red) seed mixes



Preliminary conclusions

- Depleted indigenous seedbank – poor Fynbos recovery in both passive treatments.
- Weedy grasses are more prolific without burning, while acacias dominate after fire.
- Few species of Fynbos established from sown seed without pre-treatment, but still better than without sowing.
- Pre-treatment of seed facilitates better establishment in sown plots in the field.

Future outcomes

- Sowing pre-treated seed appears to be the best strategy.
- Still need to factor in costs for initial and follow-up clearing as well as for sourcing seeds.
- Model simulating long-term recovery.
- Guidelines for better management of alien-invaded lowland Fynbos.

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