Setting restoration priorities for the Cape Floristic Region, using Cape Town as an example

P. M. Holmes & A. G. Rebelo
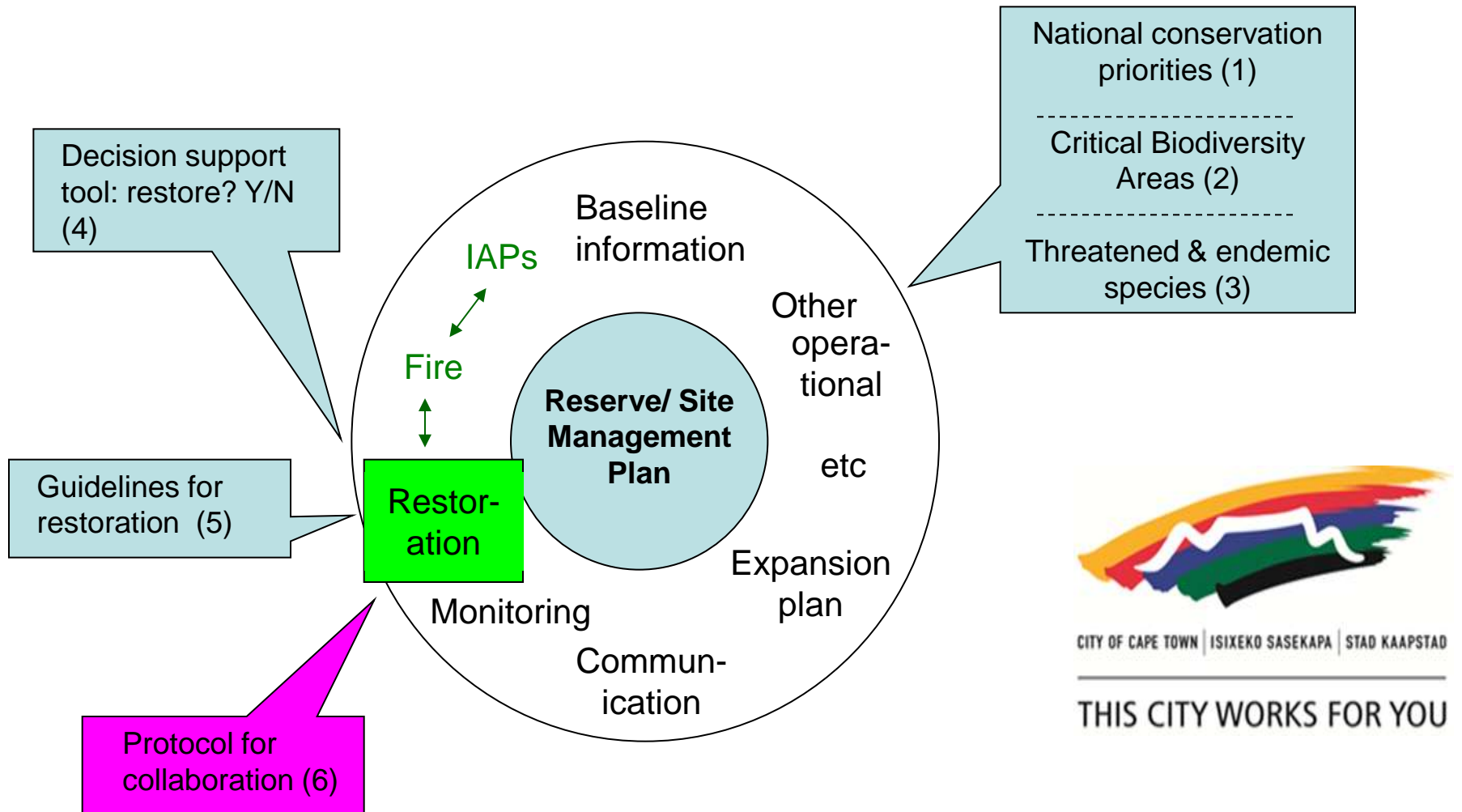

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THIS CITY WORKS FOR YOU

SANBI
Biodiversity for Life

Focus

- Planners to decide where to focus restoration for national targets

- Conservationers to manage threatened species conservation

- Protocol for Managers to assess if restoration is needed

Schematic indicating the role of a protocol for collaboration for ecological restoration within a broader management framework

- Not a recipe for restoration

Conceptual Framework for Restoration in Alien-invaded Riparian Zones

Establish realistic restoration target:
• rehabilitate for ecosystem function
• restore natural vegetation structure
• restore natural vegetation structure & diversity

Factors informing decision
Ecological: site history & condition:
• are degrading processes (abiotic & biotic) known?
• can they be reversed?
• are native propagule sources present?
Non-ecological constraints:
• site logistics
• human & financial resources

Practical restoration plan:
• alien removal – how?
• physical stabilization of banks?
• active restoration? – what species; sown or planted?
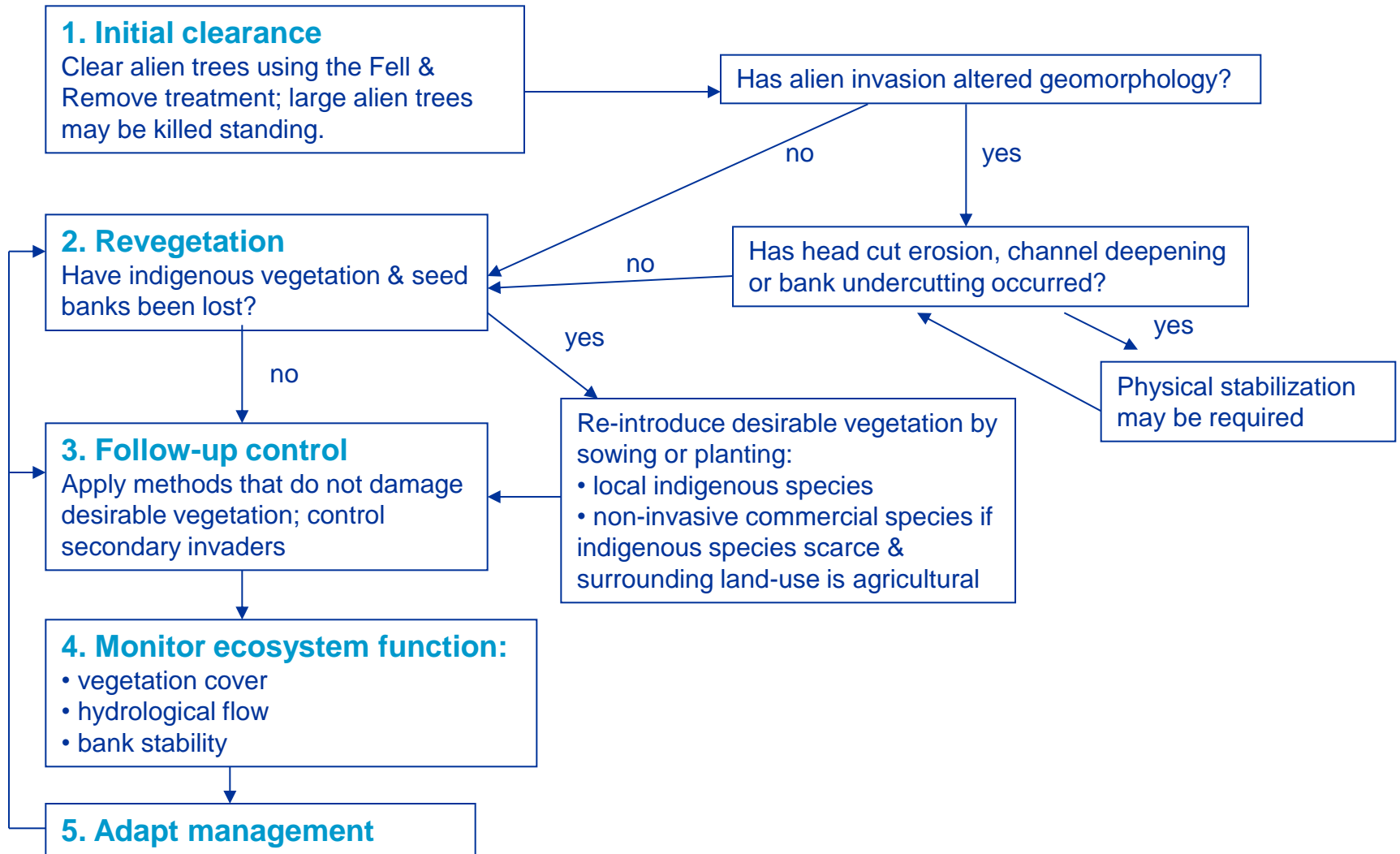
Implement restoration plan

Monitor key variables

Engage adaptive management

Notes:
• seek advice from ecologist
• incorporate restoration actions into alien clearing plans
• establish monitoring criteria at start

Adapted from Hobbs (2000) and Shafroth et al. (2008)

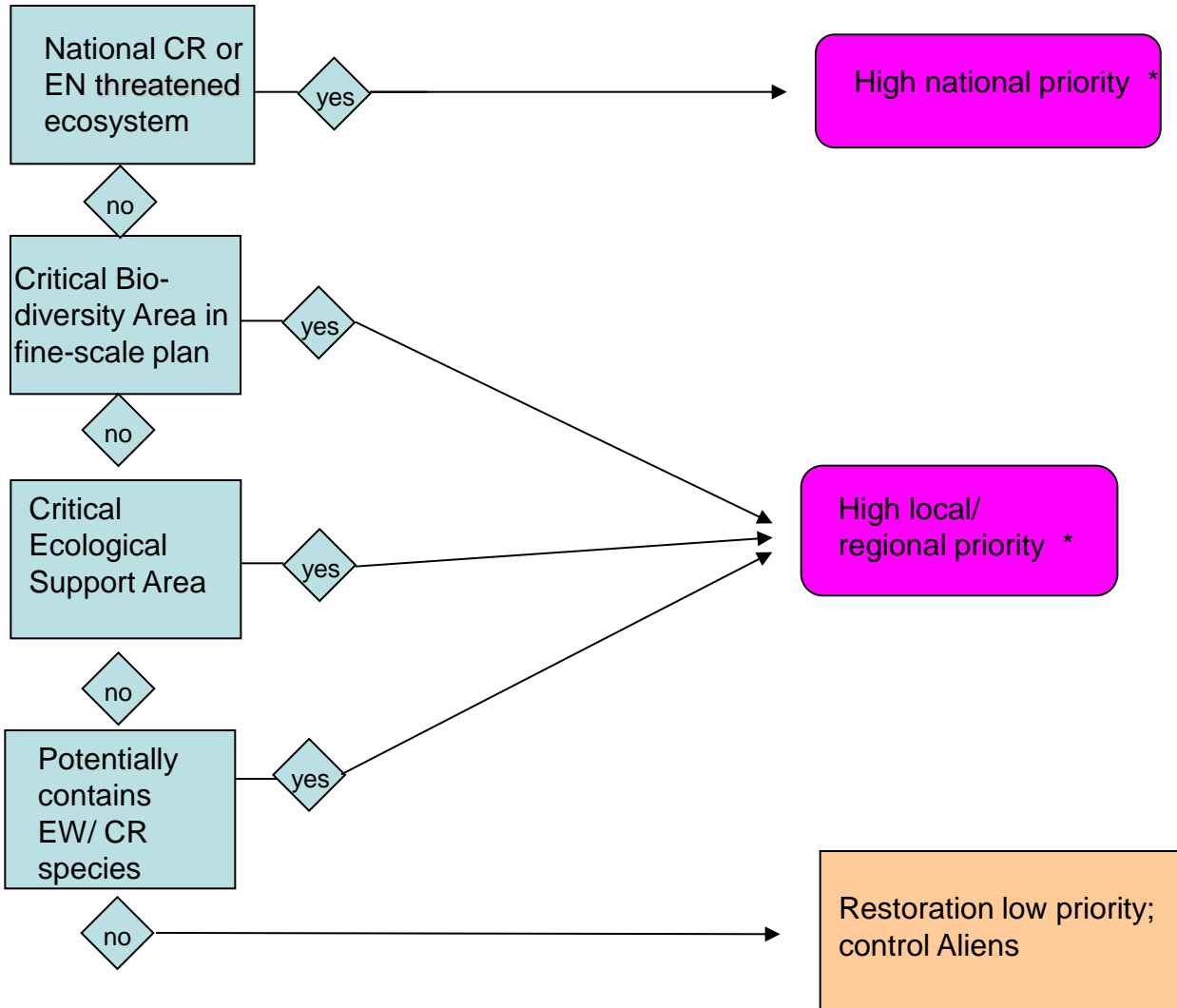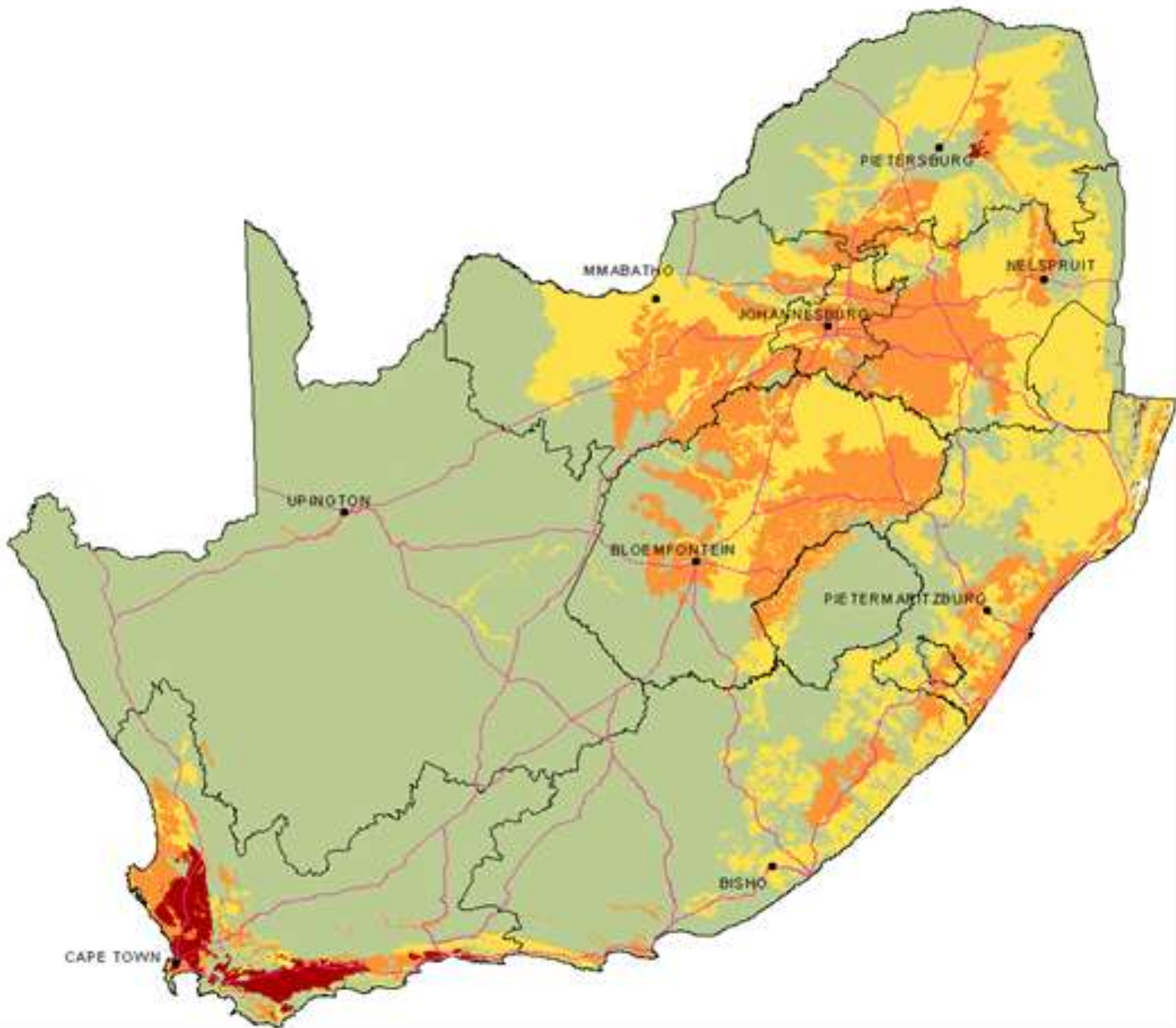# Restoration Protocol for Alien-invaded Riparian Zones

1. Initial clearance
Clear alien trees using the Fell & Remove treatment; large alien trees may be killed standing.

Has alien invasion altered geomorphology?

no → yes

2. Revegetation
Have indigenous vegetation & seed banks been lost?

no

Has head cut erosion, channel deepening or bank undercutting occurred?

no → yes

Physical stabilization may be required

yes

3. Follow-up control
Apply methods that do not damage desirable vegetation; control secondary invaders

Re-introduce desirable vegetation by sowing or planting:
• local indigenous species
• non-invasive commercial species if indigenous species scarce & surrounding land-use is agricultural

4. Monitor ecosystem function:
• vegetation cover
• hydrological flow
• bank stability

5. Adapt management

- When should restoration be considered important within a conservation area?
- What sort of restoration?

National CR or EN threatened ecosystem

yes → High national priority *

no

Critical Bio-diversity Area in fine-scale plan

yes →

no

Critical Ecological Support Area

yes → High local/ regional priority *

no

Potentially contains EW/ CR species

yes →

no → Restoration low priority; control Aliens

Decision Support Tool to assist in prioritizing sites for restoration

Required intervention

High priority site

Soil & seed banks intact → IAP control; burn; sow missing guilds (e.g. overstorey proteoids); EW, CR species

Soil intact, seed banks depleted → As above; <u>and</u> sow seed mix containing main growth form components

Soil disturbed, seed banks lost → As above; <u>and</u> correct soil nutrient levels, sow comprehensive seed mix; rodent control

Topsoil removed → Re-introduce some topsoil, or improve subsoil; sow pioneer seed mix & apply ultra slow-release fertilizer

Increasing priority/ cost-efficiency

Increasing cost & time

Subset * of Decision Support Tool to further prioritize sites according to intensity of restoration interventions (& therefore funds) required
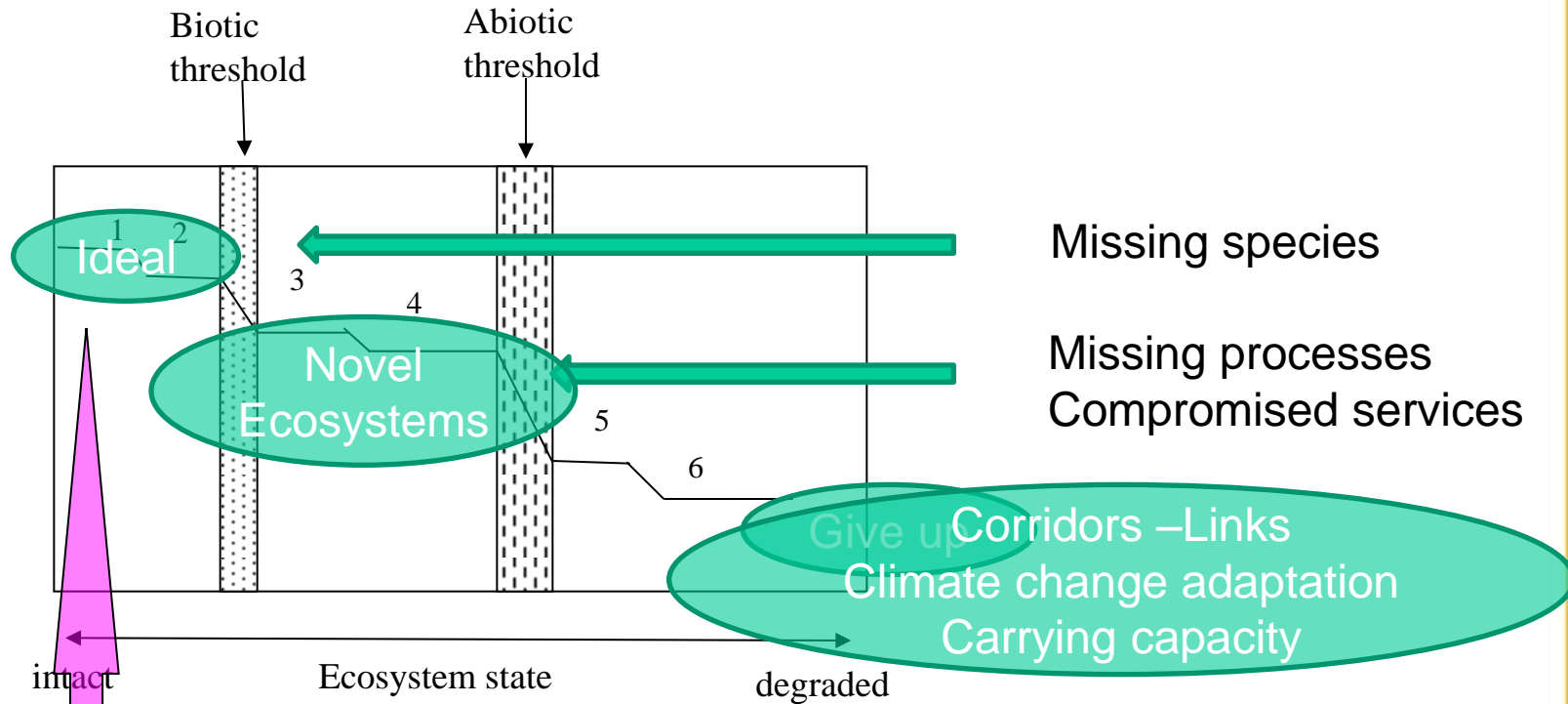
Definition of ecological restoration

Hypothetical model of ecosystem degradation (reproduced from Whisenant 1999)

Biotic threshold

Abiotic threshold

1 2
Ideal

3

4
Novel Ecosystems

5

6

Give up

intact   Ecosystem state   degraded

Missing species

Missing processes
Compromised services

Corridors –Links
Climate change adaptation
Carrying capacity

- **ecosystem repair** - refers to actions that overcome limitations in both abiotic & biotic components of the ecosystem.
- Reference sites (targets) - important for planning and monitoring restoration.

Renosterveld
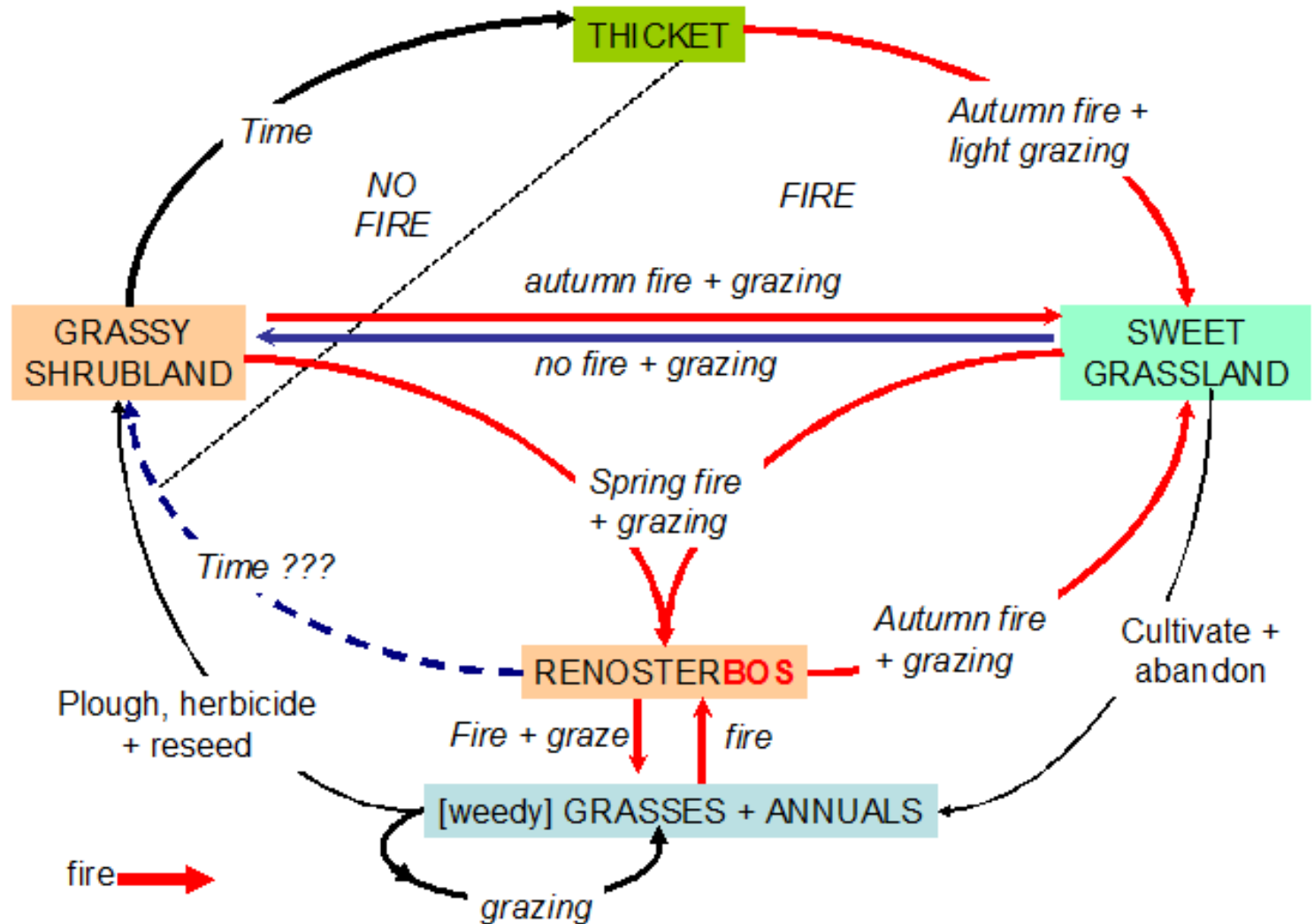
Stage in process	Collaborators	Organizations
Management plan	Manager, ecologist; local interest groups	Conservation organization or landowner; ecologist from SANBI, SANParks, CapeNature or Municipal Environmental Dept. or ecological consultant; local ratepayers, volunteer groups, NGOs
Decision to restore	Manager, ecologist	Conservation organization or landowner; ecologist from SANBI, SANParks, CapeNature or Municipal Environmental Dept.; or ecological consultant
Restoration plan	Manager, ecologist; other organizations likely to be involved (e.g. Working for Water)	Conservation organization or landowner; ecologist from SANBI, SANParks, CapeNature or Municipality Environmental Dept. or ecological consultant; other organizations implicated: e.g. Working for Water, Landcare, Working for Wetlands, restoration nursery
Implementation, including monitoring	Manager & reserve staff, ecologist; other organizations likely to be involved (e.g. Working for Water); "Friends group" or volunteers; contractors; alien control & fire teams; skills trainer; communicator; "champion" & project steering committee	Conservation organization or landowner & operational staff; other organizations implicated: e.g. Working for Water, Landcare, Working for Wetlands; ecologist from SANBI, SANParks, CapeNature or Municipality Environmental Dept. or ecological consultant; IAP, fire & restoration specialist contract teams; restoration nursery; volunteer groups

Important Collaborations in Ecological Restoration
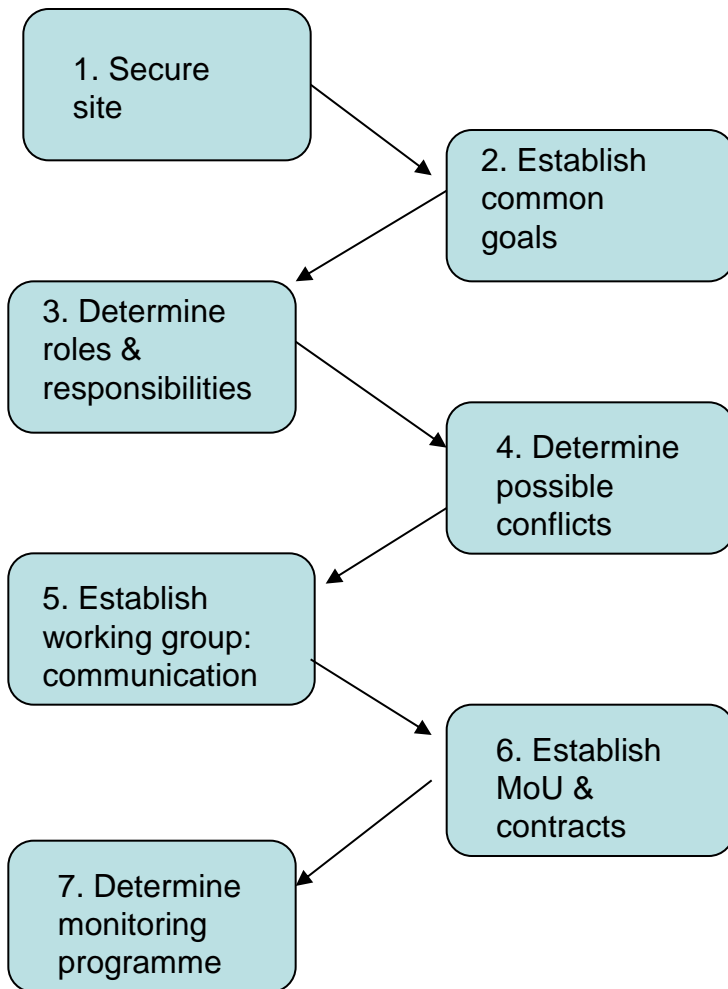
	Examples
1. Secure site	1. Site proclaimed, or managed with intention to proclaim
2. Establish common goals	2. Restore ecosystem structure/ threatened species, control alien species, determine correct microsites for re-introductions, determine quantities & propagation methods; determine timelines; identify negative impacts (integrated management and community/hybridization effects), etc
3. Determine roles & responsibilities	3. Site preparation/ seed collection/ fire management/ alien control (including follow-up)/ monitoring progress, etc. Identify champion: reserve manager
4. Determine possible conflicts	4. Acquiring permits for summer burn; felling of mature trees; nesting birds; alien removal in planted areas; control of fauna (rodents, guineafowl) etc
5. Establish working group: communication	5. Essential for communication & avoiding conflict among collaborators
6. Establish MoU & contracts	6. Arrange MoU (e.g. between various government organizations) & contracts (e.g. for training, propagation, seed collection)
7. Determine monitoring programme	7. Monitoring restoration success: determine responsible person(s) & objective – e.g. requires 3 fire cycles for locally extinct, re-introduced species.

Protocol for Collaboration in Ecological Restoration

Alien clearing

- Lots of effort and money
- How aliens cleared: restoration protocol - not just clear at all costs
  - Exclude herbicides where possible
  - Include fire
  - Trained teams for follow-up clearing
- Remap aliens nationally for restoration potential –rather than just services (water)

Overarching Issues

- Global (CFR): ecosystem to local
- CR - habitat loss and alien invasions

- Landscape scale: viable in long term :: connectivity and size important
  - edge effects
  - Potential to maintain ecosystem processes & services;
  - Potential to maintain species populations MVP

- Need to collaborate (e..g W4W: kill restoration potential): all players – incl. management, researchers, EPWPs, volunteers).

- Restoration protocols are needed

- Missing: practitioners with knowledge of what works when – library of case studies: what has worked and what failed.

Issues

- Why bother: why not save what can be saved?

  - Buy cheap land to meet non-CR targets or expensive land to restore CR ecosystems?
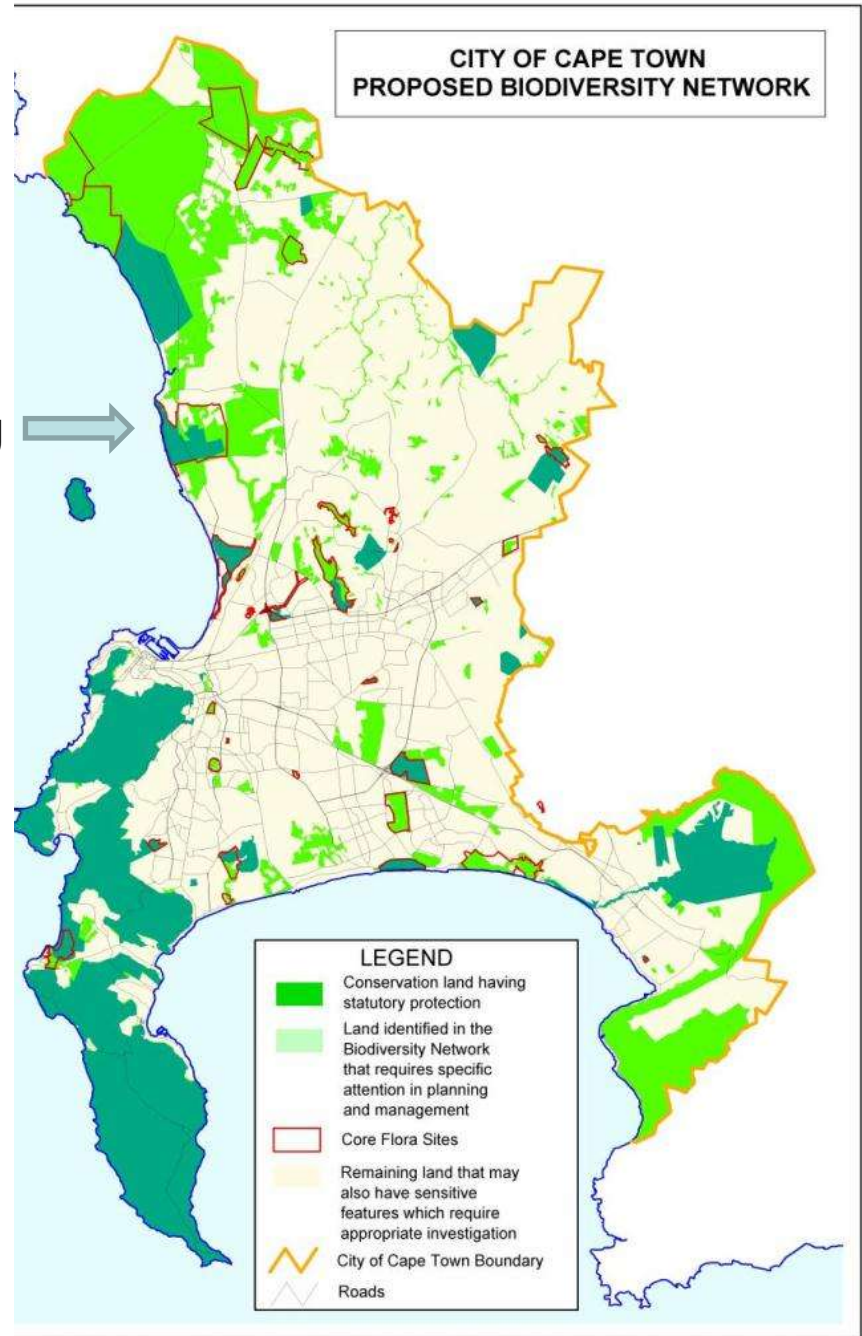
- Higher biodiversity: higher benefits.

- Three examples:

Cape Flats Sand Fynbos
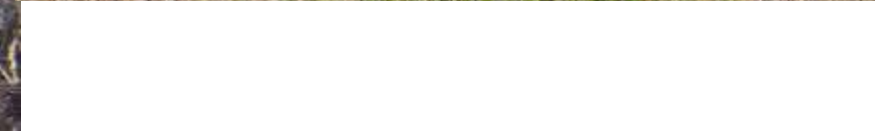
Critically Endangered

Target 30%
Transformed 86%
Remaining 14%
Conserved 1%

Blouberg ⟹

CITY OF CAPE TOWN
PROPOSED BIODIVERSITY NETWORK

LEGEND

Conservation land having statutory protection

Land identified in the Biodiversity Network that requires specific attention in planning and management

Core Flora Sites

Remaining land that may also have sensitive features which require appropriate investigation

City of Cape Town Boundary

Roads

Cape Flats Sand Fynbos: Blouberg
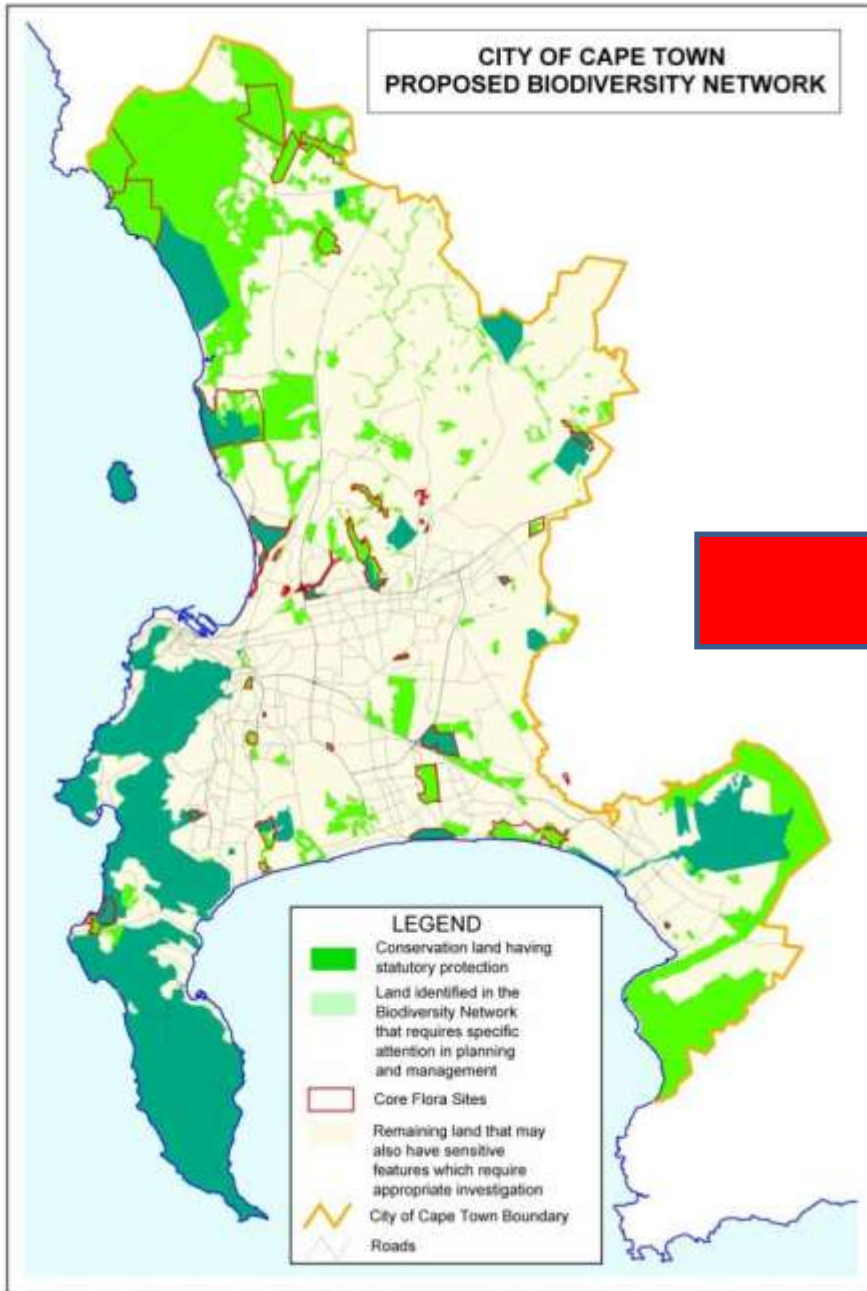
Tokai Park TMNP
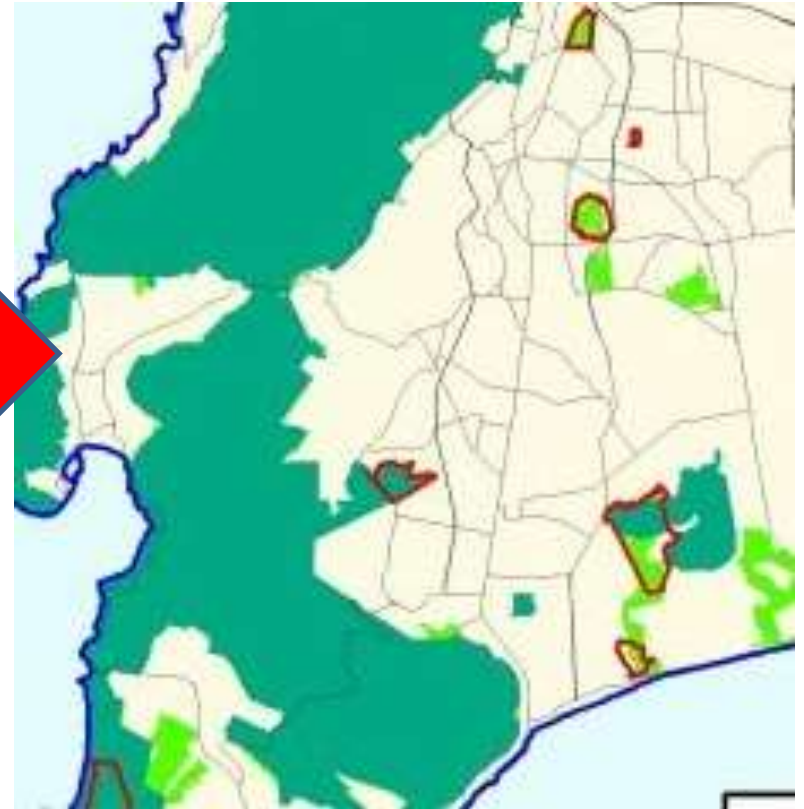
CORE FYNBOS SITE

Pine plantation (lower Tokai 2009: *P. radiata*)

Oldest Plantation
1890s
3 cycles of plantings
many experiments

Accidental Fire and Seed Banks

1988 Fire
In 20 year old "Sterile" Plantation – no Fynbos evident

Accidental Fire and Seed Banks

1988 Fire (picture at 15 years age)
Lots of Fynbos spp
Seedbanks Present!!!
Good representivity (Families, guilds)
No serotinous! Few resprouters

William Purcell (1866-1919)
BERGVLIET

TOKAI (1915-1919)

- **595 spp at Bergvliet Farm (1915-1919)**
                      = 26% Peninsula flora
-      **+ 74 naturalized aliens**

- **318 recorded already at Tokai (incl. aliens)**
- **+ 86 spp from Tokai or Meadowridge (not in Bergvliet, excl aliens)**

- **= 680 species**

- **RL Status: X 2; CR 7; EN 6; VU 14; NT 5**
- **Biggest genera: Oxalis 18; Erica 14; Senecio 14; Moraea 13, Crassula 12,**
         Gladiolus 11, Helichrysum 11, Pelargonium 10, Psoralea 9

<- Buffalo grass = A17b - ellotii site

Se glomerata ditch

N

Diastella proteoides Tokai

CANAL

Main donga

Road donga

S donga

WHERE TO PLANT?

Firebelts

Alien Control
Too many players!

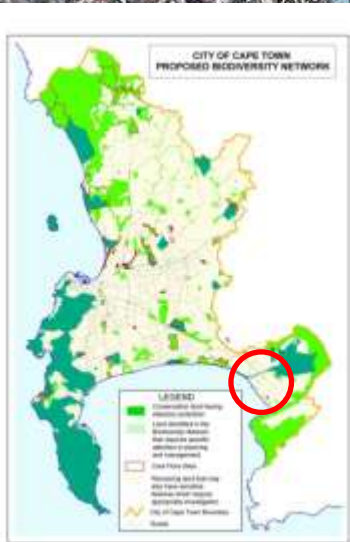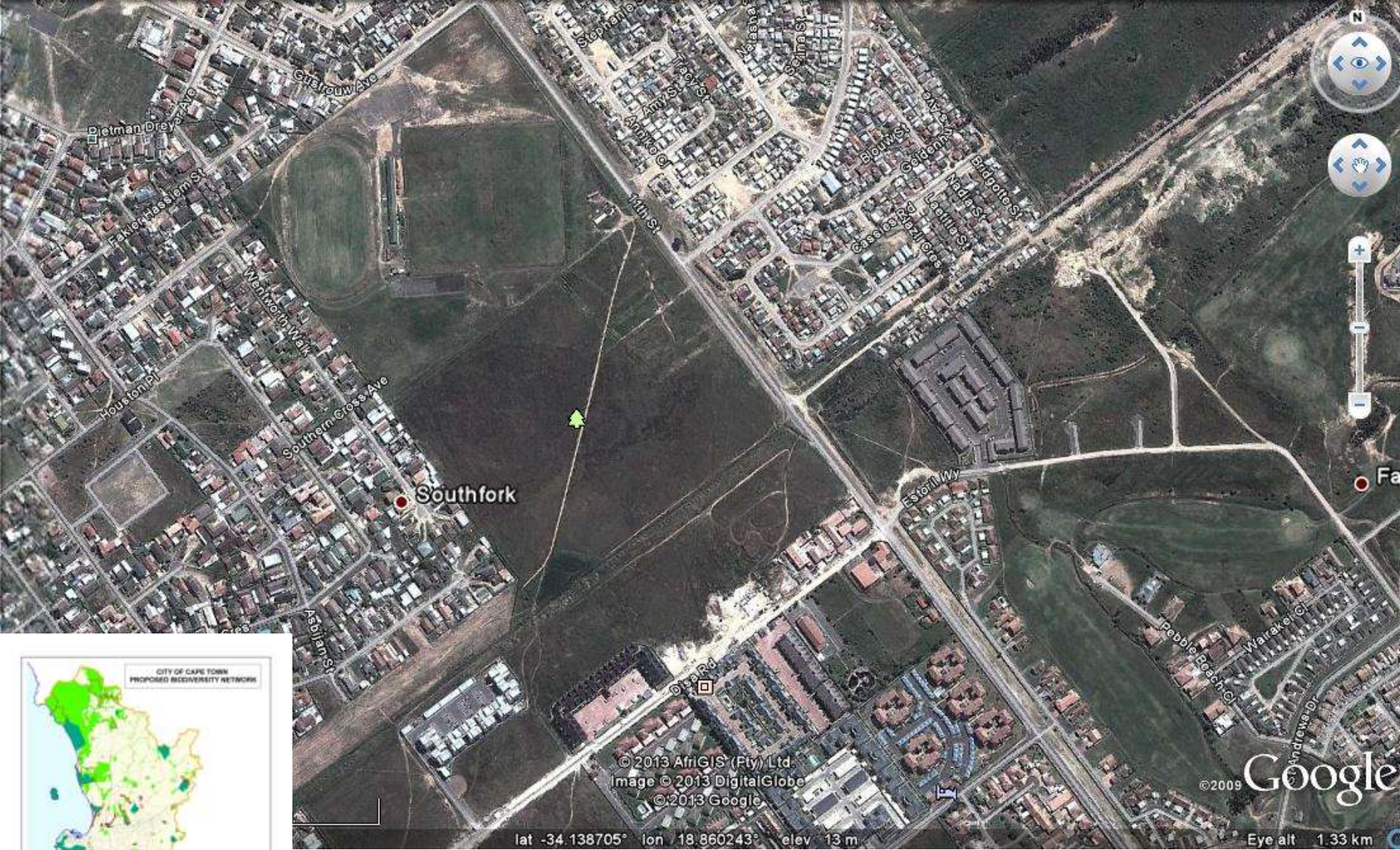**Problem Animals**

Restoration or Gardening?

W4Wet!
Planted 6 spp
Weeded 46 spp

Geometric Tortoise

Harmony Flats: Lourensford Alluvium Fynbos

- How do we integrate a national restoration programme with local focus??

Thanks