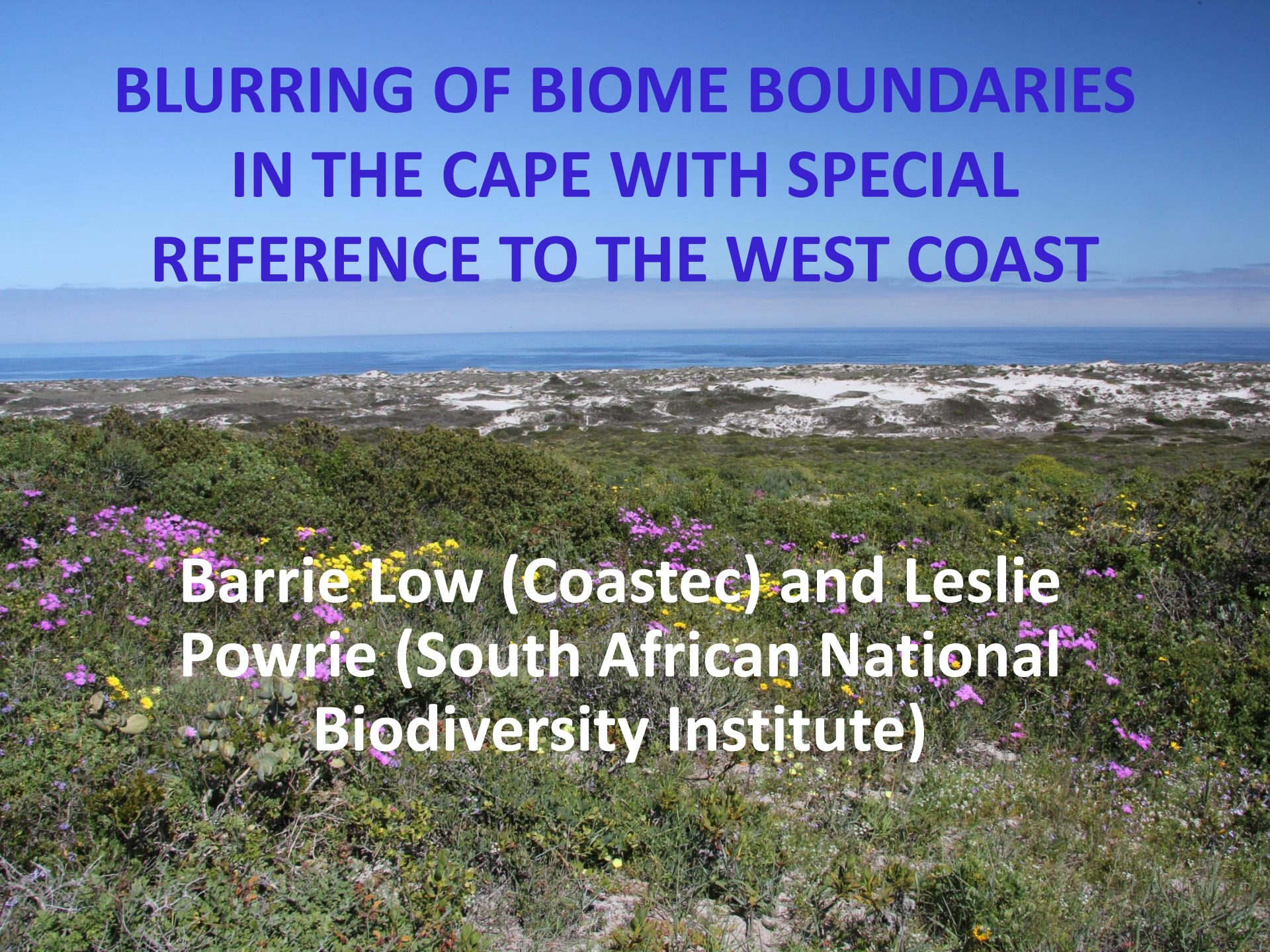
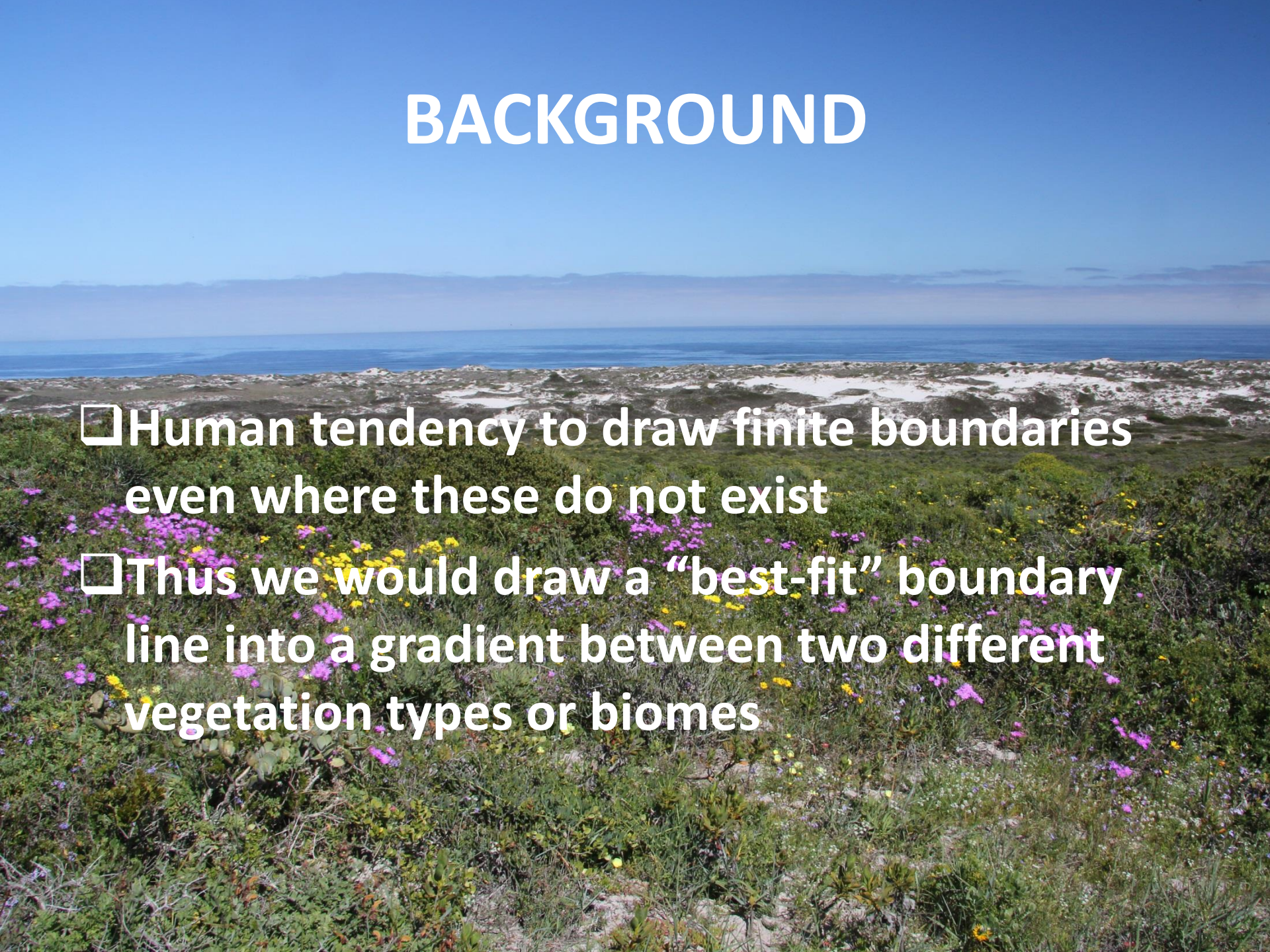
BLURRING OF BIOME BOUNDARIES IN THE CAPE WITH SPECIAL REFERENCE TO THE WEST COAST



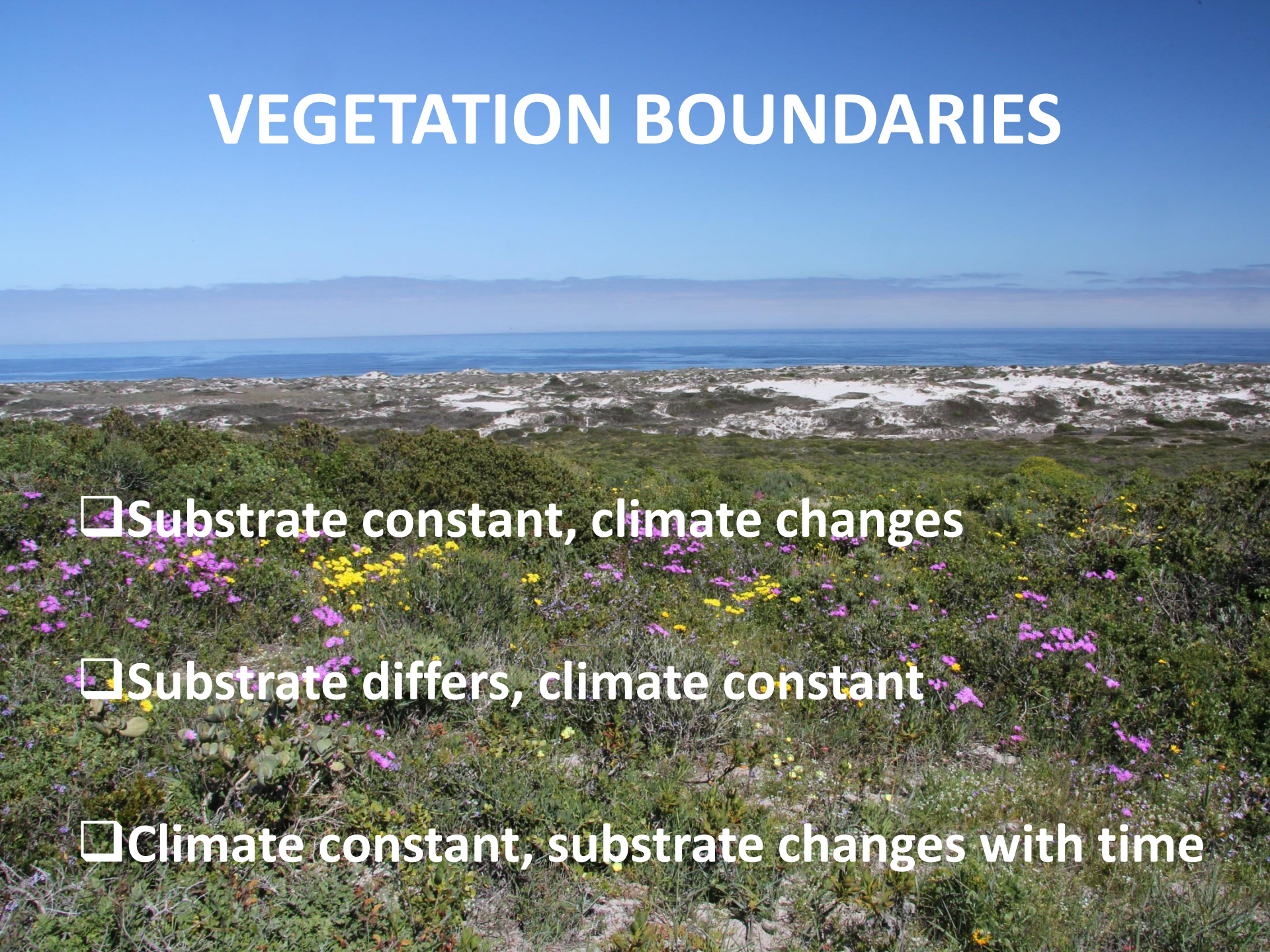
Barrie Low (Coastec) and Leslie Powrie (South African National Biodiversity Institute)

BACKGROUND

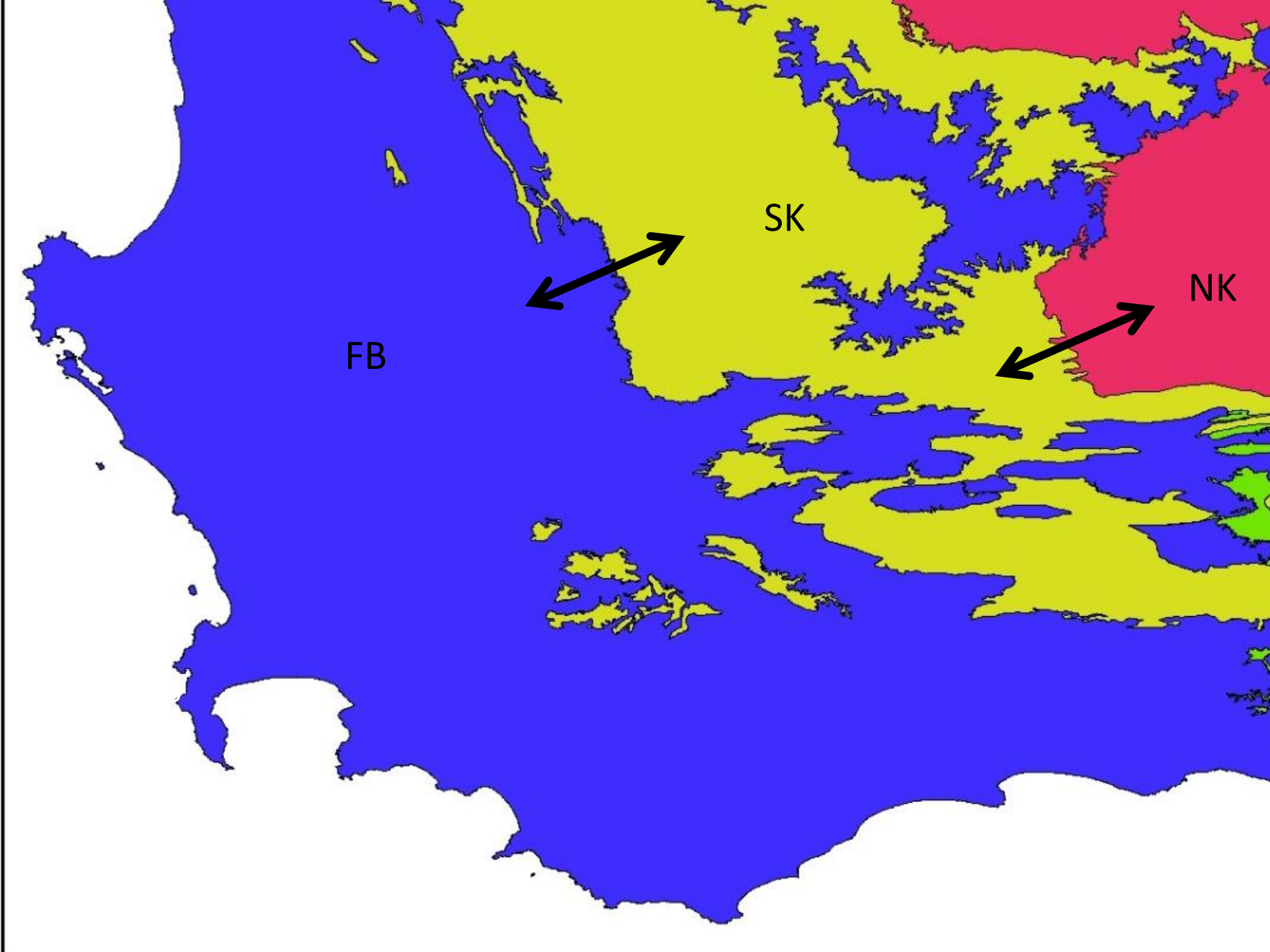


- Human tendency to draw finite boundaries even where these do not exist
- Thus we would draw a “best-fit” boundary line into a gradient between two different vegetation types or biomes

VEGETATION BOUNDARIES

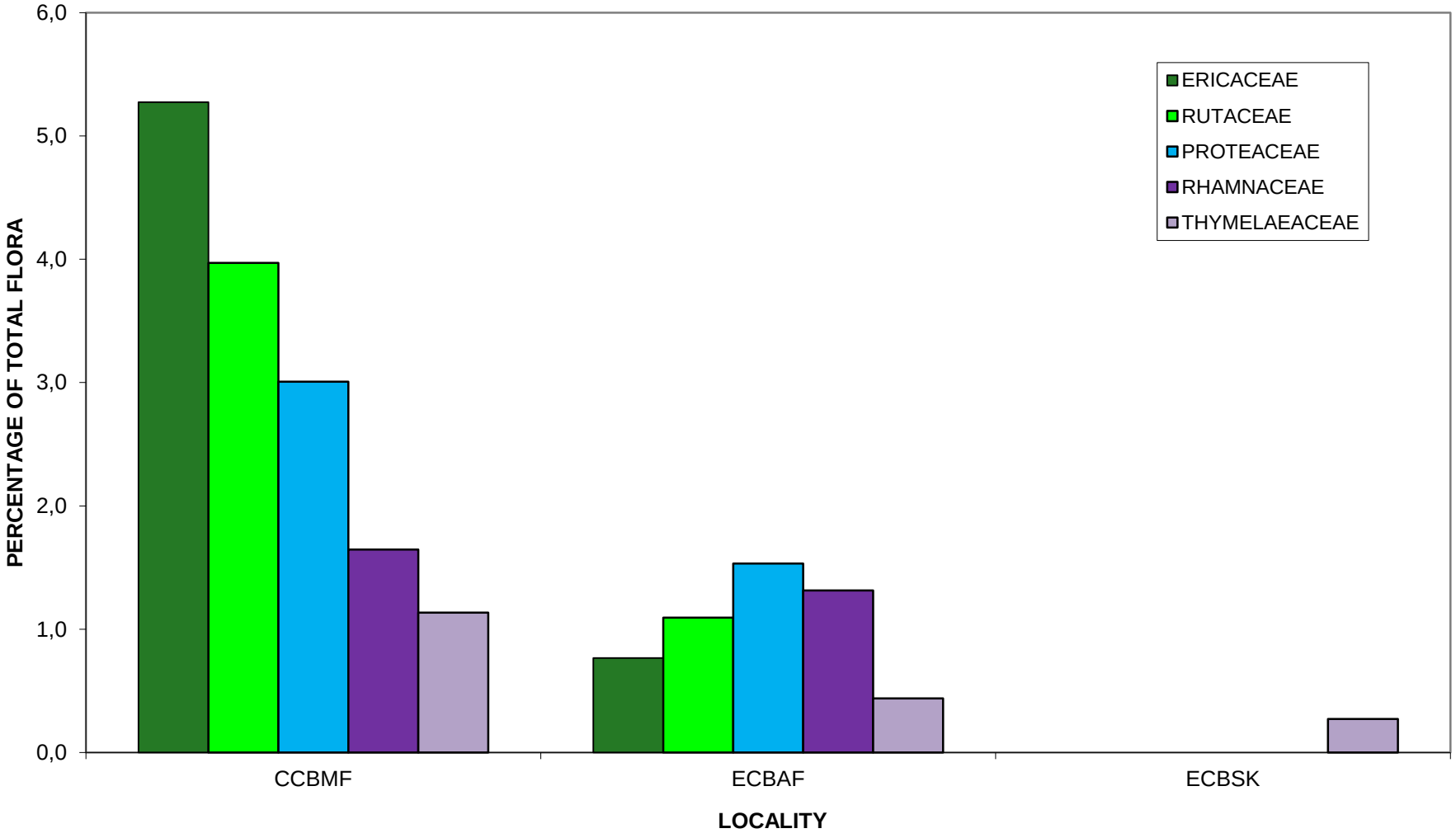


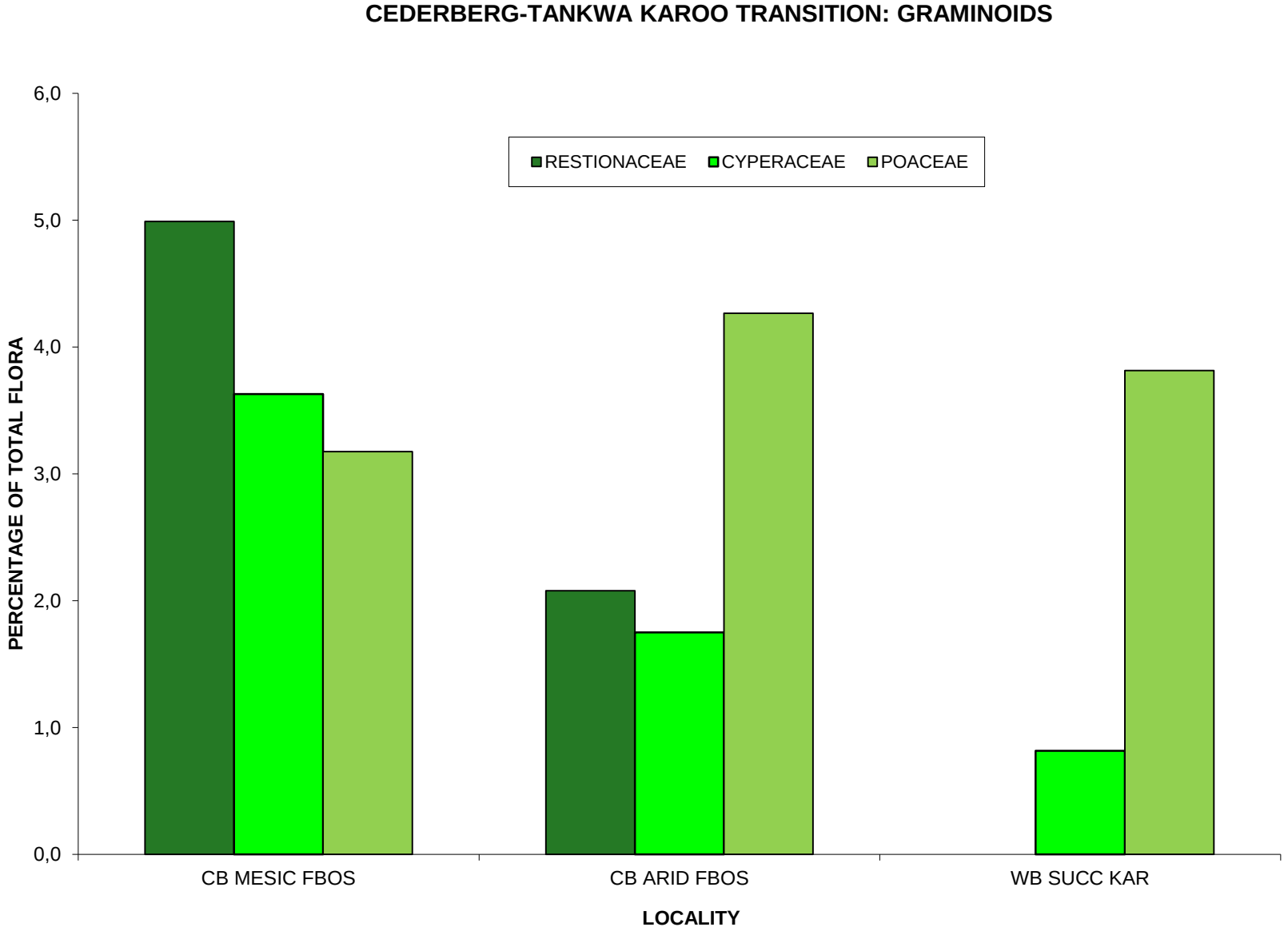
- Substrate constant, climate changes
- Substrate differs, climate constant
- Climate constant, substrate changes with time

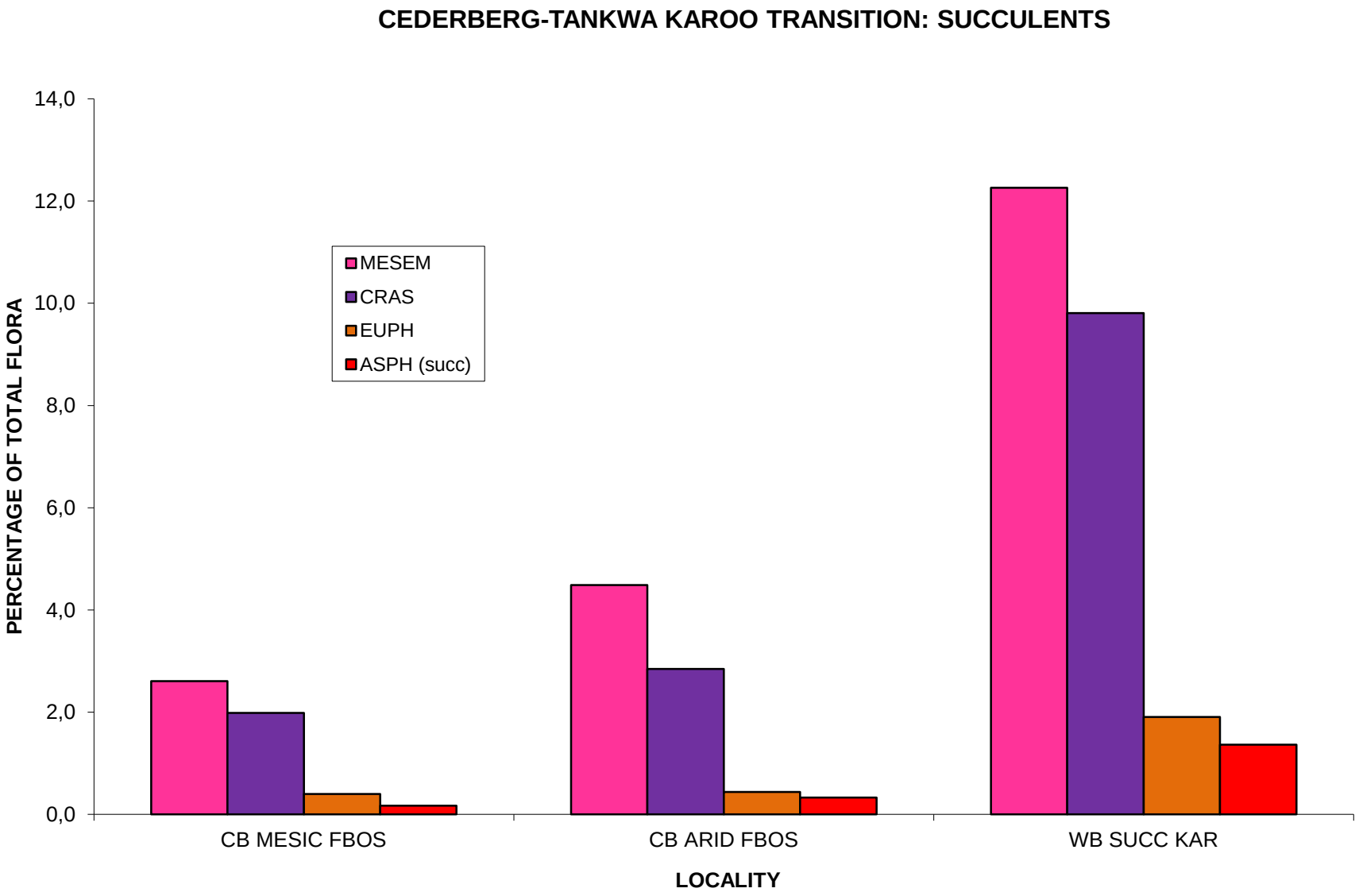

SK
NK
FB

QUARTZITE CONSTANT – CLIMATE VARIES (CEDERBERG TO TANQUA KAROO)

CEDERBERG-TANKWA KAROO TRANSITION: FYNBOS SHRUBS

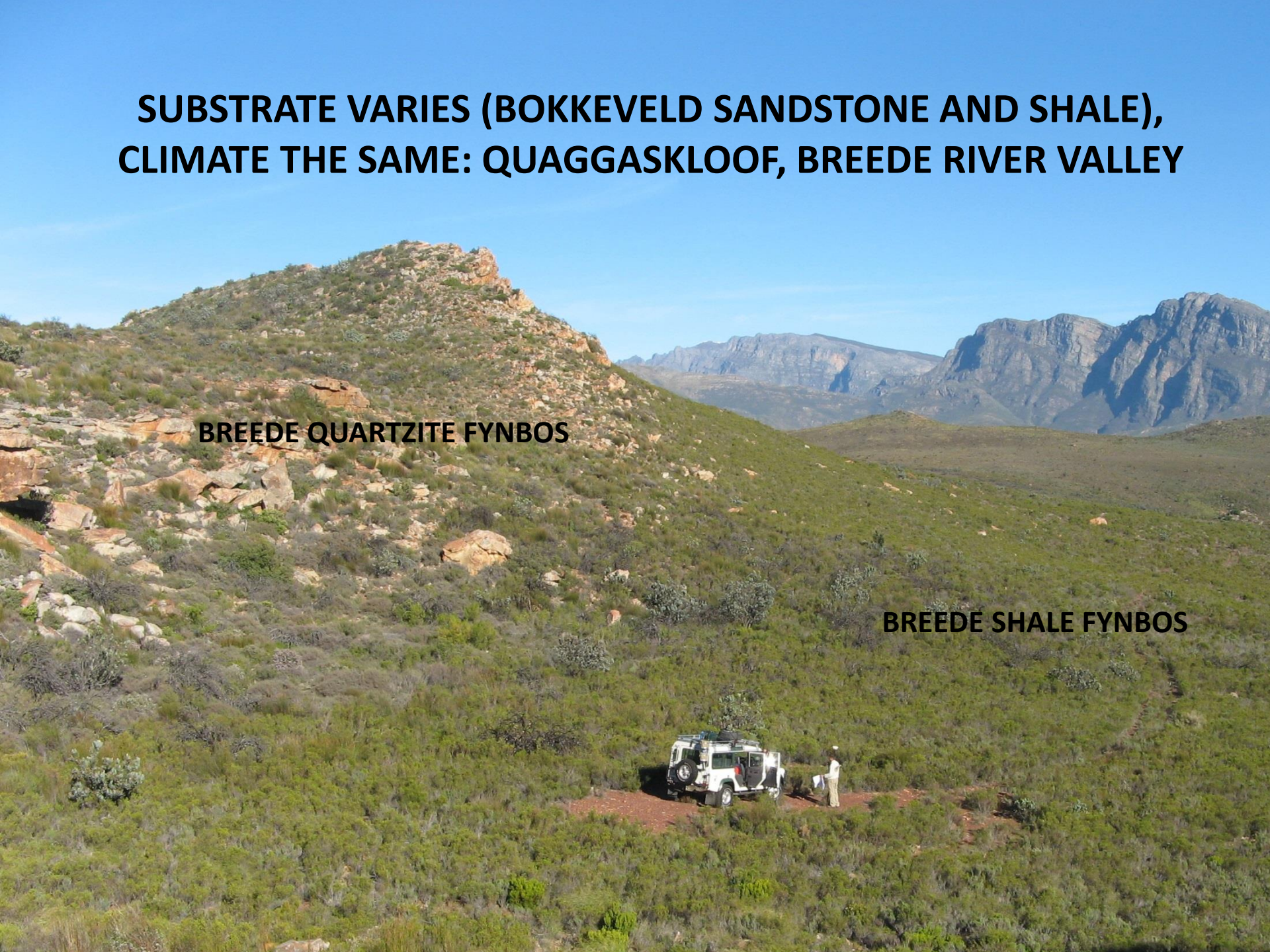



CEDERBERG-TANKWA KAROO TRANSITION: GRAMINOIDS
RESTIONACEAE
CYPERACEAE
POACEAE
6,0
5,0
4,0
3,0
2,0
1,0
0,0
PERCENTAGE OF TOTAL FLORA
CB MESIC FBOS
CB ARID FBOS
WB SUCC KAR
LOCALITY

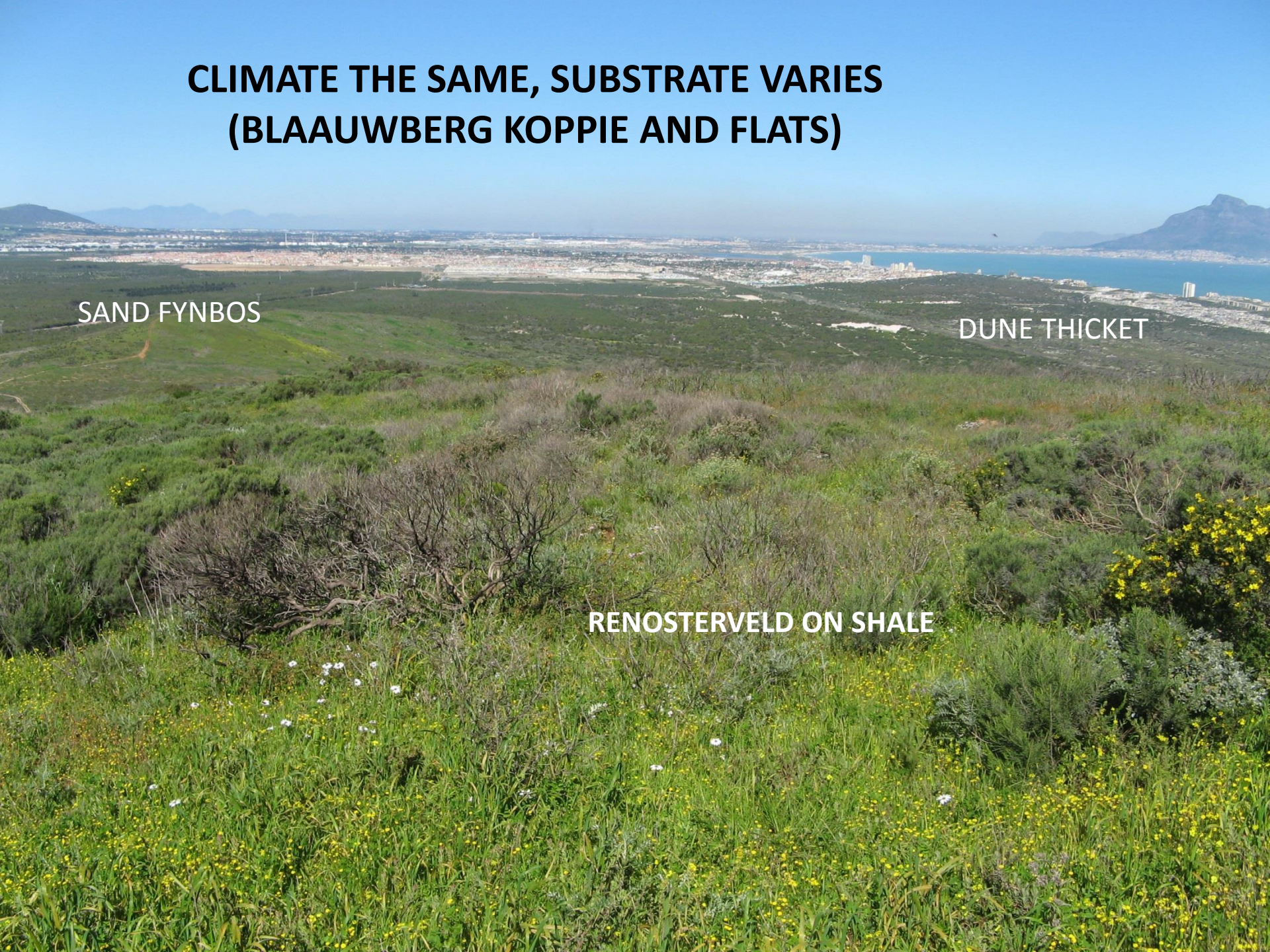

CEDERBERG-TANKWA KAROO TRANSITION: SUCCULENTS
14,0
12,0
10,0
8,0
6,0
4,0
2,0
0,0
PERCENTAGE OF TOTAL FLORA
MESEM
CRAS
EUPH
ASPH (succ)
CB MESIC FBOS
CB ARID FBOS
WB SUCC KAR
LOCALITY


CLIMATE CONSTANT, GRANITE NEXT TO CALCAREOUS LIMESTONE/ SAND, SALDANHA PENINSULA
SALDANHA GRANITE RENOSTERVELD
SALDANHA LIMESTONE THICKET

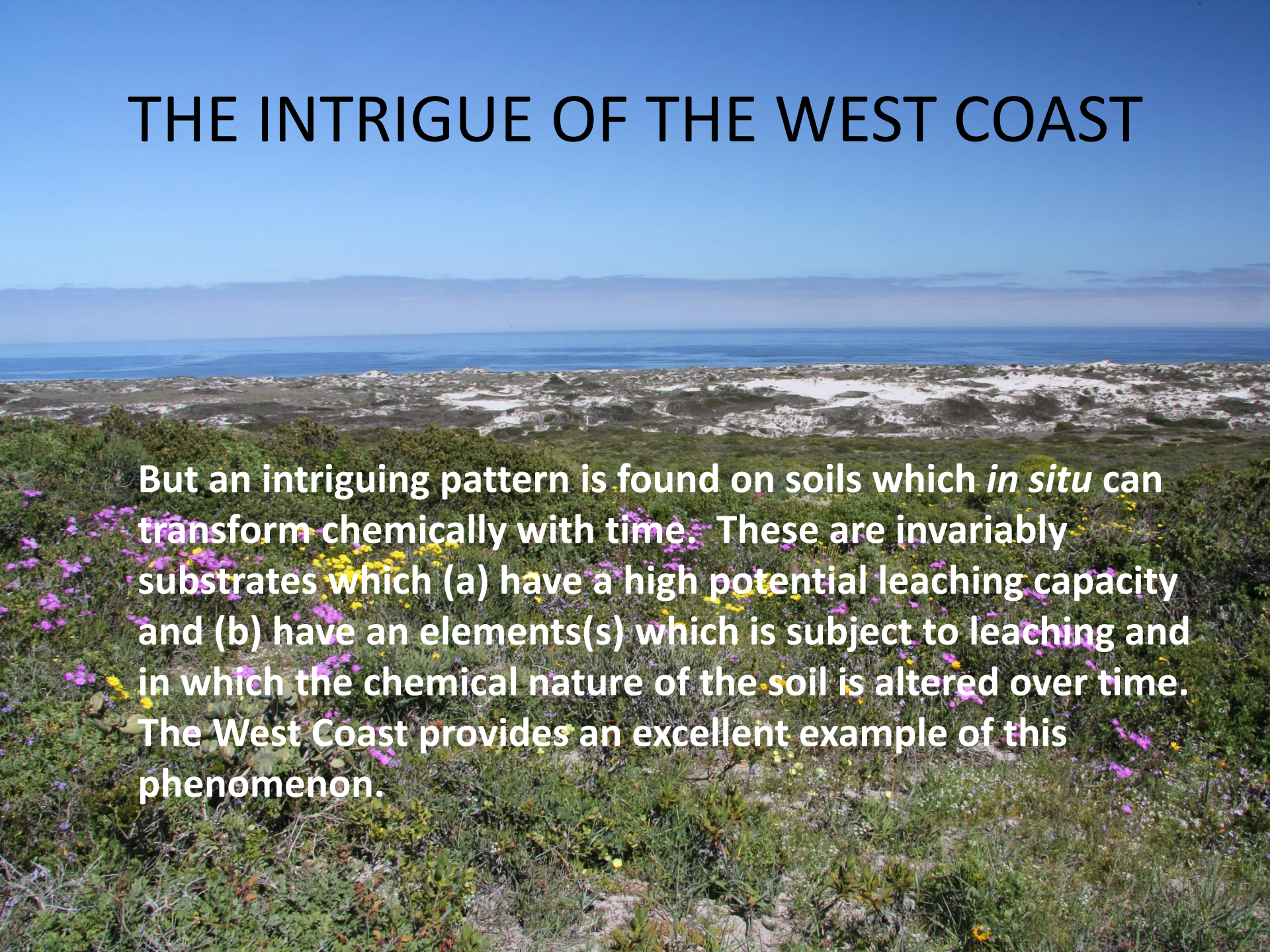
SUBSTRATE VARIES (BOKKEVELD SANDSTONE AND SHALE), CLIMATE THE SAME: QUAGGASKLOOF, BREEDE RIVER VALLEY



CLIMATE THE SAME, SUBSTRATE VARIES (BLAAUWBERG KOPPIE AND FLATS)



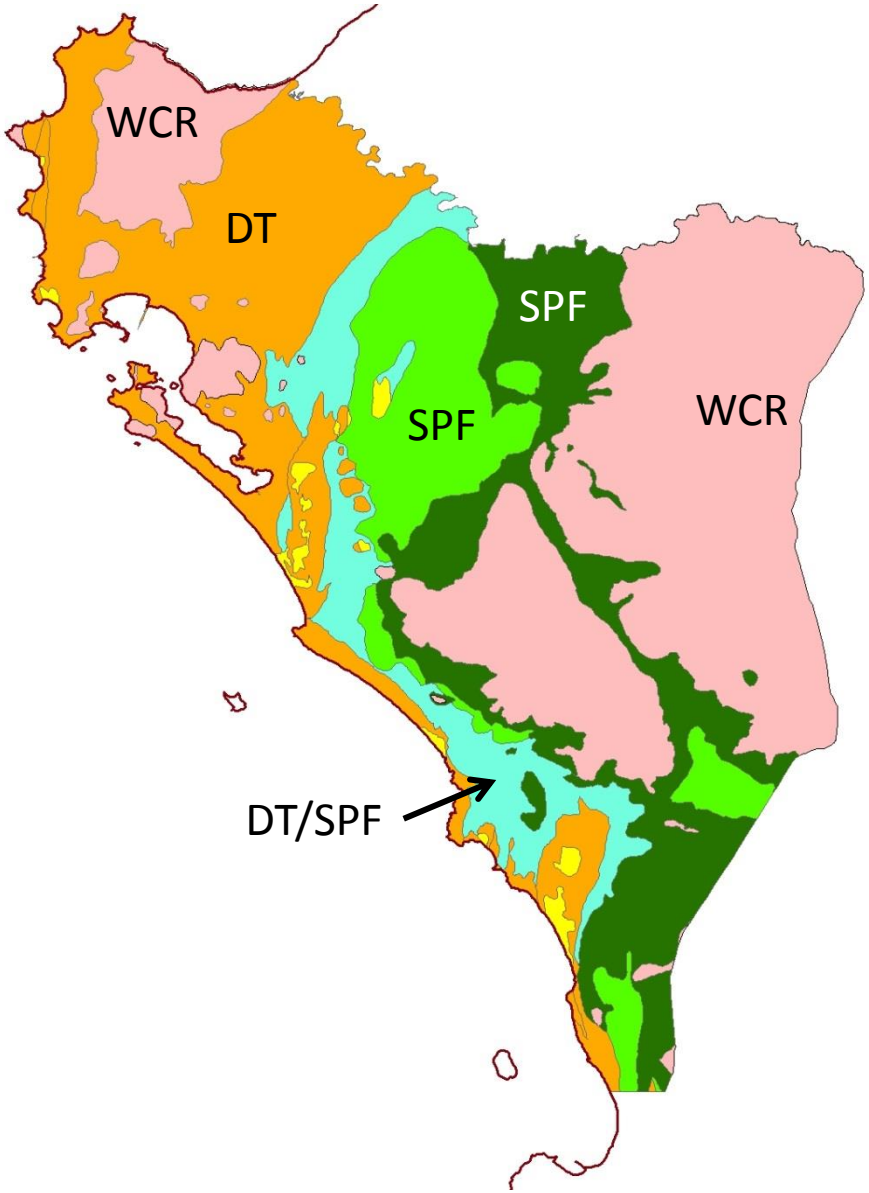
THE INTRIGUE OF THE WEST COAST

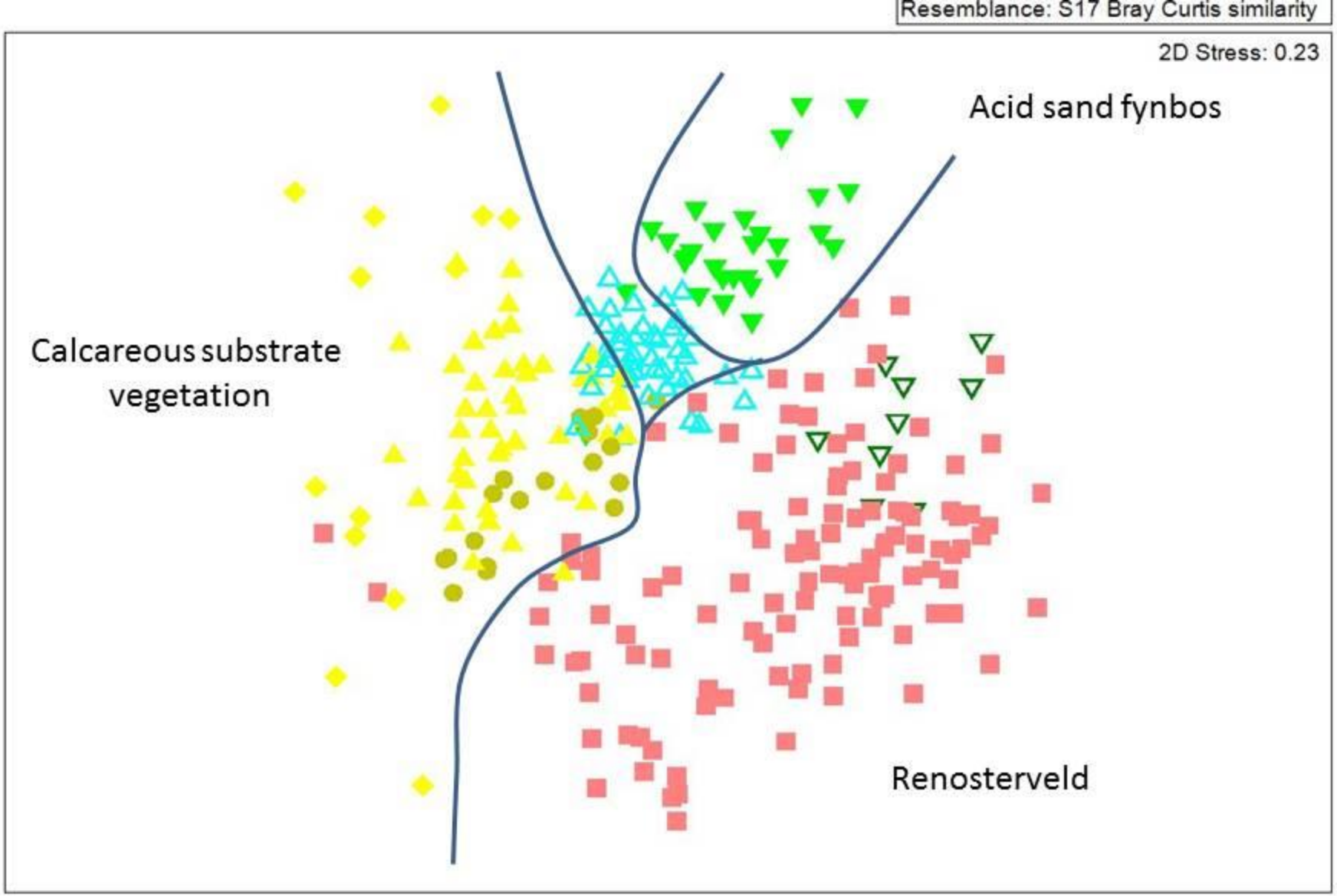


But an intriguing pattern is found on soils which *in situ* can transform chemically with time. These are invariably substrates which (a) have a high potential leaching capacity and (b) have an elements(s) which is subject to leaching and in which the chemical nature of the soil is altered over time. The West Coast provides an excellent example of this phenomenon.

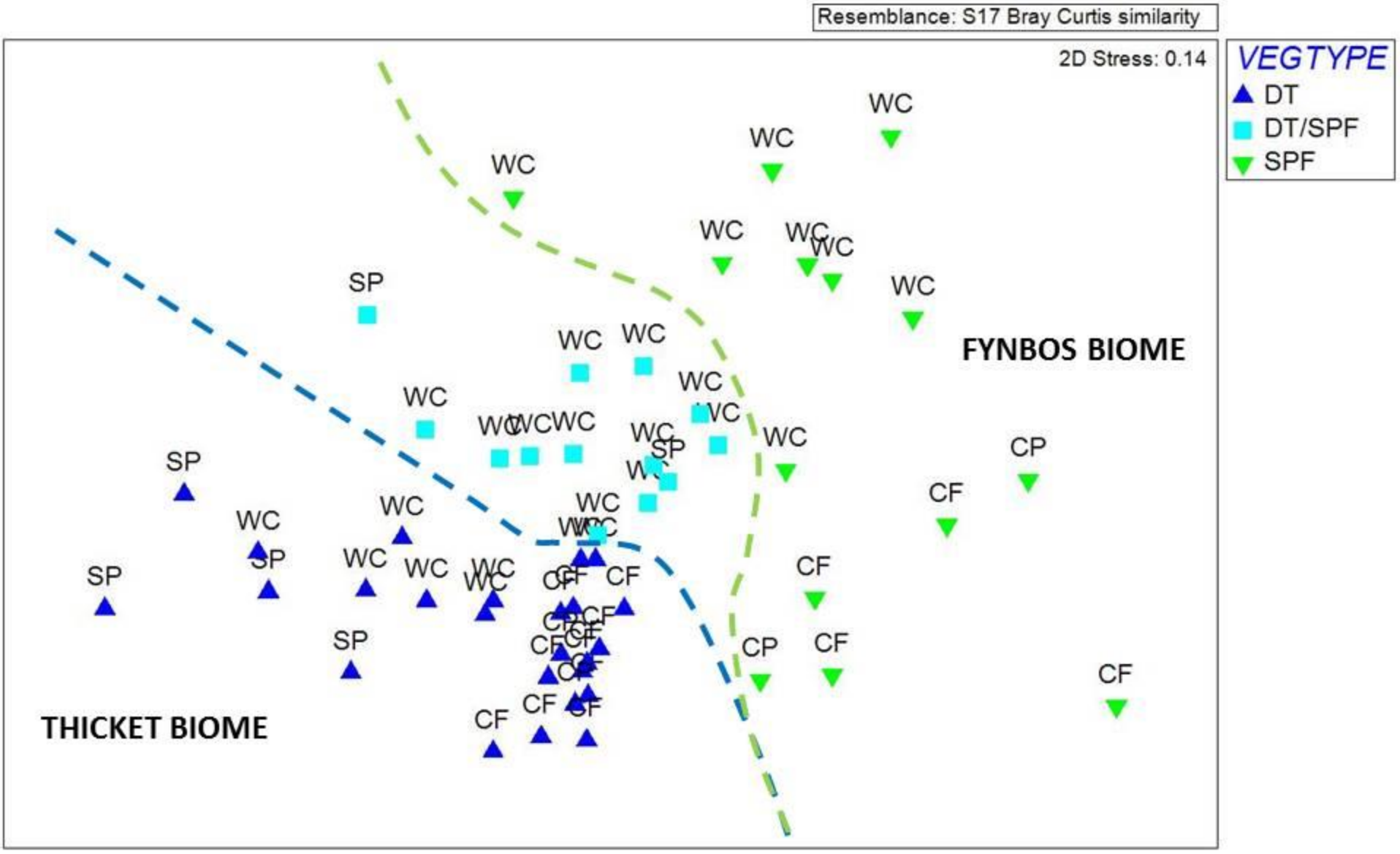
POSSIBLE SCENARIOS

- Detailed vegetation mapping on the West Coast south of Saldanha shows thicket and fynbos separated by a unit which represents a mix of species from both extremes. This in turn suggests the thicket versus fynbos biome boundary in this region is blurred
- With time, two scenarios can be painted:
  - (i) Coastal sands will continue leaching until all soils reach maximum acidity and support only fynbos
  - ii) Coastal sands will continue to feed into the system from the south and south-west and provide a continuous supply of calcareous material, thus ensuring the process is unending

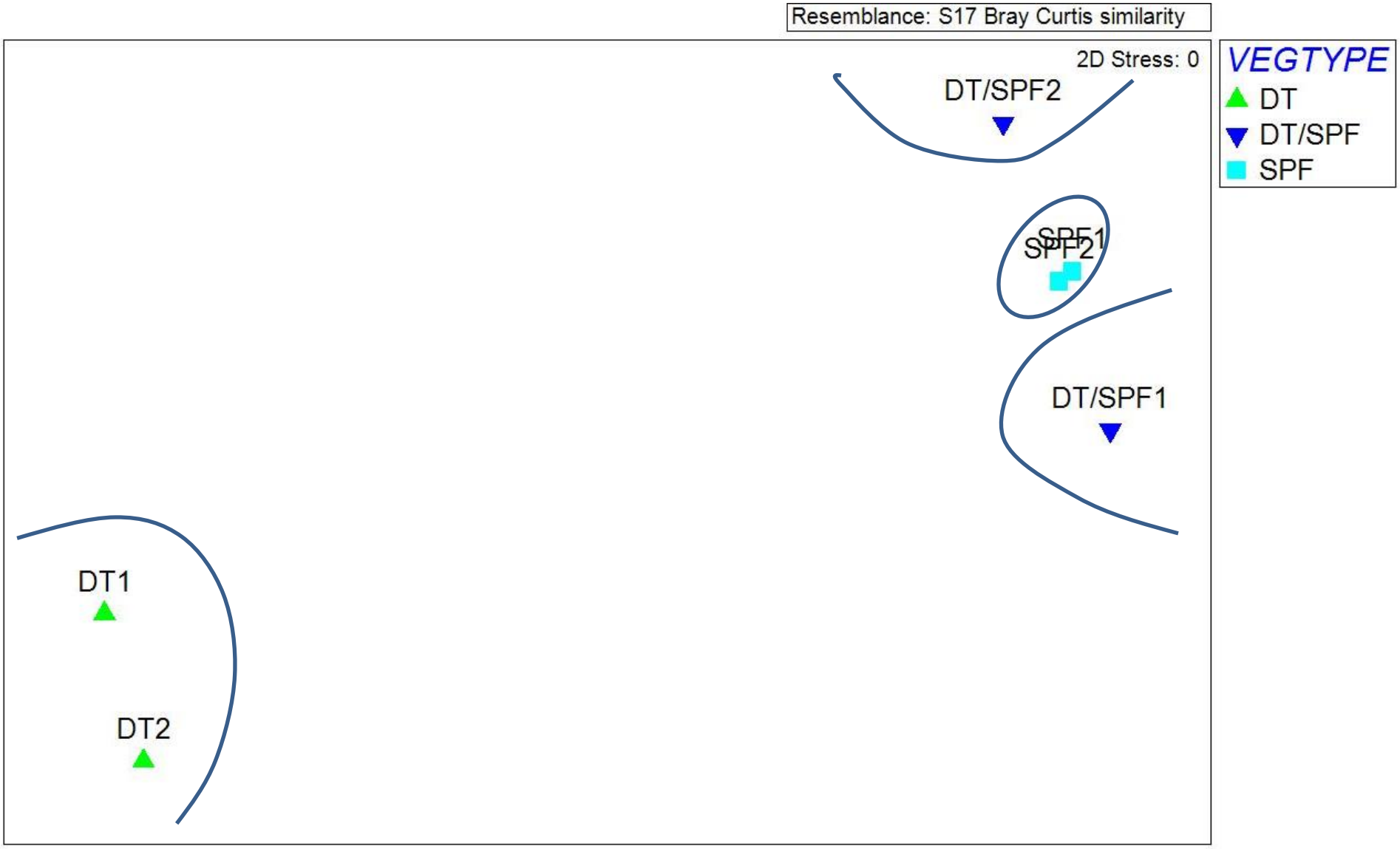

WCR
DT
SPF
SPF
WCR
DT/SPF



MDS analysis of plots from the West Coast. There is clear separation of calcareous substrate, acid sand fynbos and renosterveld vegetation types. Dune thicket plots are in dark yellow circles. The turquoise triangles represent a calcareous sand to acid sand transition



MDS analysis of coastal sand floras from the Saldanha Peninsula (SP) and West Coast (WC) to the Cape Flats (CF) and Cape Peninsula (CP) showing separation into DT, DT-SPF and SPF on the one hand, and subregional floras on the other



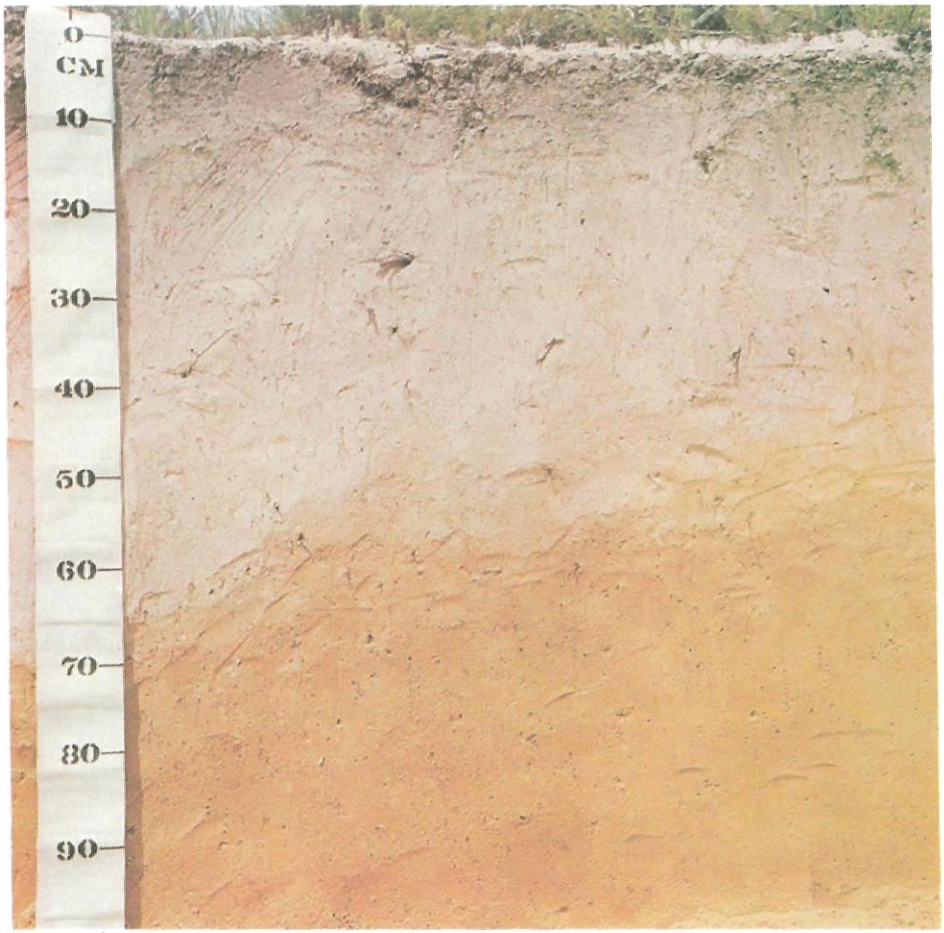
Floristic relationship (200 m2 plots) amongst dune thicket and sand fynbos on the West Coast at Jakkalsfontein. Note that the ecotonal vegetation type (DT/SPF) is allied with SPF and not DT

FERNWOOD FORM — Fw

ORTHIC A

E HORIZON

CONSTANTIA FORM — Ct



ORTHIC A

E HORIZON

YELLOW-BROWN
APEDAL
B

LAMOTTE FORM — Lt

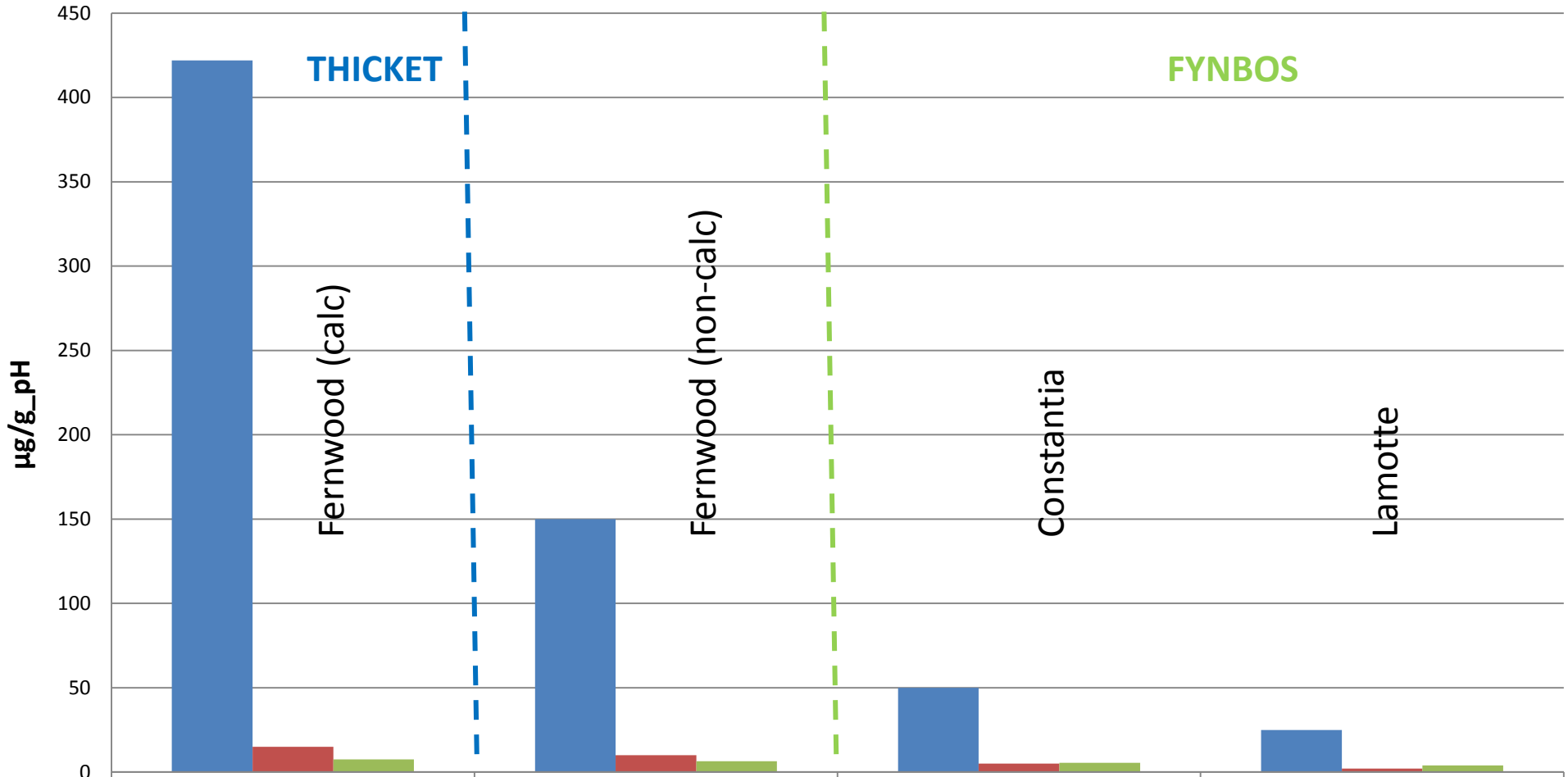
ORTHIC A

E HORIZON

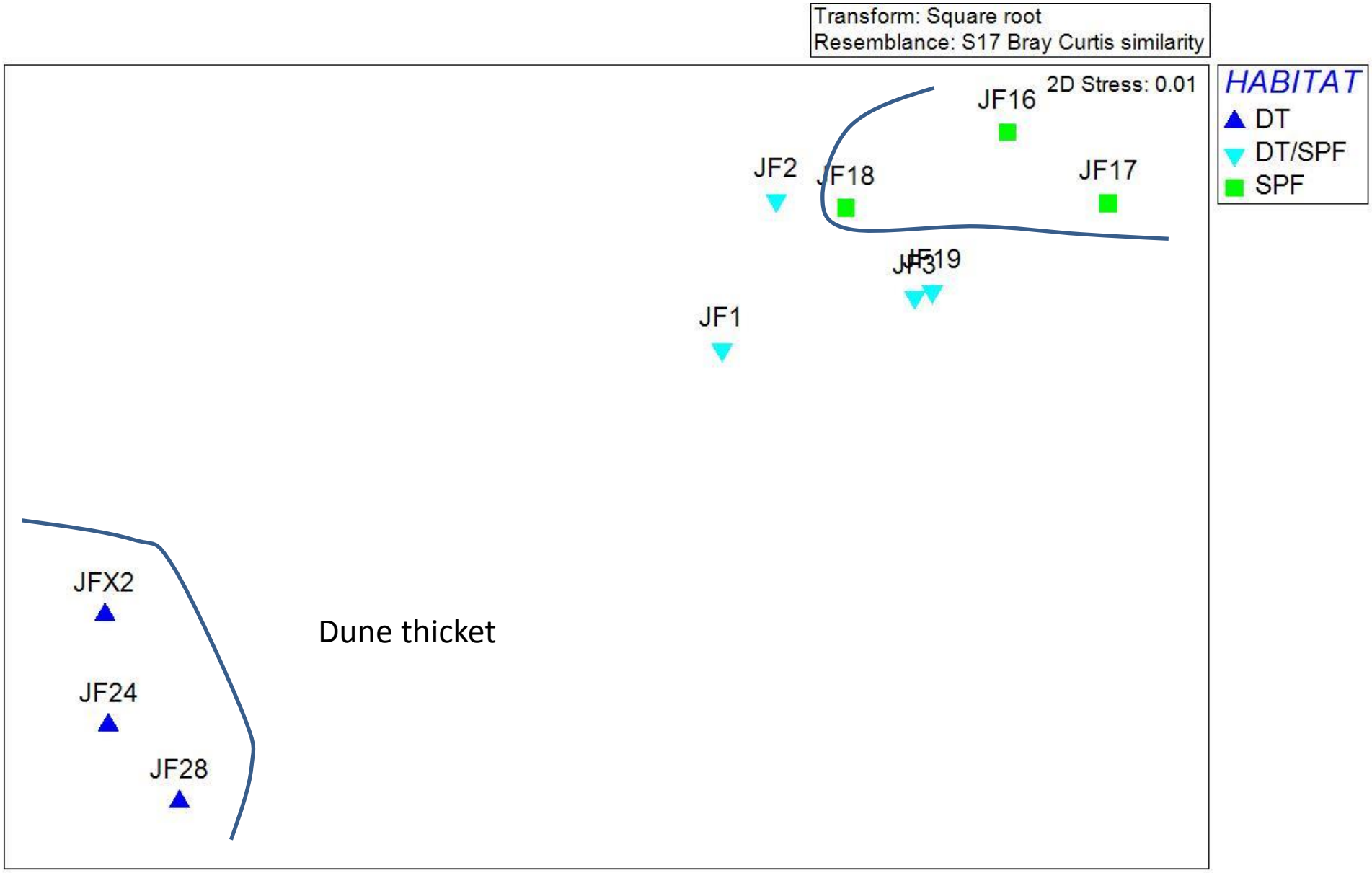
PODZOL B

UNCONSOLIDATED MATERIAL WITH SIGNS OF WETNESS

Change in soil chemistry along ecotone between dune thicket and sand fynbos on the West Coast



	Dune thicket	DT/SPF	Sand plain fynbos	Sand plain fynbos
P	422	150	50	25
Ca	15	10	5	2
pH	7,5	6,5	5,5	4



MDS of topsoils (pH, resistance, P, cations) on the West Coast at Jakkalsfontein showing the ecotone between dune thicket and sand plain fynbos

CONCLUSIONS

- Dune thicket and sand plain fynbos differ (both floristics and vegetation) – these are separate BIOMES!)
- On the West Coast they are generally separated by an ecotone which has elements of both DT and SPF
- Floristically this ecotone has a greater affinity with SPF than DT

CONCLUSIONS (contd.)

- The ecotone between DT and SPF occurs along a soil gradient (climate similar) where there is gradual leaching and loss of key elements, leading to a “blurry” boundary between the two
- Soil chemistry of DT/SPF and SPF far more similar than that of DT, mainly due to a significant reduction in calcium, phosphorus and pH
- Leaching has probably occurred over the last 1000 years plus (late Holocene), suggesting long-term invasion of the ecotone by SPF
- However DT is maintained through constant inputs of calcareous sand at the coast
- The DT/SPF ecotone = >40 000 ha suggests a distinct (“new”) vegetation type, with possible inclusion in the Fynbos Biome