# Monitoring and evaluation of the restoration of a highly degraded remnant of the endangered ecological community *Eastern Suburbs Banksia Scrub:* Potential lessons for how monitoring can guide a restoration project.

**A Presentation to the Restoring Biodiversity 09 Forum – Innovations in Ecological Restoration.**

**11 September, 2009.**

**Ian Perkins**

**Teacher in Applied Environmental Management**

**TAFE NSW – NSI – Ryde College.**

**(02) 9448-6263 / ian.perkins@tafensw.edu.au**

**Principal Consultant**

**Ian Perkins Consultancy Services**

**PO Box 29, Erskineville. NSW. 2043.**

**ian.perkins@ipcs.com.au | M: 0418675502**

**Concept of Resilience** ⟷ **Practice of Restoration** → **Restored Ecosystem**

## What is this relationship?

**How do we 'measure' resilience and its value whilst dealing with often divergent views?**

# ‘Testing’ Resilience

- Need to clearly define the ‘***observations***’ (or indicators) with ‘***interpretations***’ we make.
- ***How do we balance these two components – especially given the diverse range of ecosystems, their variable ‘states’, history, and also the often varying views of restorationists?***
- Development of ‘**tools**’ to assist in **documenting** and **communicating** our resilience assessments
- **Application of restoration techniques ‘in the field’** – combined with essential **monitoring** and **evaluation** of results to inform and refine our ‘tools’

# ‘Resilience’ Debates

- Rather than being seen as ‘confrontational’, they should be viewed as a **positive contribution** to our understanding of restoration of different ecosystems – and the relationship between resilience theory and restoration practice.

- ‘Intensity’ of debate is usually relative to the state of degradation (typology of impacts) of the ecological community. ***More debates with more highly degraded remnants?***

# Case Study

## **Centennial Parklands, Sydney**

## ‘Lot 23’ Eastern Suburbs Banksia Scrub Restoration Project

**2002 – 2007** (period discussed)

project is ongoing

CENTENNIAL parklands

New South Wales Government
Department of
Environment, Climate Change and Water

Australian Government
Department of the Environment, Water, Heritage and the Arts

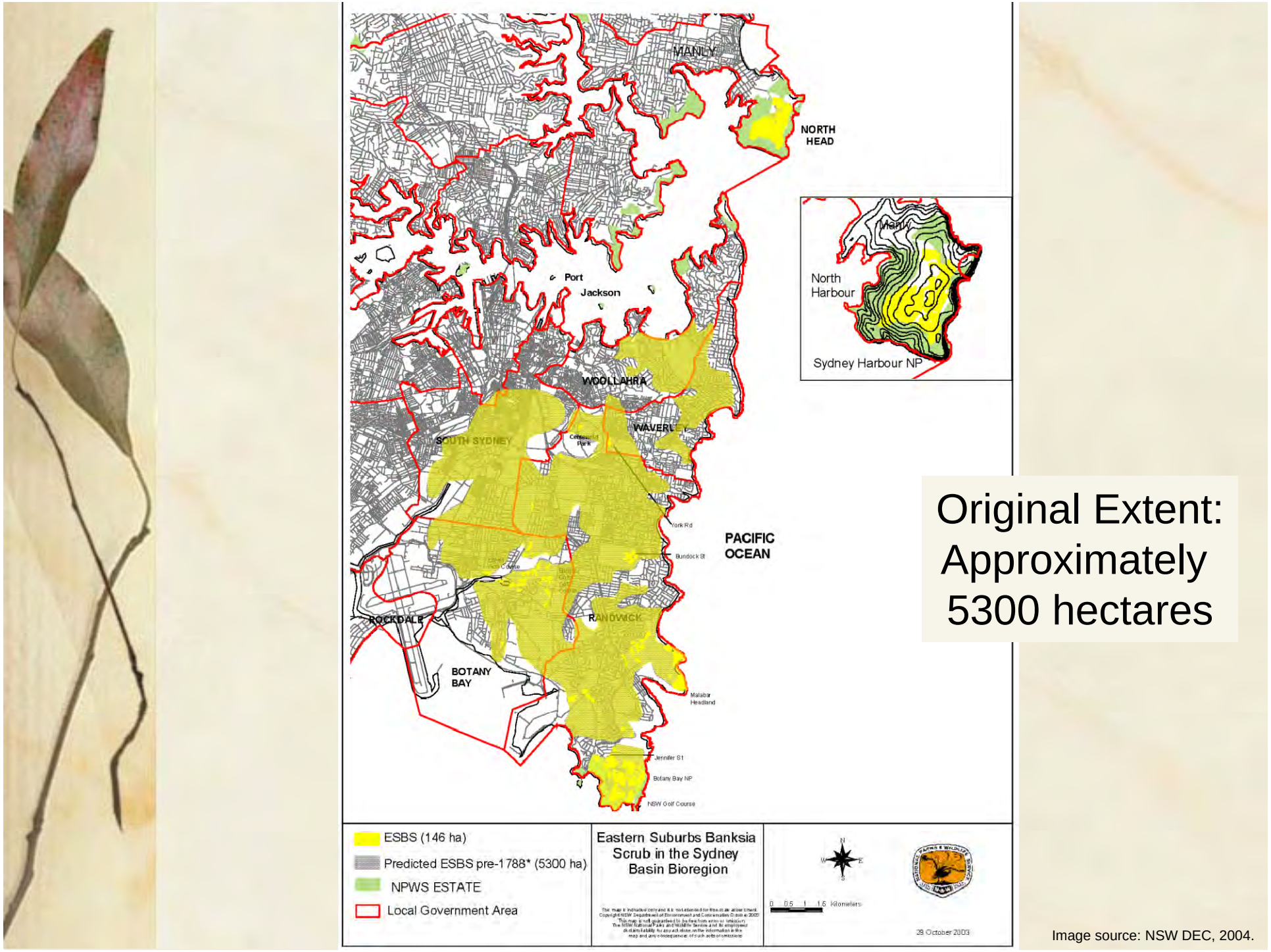
UBM

Urban Bushland Management Consultants

IAN PERKINS CONSULTANCY SERVICES

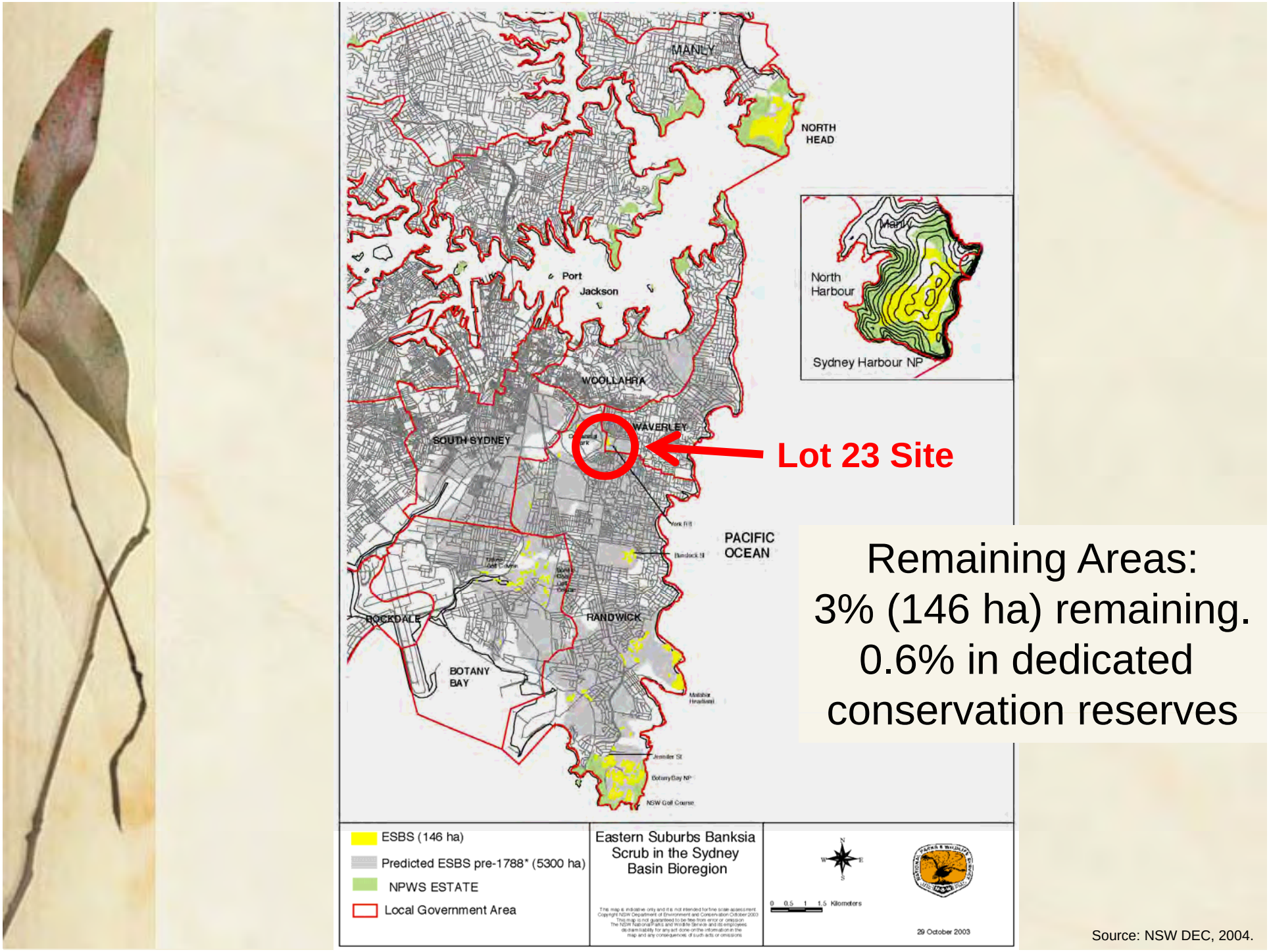
PB PARSONS BRINCKERHOFF
100 YEARS

**Bush Habitat Restoration Co-operative**




Original Extent: Approximately 5300 hectares

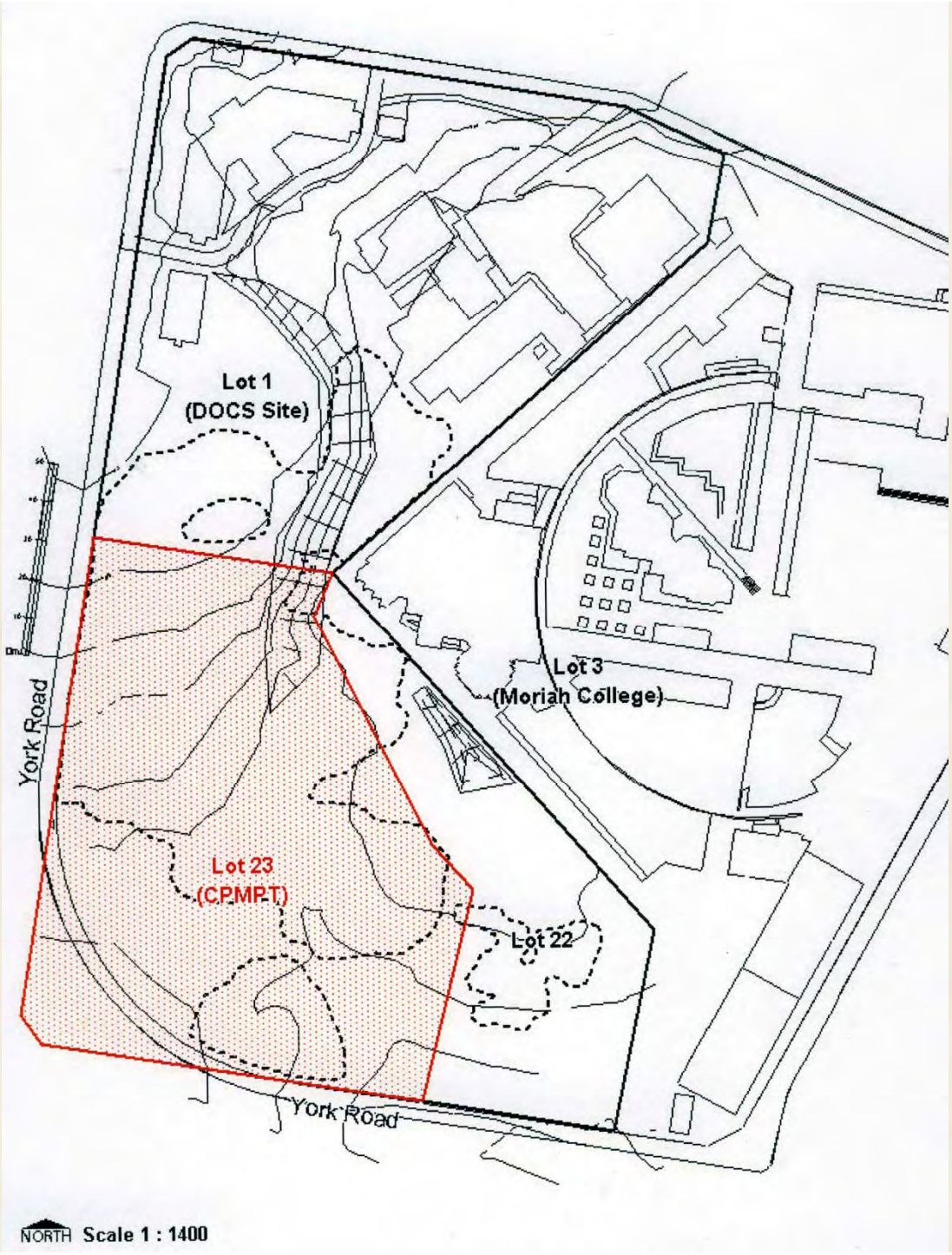
Image source: NSW DEC, 2004.




Remaining Areas:
3% (146 ha) remaining.
0.6% in dedicated conservation reserves

Source: NSW DEC, 2004.

Lot 23



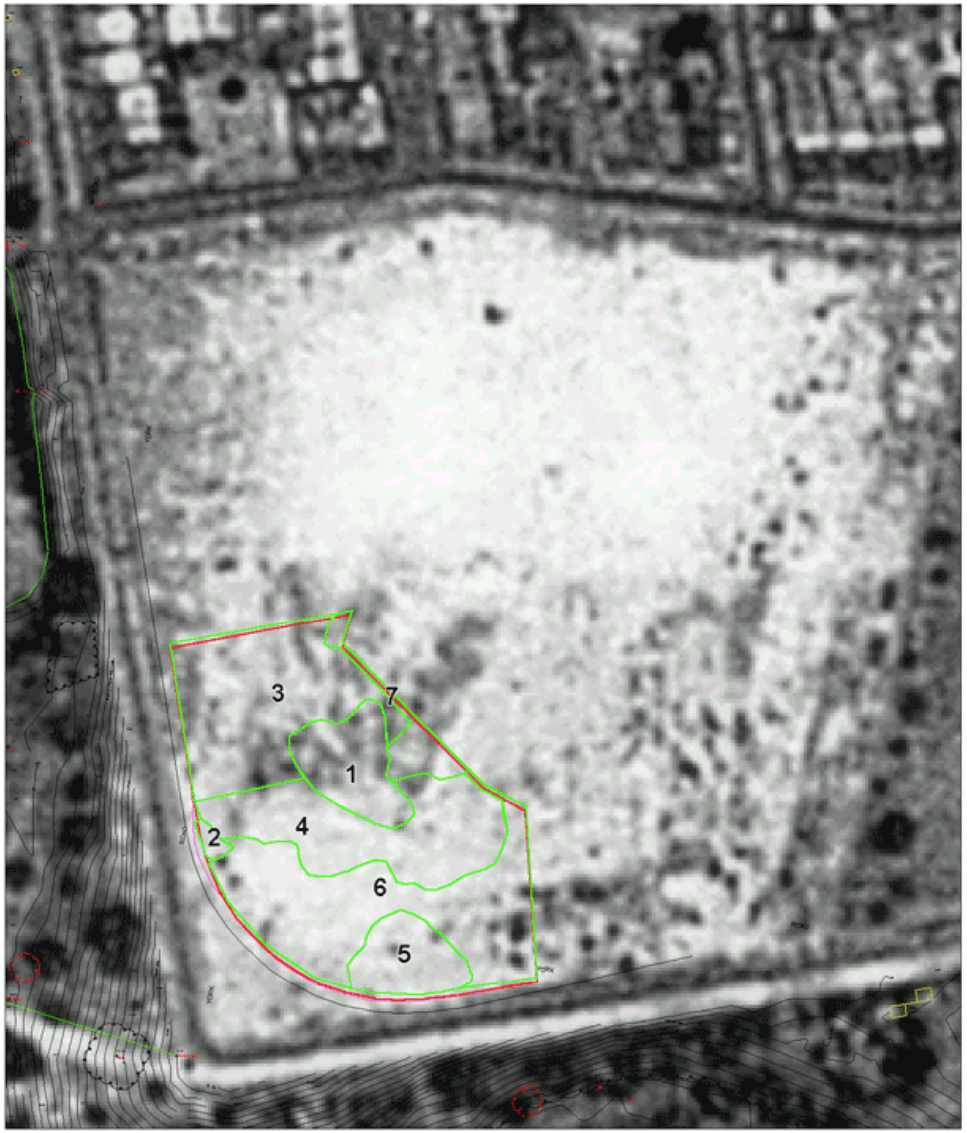

# Lot 23:

## 1.07 hectares.

Transferred to the Centennial Park and Moore Park trust in 2001 as part of an 'offset' to adjacent development.

'Mosaic' of insitu-resilience on site likely as a result historic impacts (typology).

Image Source: Urban Bushland Management. 2002.




# Lot 23 - 1930

**N↑ Scale 1:2000 @ A4**

# Lot 23 - 1947

metres

N↑ Scale 1:2000 @ A4

**Lot 23 1955**

**N ↑ Scale 1:2000 2 A4**

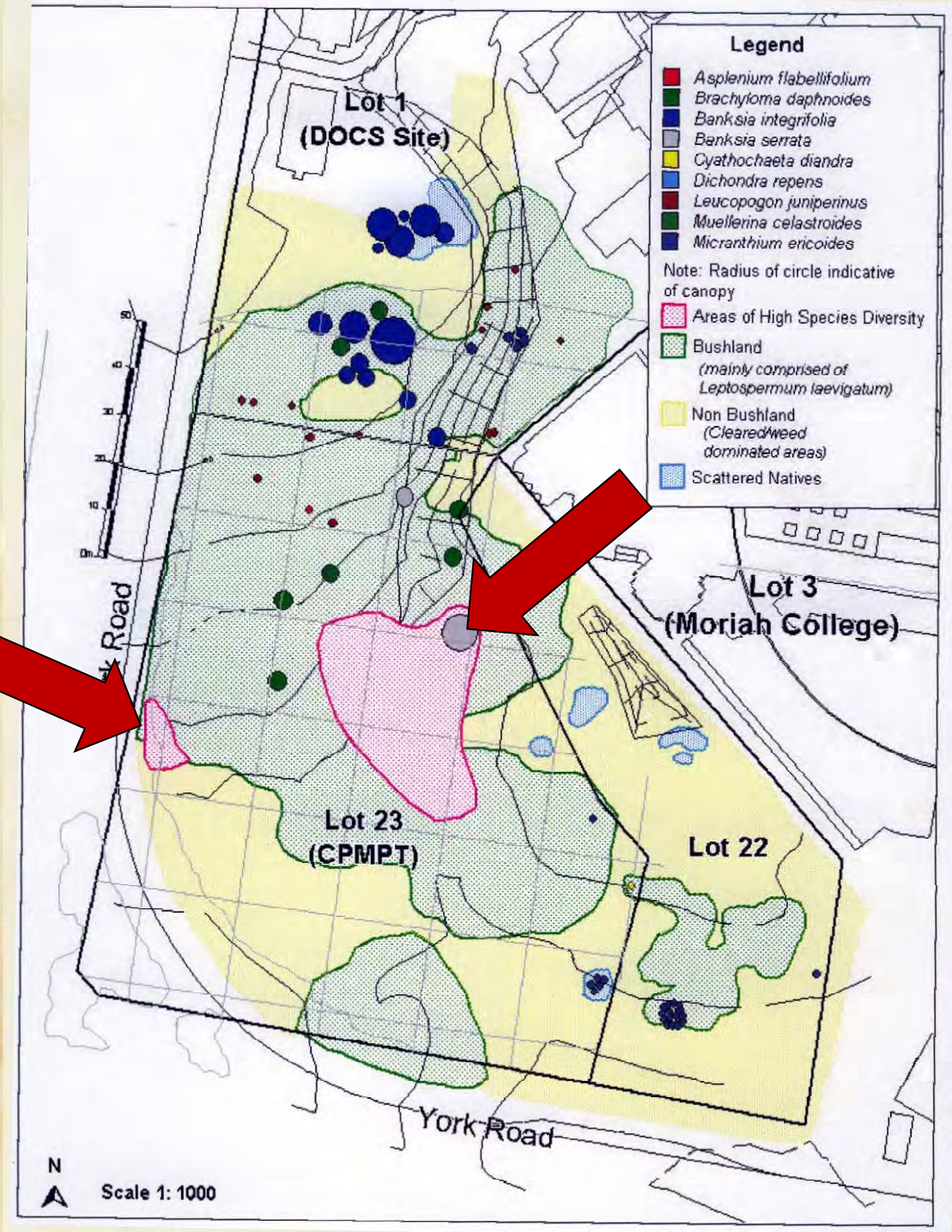
**Lot 23 - 1969**

**N ↑** **Scale 1:2000 @ A4**

# Lot 23 - Circa 2002

metres

N ↑ Scale 1:2000 @ A4



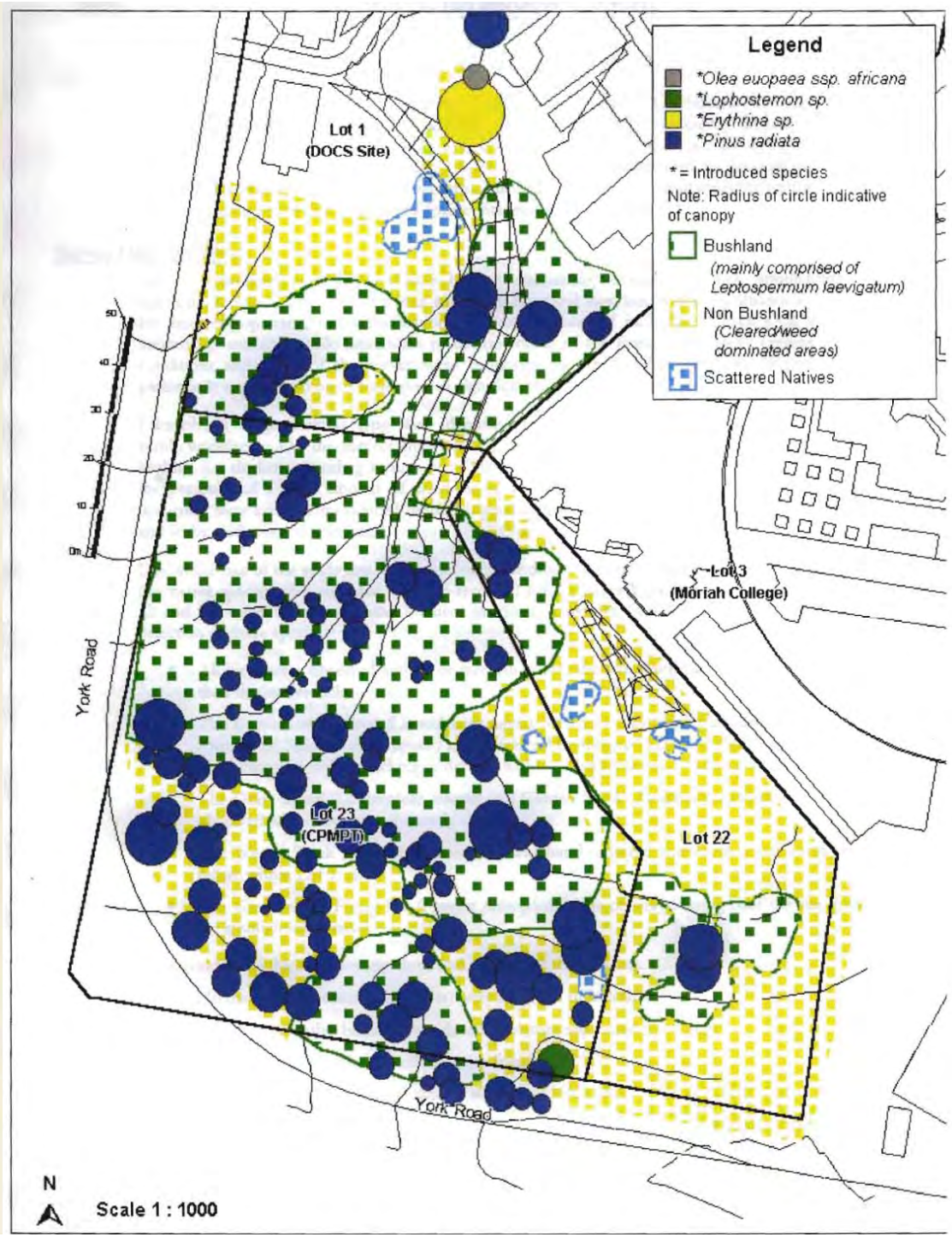

# 2001:

32 ESBS species recorded scattered across site.

2 areas of '*high species diversity*' identified.

Image Source: Urban Bushland Management. 2002.

'Benchmark' image source: NSW DECCW.




# 2001:

146 Exotic *Pinus* species dominate the site.

Also, high levels of other competitive exotic plant species present (particularly *Lantana camara* and grass species.

Image Source: Urban Bushland Management. 2002.

# Lot 23 ESBS Restoration Planning and Implementation

## Methodology:

- ***Development of a restoration plan***
  (Urban Bushland Management Consultants).

- ***Implementation of restoration work in accordance with plan – commenced in 2002.***
  (Bush Habitat Restoration Co-operative and Volunteers).

- ***Monitoring of site to measure response to restoration treatments (in-situ resilience).***
  (Ian Perkins Consultancy Services – Project Managers 2002-2006)
  (Parsons-Brinckerhoff – 2006 to present)

- ***Project is considered to be a 'best practice' demonstration site for ESBS restoration by NSW Dept. of Environment, Climate Change and Water.***

# Lot 23 ESBS Restoration Planning and Implementation

## Project Objective:

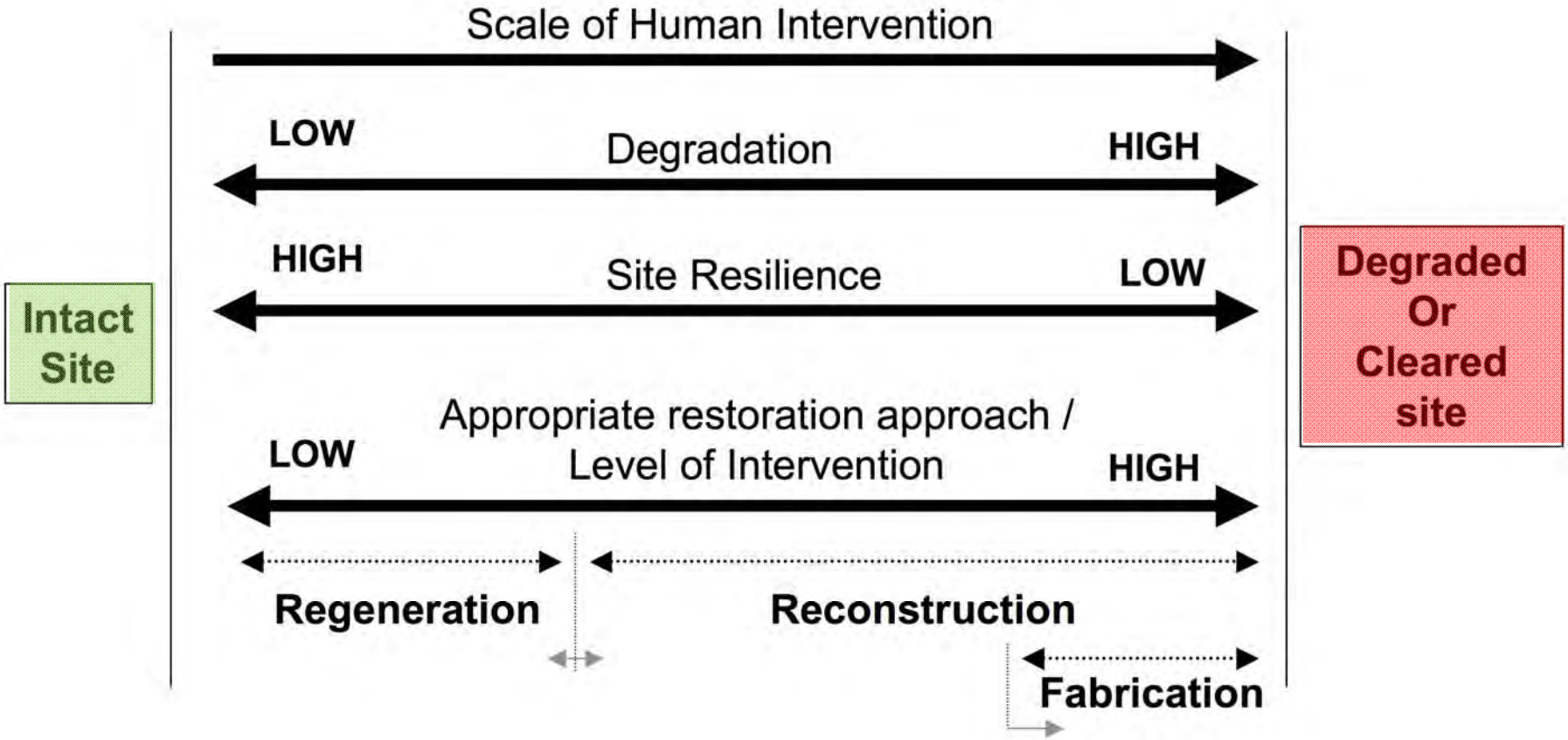
- *"**Within 10 years**, the degraded remnant Eastern Suburbs Banksia Scrub on Lot 23 (York Road Bushland) **will be floristically and structurally restored**, **albeit in a more simple form that would previously have existed in nature**; providing habitat for a variety of native flora and fauna, and opportunities for passive recreation and public education."*

Source: Urban Bushland Management. 2002.

# Principles

Relationship between the scale of human intervention, level of degradation and site resilience and the appropriate level of intervention.

Adapted from McDonald (1993) and McLoughlin (1997)



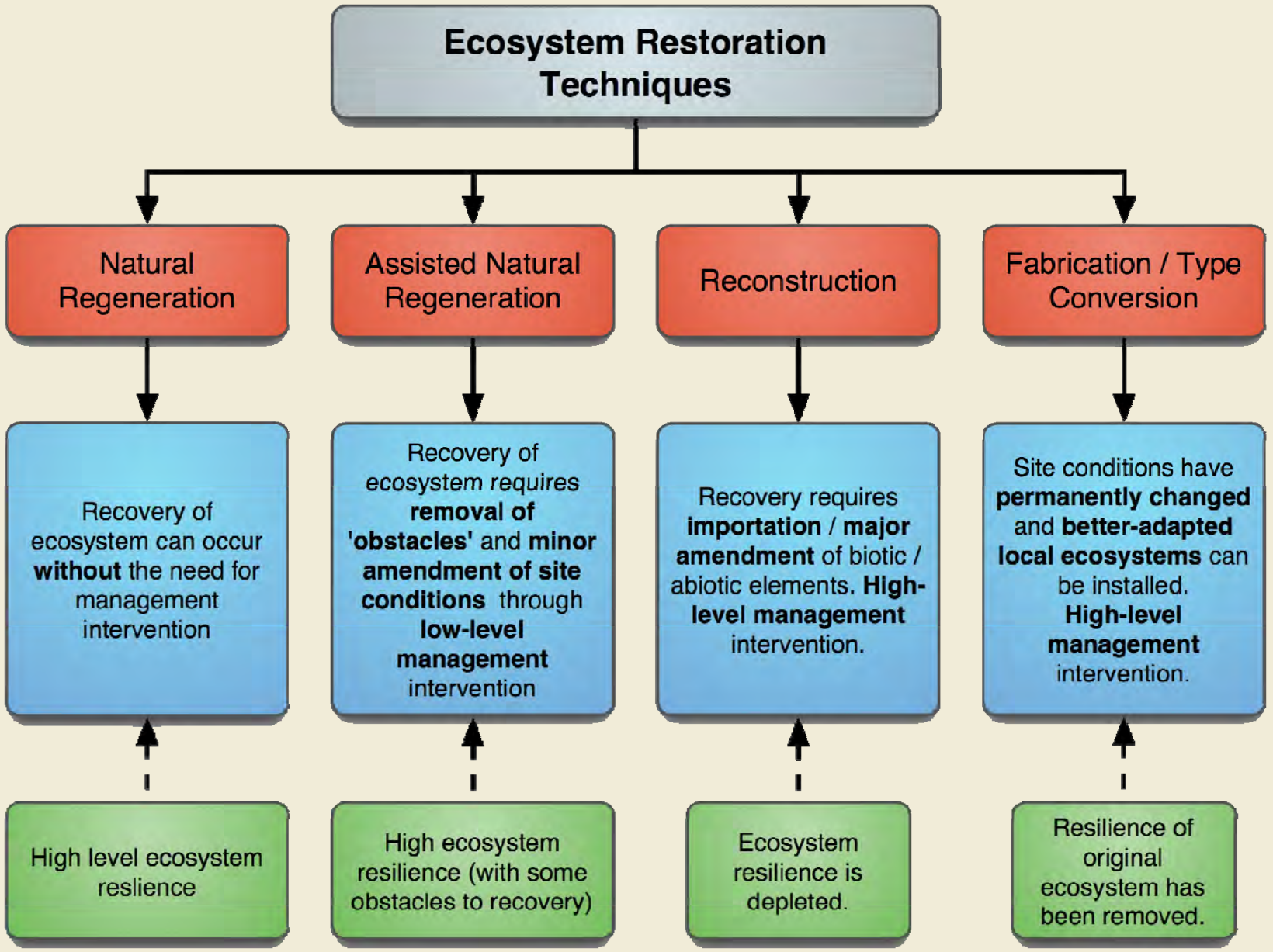
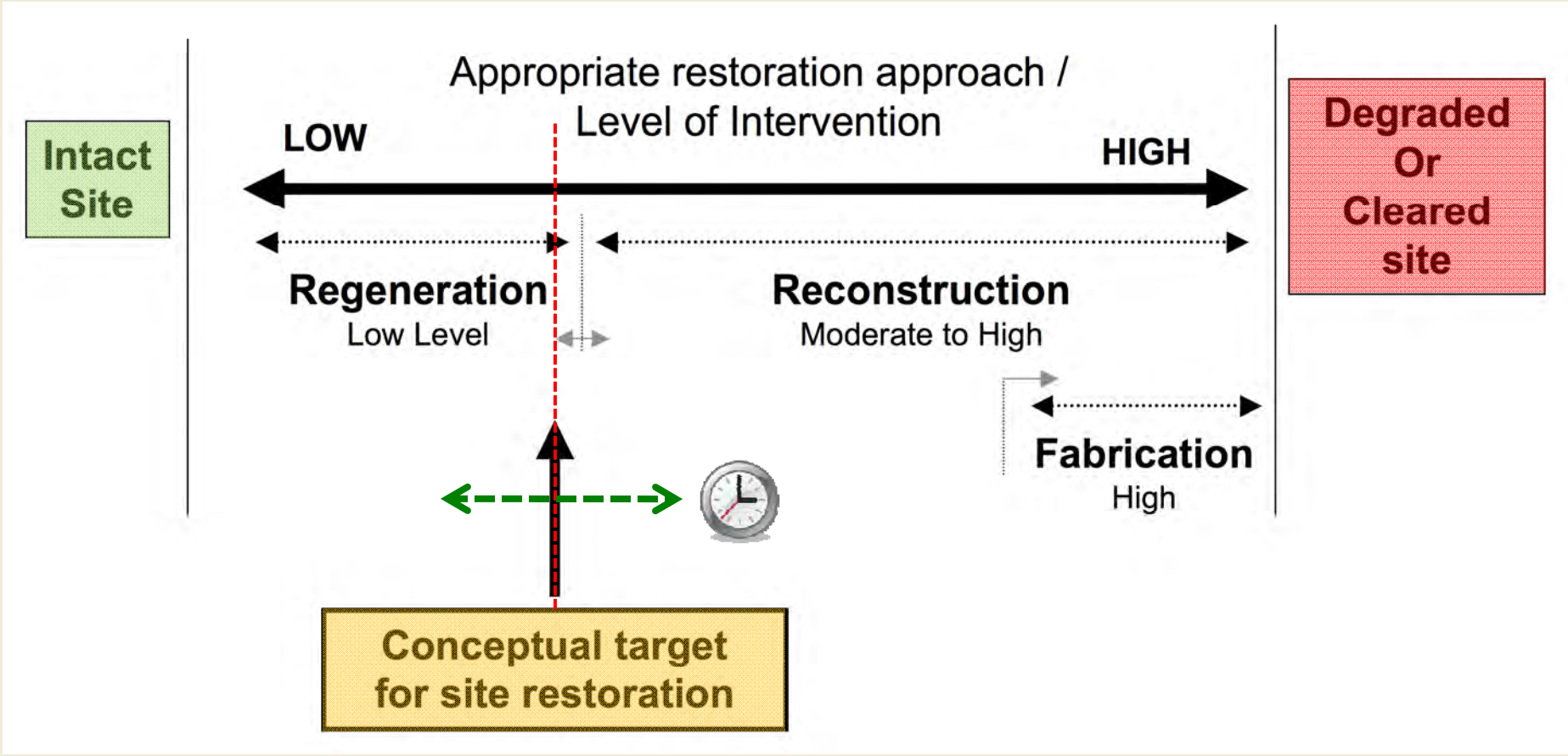



Image adapted from McDonald, T. (1993). Ecosystem resilience and the restoration of damaged plant communities. In Proceedings of seminar - *Bushland in Our Cities and Suburbs. Part 2: Making Bush Regeneration Work*. Nature Conservation Council of NSW. p12-26.


Intact Site
Appropriate restoration approach / Level of Intervention
LOW
HIGH
Degraded Or Cleared site
Regeneration
Low Level
Reconstruction
Moderate to High
Fabrication
High
Conceptual target for site restoration

# Adaptive Management Cycle – A Key Component of the Project

**Monitoring and Evaluation: Balancing our 'observations' with the need for documentation based on clear objectives.**

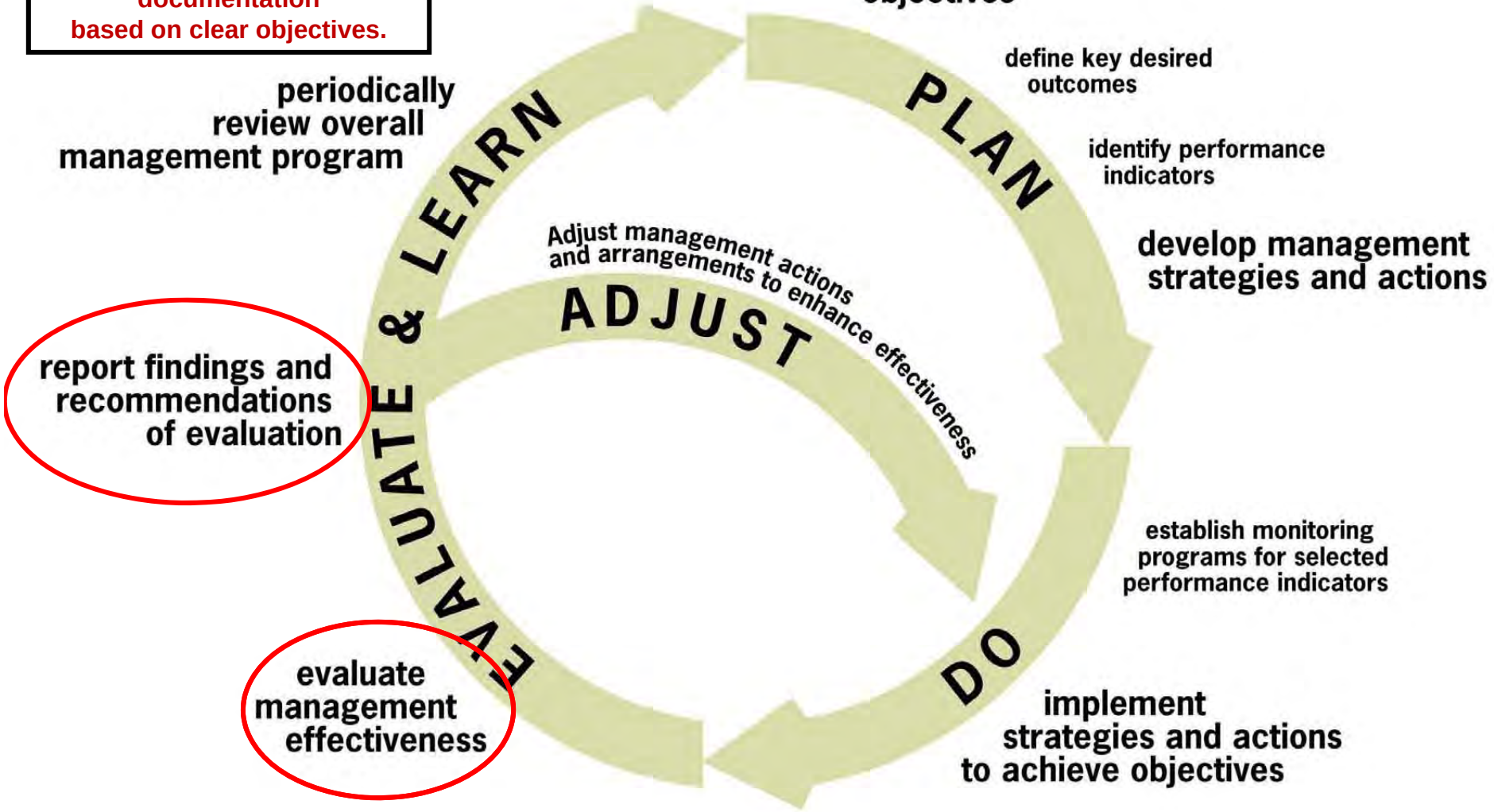
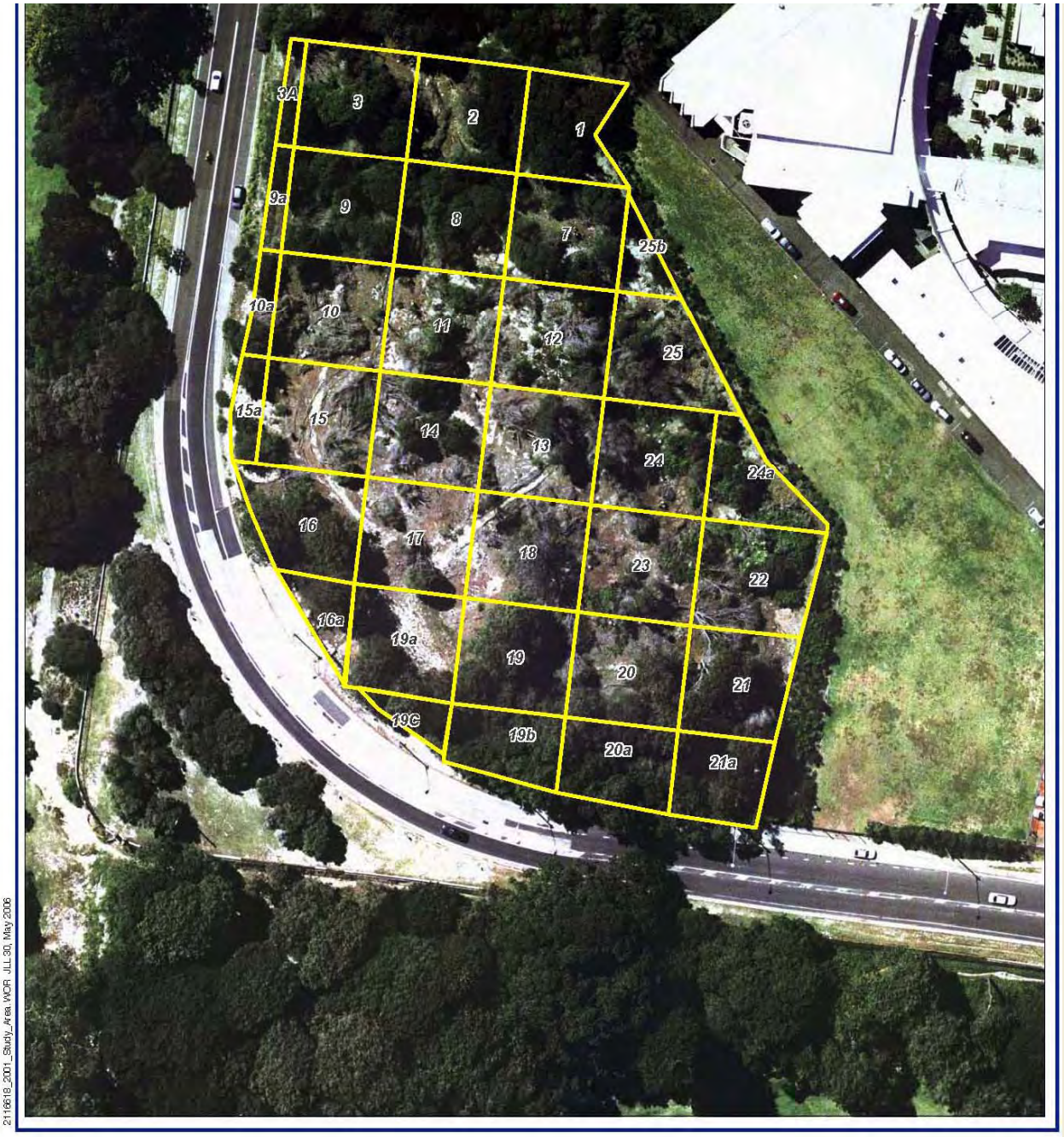



Image Source: Jones, G (2004) 'Is the management plan achieving its objectives?' *In* Worboys, G, Lockwood, M & DeLacy, T, *Protected Area Management. Principles and Practice*, Second edition, Oxford University Press.




# Monitoring Quadrats:

16: 20 x 20m
14: partial quadrats

Data on species diversity, abundance and survival rates recorded every 6 months for 3 years – then annually.

**Image Source: Parsons Brinckerhoff. 2006.**

# Lot 23 ESBS Restoration Planning and Implementation

- **Works:**
  - Over $250,000 expended.
  - Fencing (including pest species control measures)
  - Staged Pine Removal (and mulch)
  - Some translocation of ‘salvaged’ plants from adjacent sites.
  - Application of assisted natural regeneration techniques.
  - Construction of ‘transitional’ fauna habitat.
  - High level of monitoring and evaluation of regeneration response.

Source: Ian Perkins Consultancy Services. 2005.

Photograph 1 - Pine removal

Photograph 2 - Windthrown *Leptospermum* after storm (post Pine Removal)

Photograph 3 - Stacking of cut Leptospermum for fauna "brush hides" and delineation of walking tracks

Photograph 4 - *Pinus* mulch removal has been extensively undertaken in all areas to improve ESBS regeneration potential

# Lot 23 ESBS Restoration Planning and Implementation

- **Results to date:**
  - Overall ESBS plant species diversity increase from 32 – 46 plant species.
  - Some species had not be previously recorded on the site (role of remnant seedbank).
  - Significant increases in species abundance.
  - Considerable variability in regeneration response across site (‘mosaic effect’ – influence on past land use impacts?)
  - Deep soil disturbance (unintended) yielded interesting regeneration responses.

# 2001

## ESBS Species Diversity

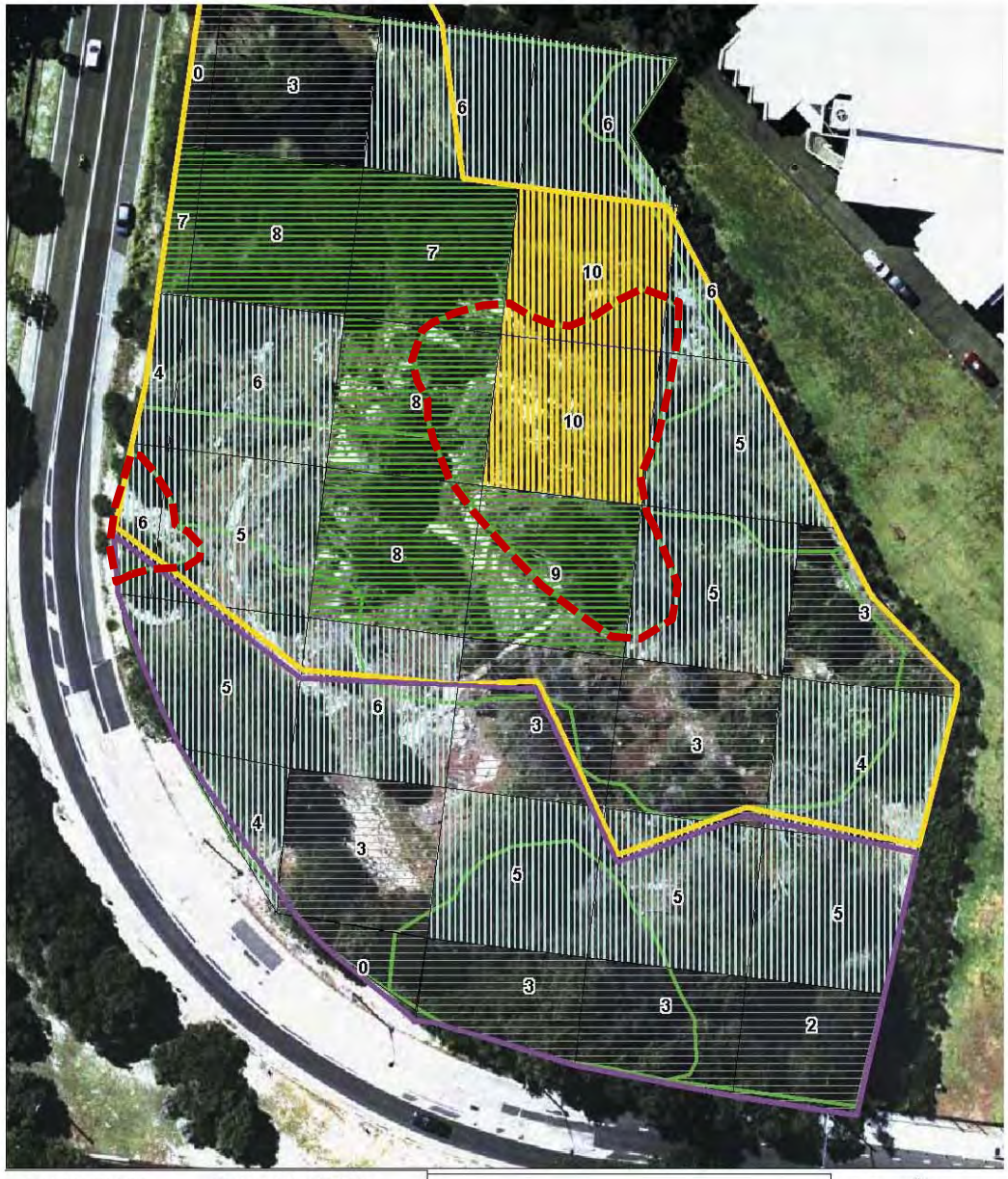



Figure 2 – Map of Species Richness 2001 (Survey: D. Thomas)

Source: Ian Perkins Consultancy Services. 2005.

# 2005

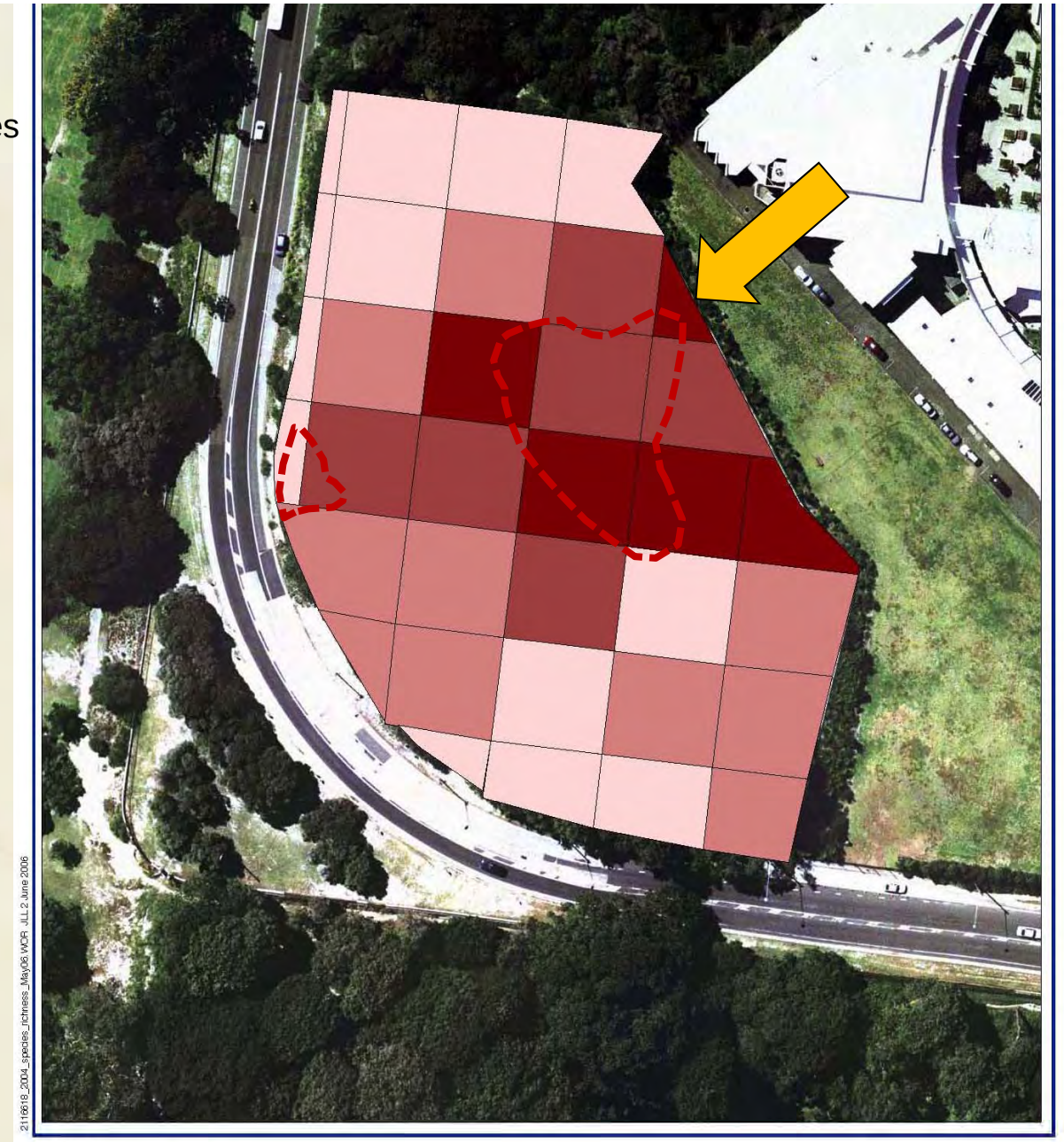
## ESBS Species Diversity

Figure 3 – Map of Species Richness May 2005 (Survey IPCS)

Source: Ian Perkins Consultancy Services. 2005.

# 2006

## ESBS Species Diversity




Source: Parsons Brinckerhoff. 2006.

Figure 3.1 Native species richness in each quadrat in May 2006

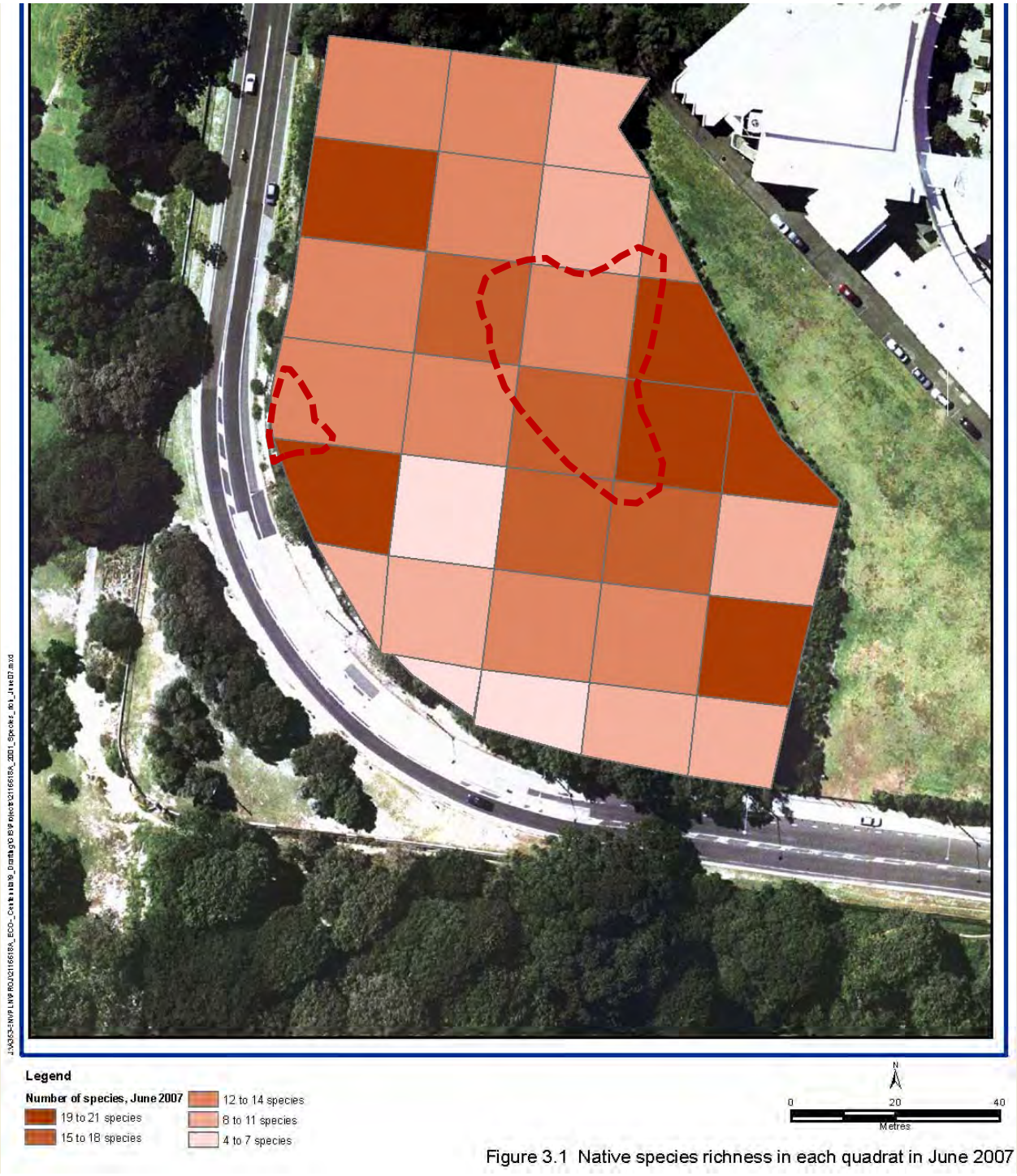
Photograph 14 - 180° view of Unit 7 (Boundary with Moriah College) - April 2003

Photograph 15 - 180° view of Unit 7 with high levels of ESBS regeneration occurring - May 2004

Source: Ian Perkins Consultancy Services. 2005.

# 2007

## ESBS Species Diversity




Source: Parsons Brinckerhoff. 2007.

Figure 3.1 Native species richness in each quadrat in June 2007

# 2005

## Quadrat Sensitivity Maps (Example)

Produced every 6 months after data collection and analysis as part of monitoring.

Sensitivity of quadrats changed dramatically as restoration progressed.

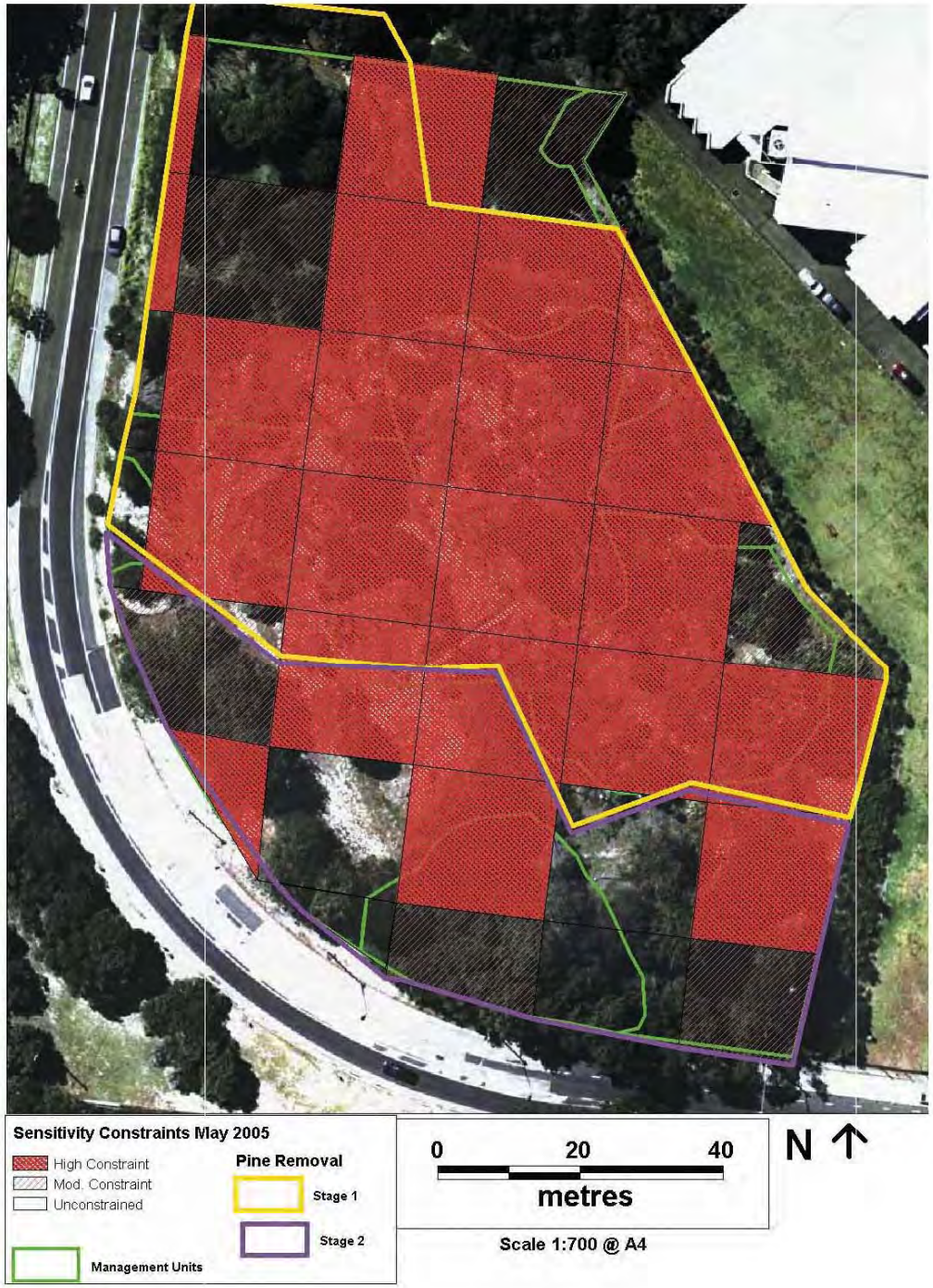



Figure 5 - Map of Sensitivity Constraints (May 2005)

Source: Ian Perkins Consultancy Services. 2005.

# Harnessing 'resilience' to restored endangered ecological communities

## Summary of monitoring outcomes to date:

- Overall ESBS plant species diversity increase from 32 to 46 species in 5 years.
- Several species had not been previously recorded on the site (role of residual seedbank).
- Significant increases in species abundance.
- Unexpected loss of some species of fauna due to unanticipated impacts (ie. Loss of habitat after storm impacts and probable inadequate compensatory habitat creation).

# Harnessing ‘resilience’ to restored endangered ecological communities

## Summary of monitoring outcomes to date:

- Increases in ESBS plant species still being recorded, but rate of increases now diminishing (influence of resilience has been maximised?) Time to start considering ‘reconstruction’ techniques (higher level interventions)

# Ecological Burns – October 2008

Image Sources: Centennial Park and Moore Park Trust.

# Harnessing ‘resilience’ to restored endangered ecological communities

## Reflections on the use of monitoring for testing resilience…

- The practical application of the ‘precautionary principle’ when planning restoration of highly degraded or highly significant ecological communities?
- ‘Buy time’ for planning higher level interventions which may include movement of genetic material and reintroduction of species?
- Is the outcome of resilience driven restoration worth the cost? How do we balance ‘resilience’ driven restoration with financial imperatives?

# Harnessing ‘resilience’ to restored endangered ecological communities

## Reflections on the use of monitoring for testing resilience…

- ‘Halo’ effect of regeneration response at Lot 23 (ie. Higher levels of regeneration around ‘remnants’). Does not appear to contradict current restoration practice of:
  - Protecting ‘core’ remnant areas (high species diversity); and
  - Removing / ameliorating threatening processes.
- When / how do we define the restoration target for using ‘resilience’ driven approaches? Needs careful planning and consideration.

# References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