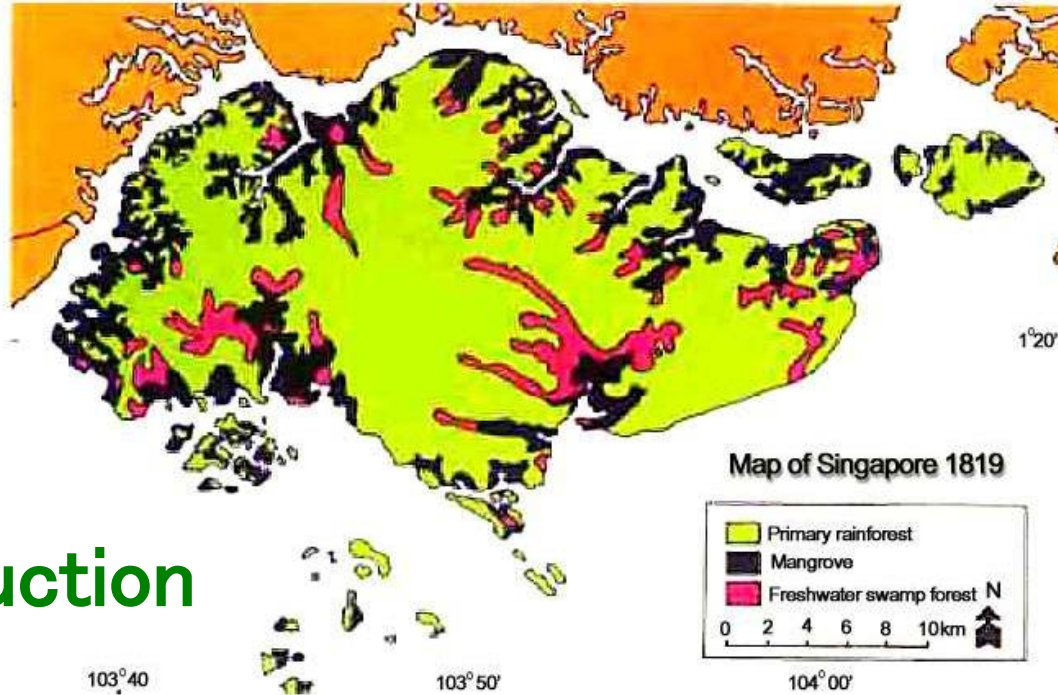


# Environmental Education and Protection through long-term ecological research and partnership:

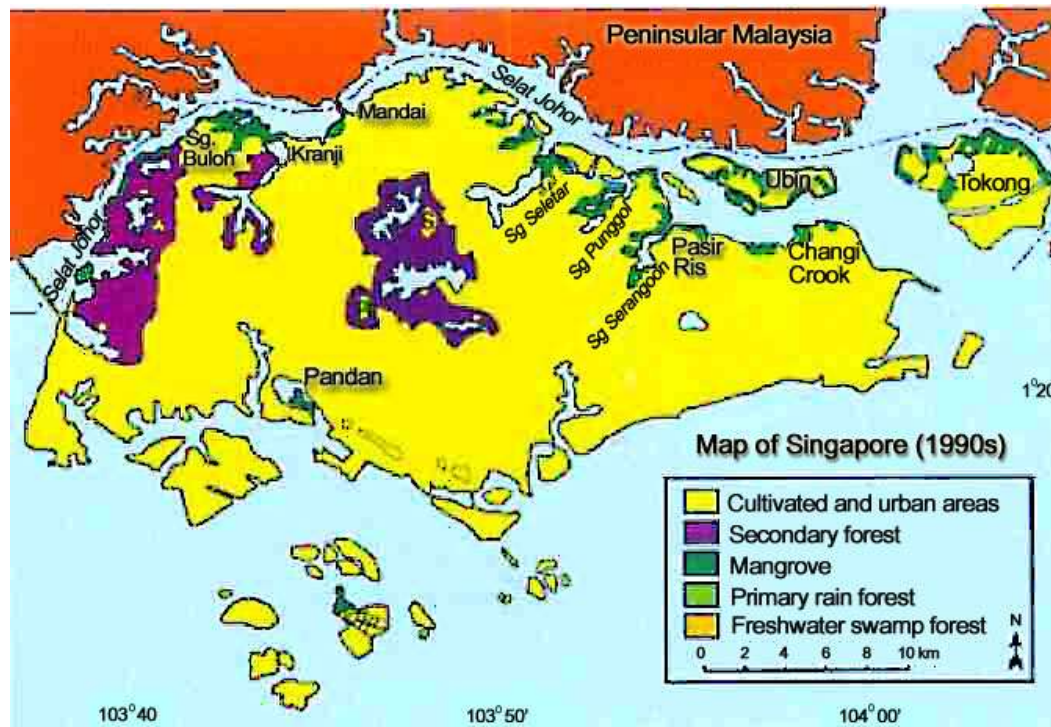
a Singapore case study



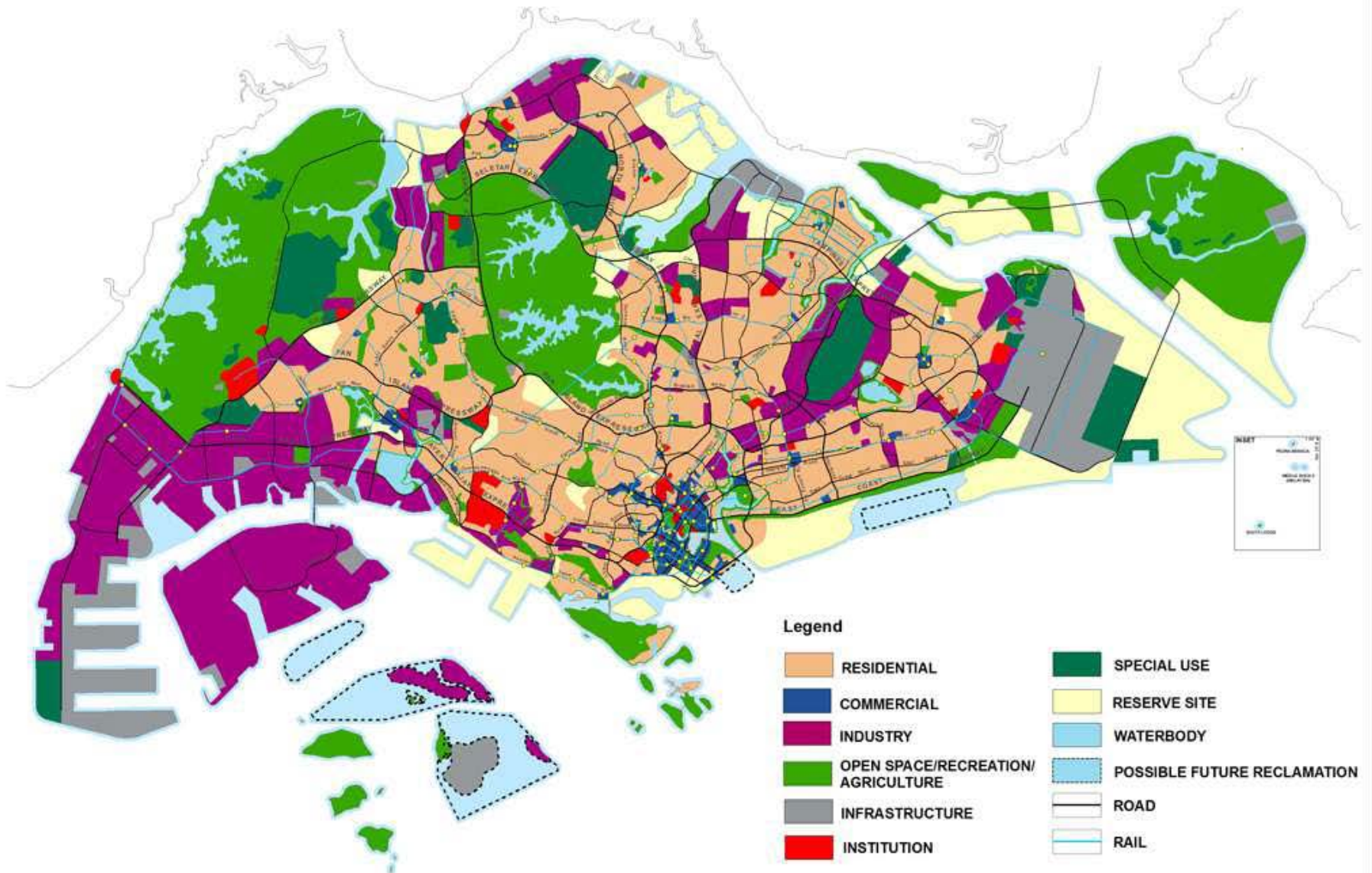
Dr Shawn Lum  
Ms Sharon Chan  
Ms Tan Beng Chiak

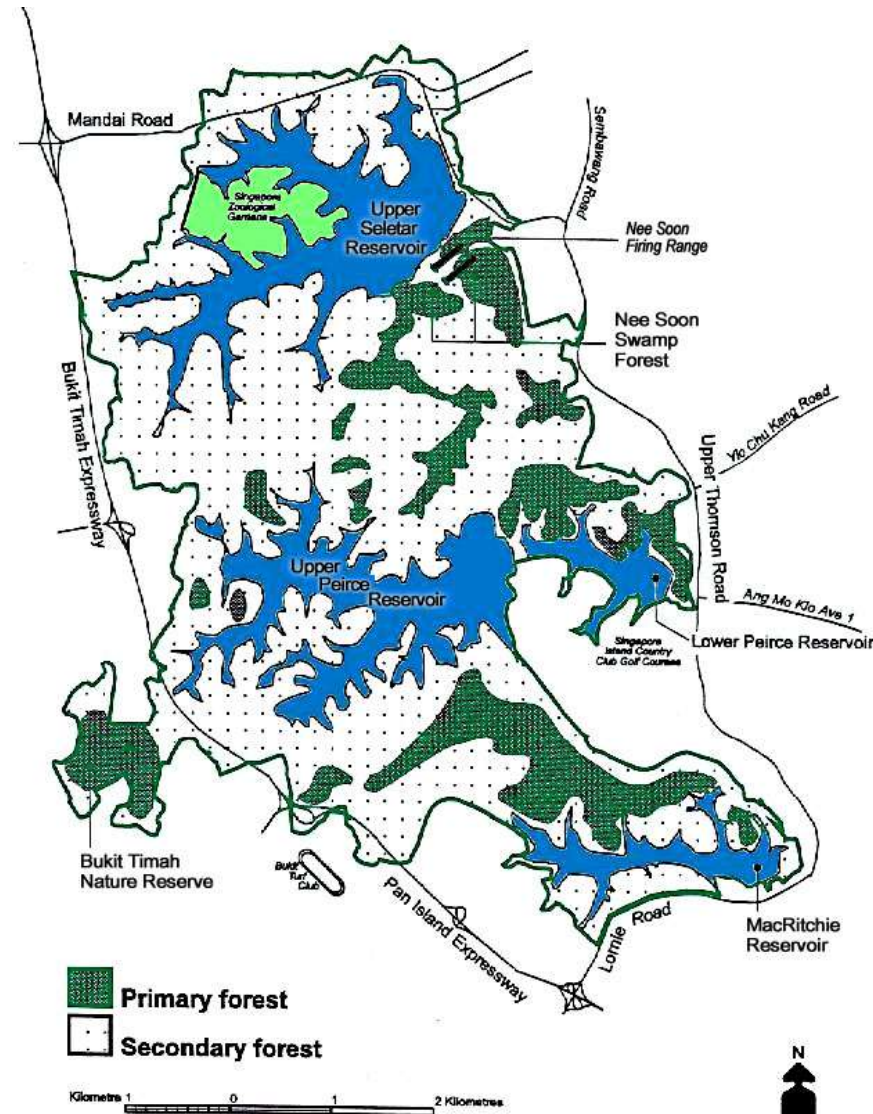


# ○ Introduction



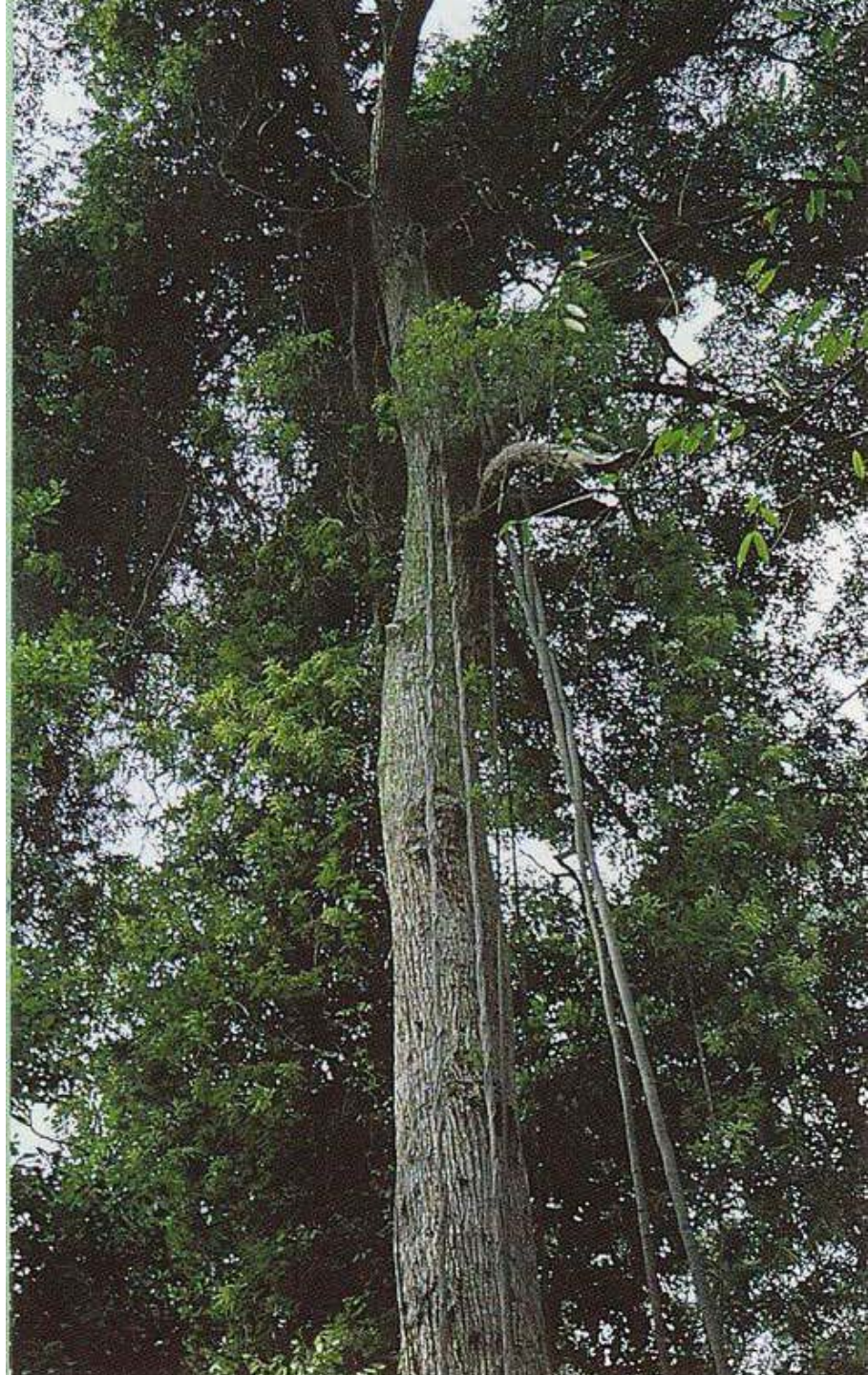
# Land Use in Singapore 2013





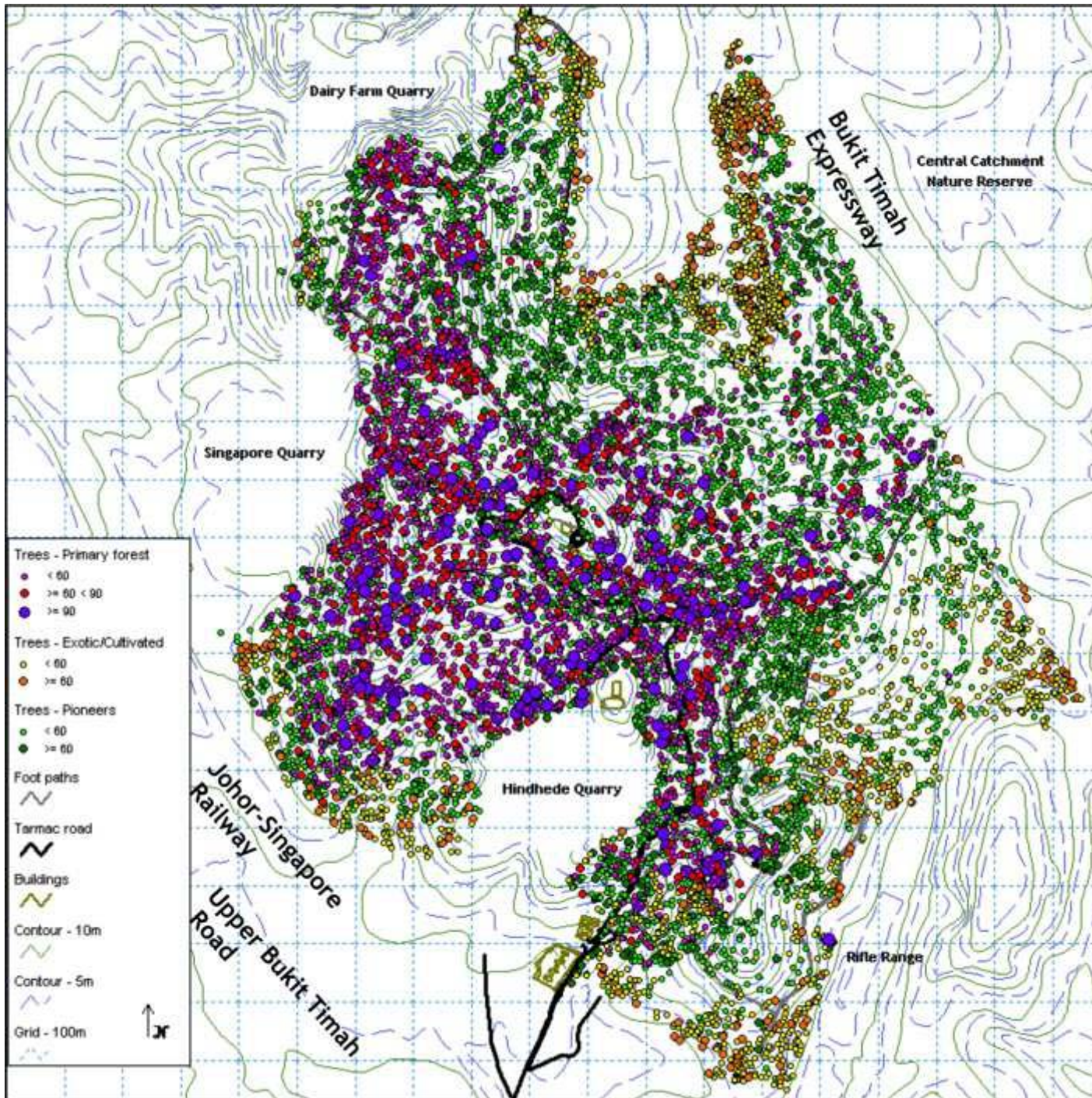


Taken from A View from the Summit



- **Long-term Study at BTNR**
  - Impacts of fragmentation?
  - Fate of primary forest?
  - Impacts of defaunation?

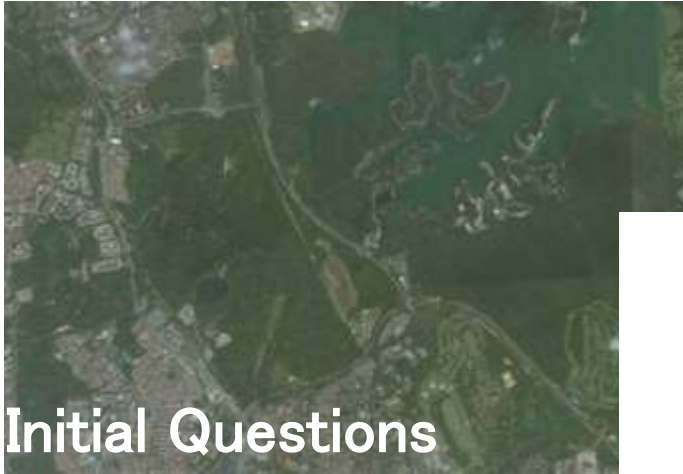




Findings from NIE-  
CTFS plot

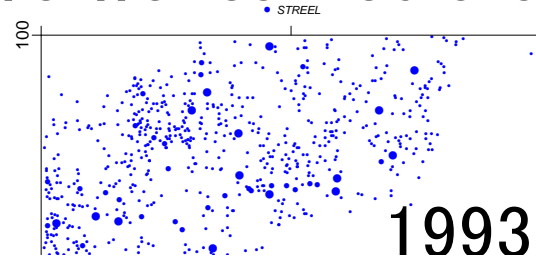


# Bukit Timah – What have we learned after 20 years?

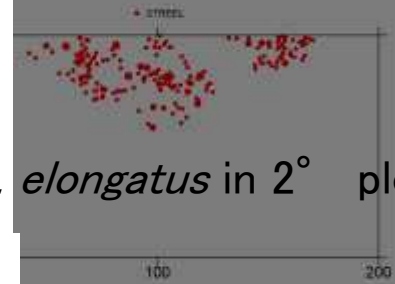


## Initial Questions

- Impacts of fragmentation
- Fate of primary forest
- Impacts of defaunation

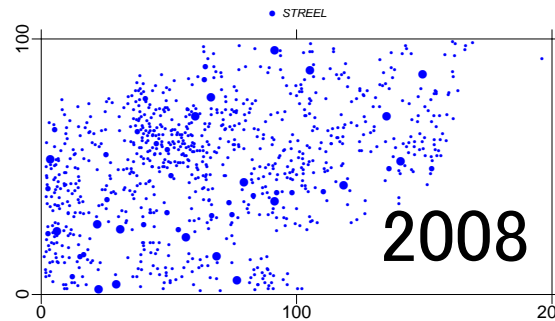


1993



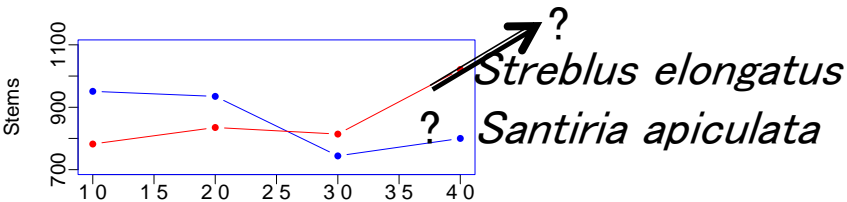
*S. elongatus* in 2° plot

*Streblus elongatus*: 782 to 1021 stems



2008

- Primary forest was (surprisingly?) stable
- Some changes in relative abundance



## ... and what's ahead?

- Change? What drives it?
- Field experiments needed
- Getting a wider group of researchers involved
- Effects of defaunation?

- Secondary forest recovery is slow
- Highest mortality among earlier pioneers but recruitment of primary forest species limited

## Long-term Study at BTNR:

- **Forest dynamics**
- **Impacts of defaunation**
- **Assessment of exotic species invasiveness**
- **Population genetics**
- **DNA Barcoding**
- **Carbon stocks**
- **Soil microbes**





## ○ From Reforestation to Field Station

LAU POOK KUN

Getting down to serious work in Mandai forest are the staff and students of various schools, together with NIE personnels.

November 14, 1999: THE SUNDAY TIMES

# NIE adopts Mandai forest

By SHARMILPAL KAUR

THE Mandai forest has new parents. It was adopted yesterday by the National Institute of Education of the Nanyang Technological University.

part in caring for nature areas and public parks.

The eight schools are the Singapore American School, Henry Park Primary, Bukit View Secondary, Naval Base Secondary, Raffles Girls Secondary, River Valley High, Corporation Primary, and

At the same time, it is understood that each school will also use the plot for individual projects.

Two months ago, Henry Park Primary, launched its own. More than 80 of its students started seedlings in plastic cups. They will put

let. They say that the toilet is a nice place because it is wet all the time."

The NIE will use the forest as a living classroom for its ecology and environmental programmes.

Associate Professor Shawn Lum of the biology

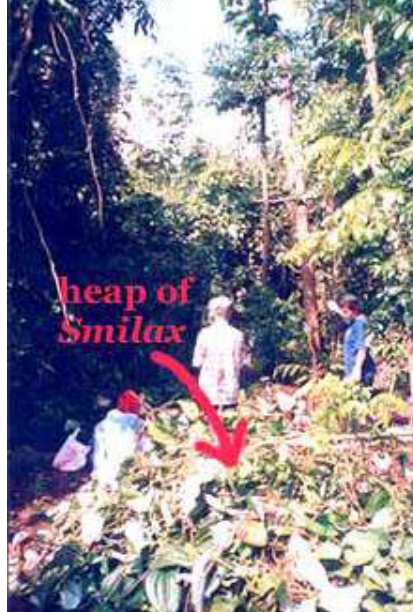
aggressive creeper. It went out of control and covered the forest. It smothered the smaller trees to death."

The schools will also have to experiment and find out which plants will grow best there.

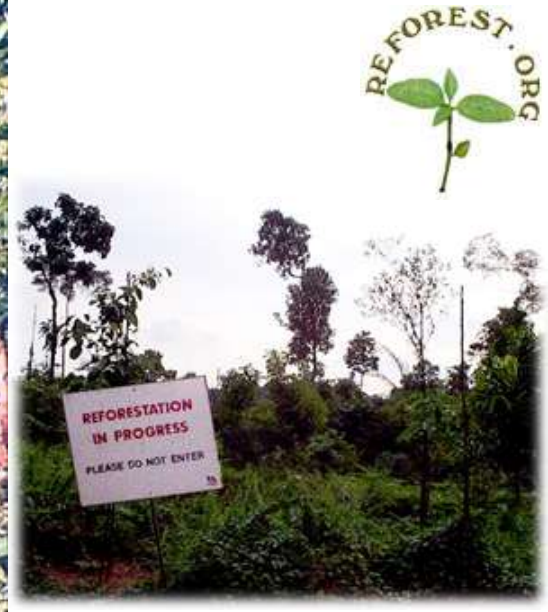




*It begins with just*



**heap of  
Smilax**





collecting reservoir water



measuring physical conditions

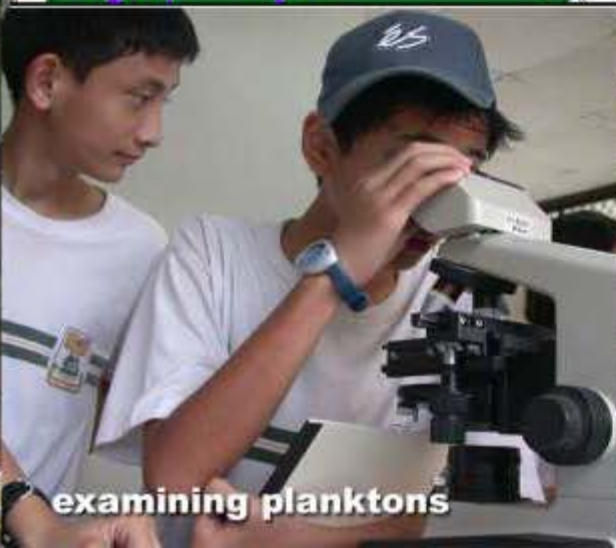


healthy forest

# Nature Learning Camp 2001



stream study

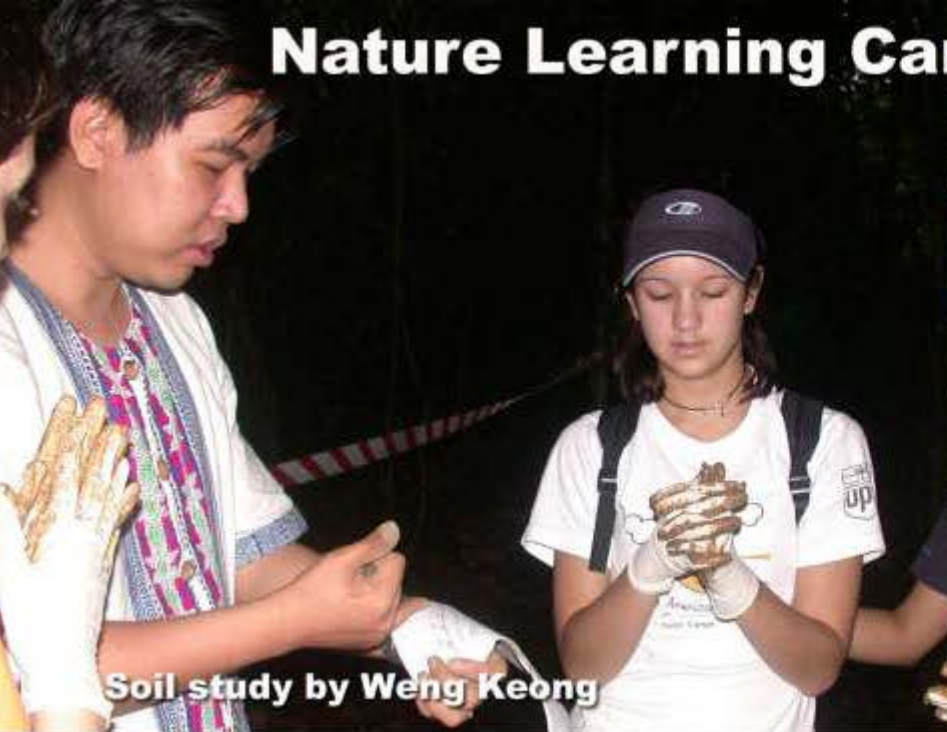


examining planktons

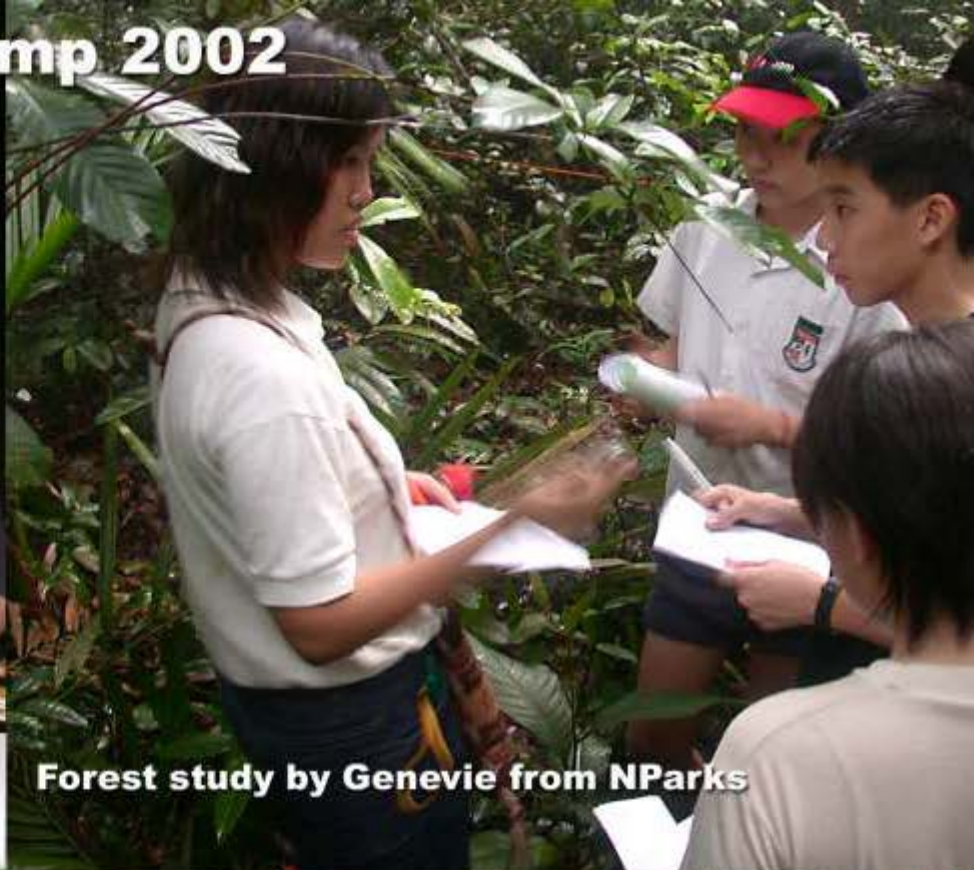


disturbed forest

# Nature Learning Camp 2002



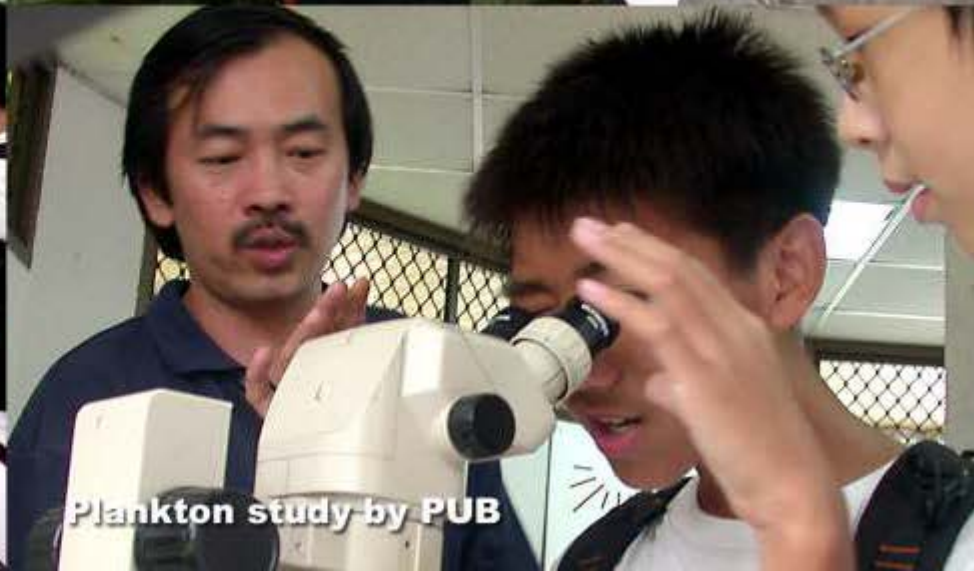
Soil study by Weng Keong



Forest study by Genevie from NParks



Insect study by Benjamin from NParks



Plankton study by PUB

# Wallace Environmental Learning Laboratory (WELL)

- *The First Learning Laboratory in the Forest of Singapore*





Courtesy of National Archives of Singapore  
26 September 1966



# Location



# Dairy Farm in the 60s



Wallace Environmental  
Learning Laboratory  
Established by RRS and EPRI



# Neglected National & Natural Heritage



Wallace Environmental  
Learning Laboratory  
Established by RDS and IPRIS





# Transformation to WELL



Wallace Environmental  
Learning Laboratory  
Established by RDS and KPEsis



# The Learning Lab



Wallace Environmental  
Learning Laboratory  
Established by BNC and EBN



# Learning ABOUT the environment

- To develop knowledge, understanding, and appreciation for the environment – community & natural surroundings
- raise environmental literacy

Activity with  
Ecologist, Dr  
Shawn Lum





# Learning IN the environment



Wallace Environmental  
Learning Laboratory

Hands-on exploration

- outdoor fieldwork – depth in curriculum
- experiential learning – develop skills and solve issues in environment



# Learning IN the environment

- scientific thinking through inquiry based activities and research

Stream studies by SAS



# Learning FOR the environment



Wallace Environmental  
Learning Laboratory  
Established by RDS and KPEIS

- self-worth, rootedness and connectedness with environment and community
- acquire attitudes of care and concern
- build a understanding of nature and make informed contributions to discussions

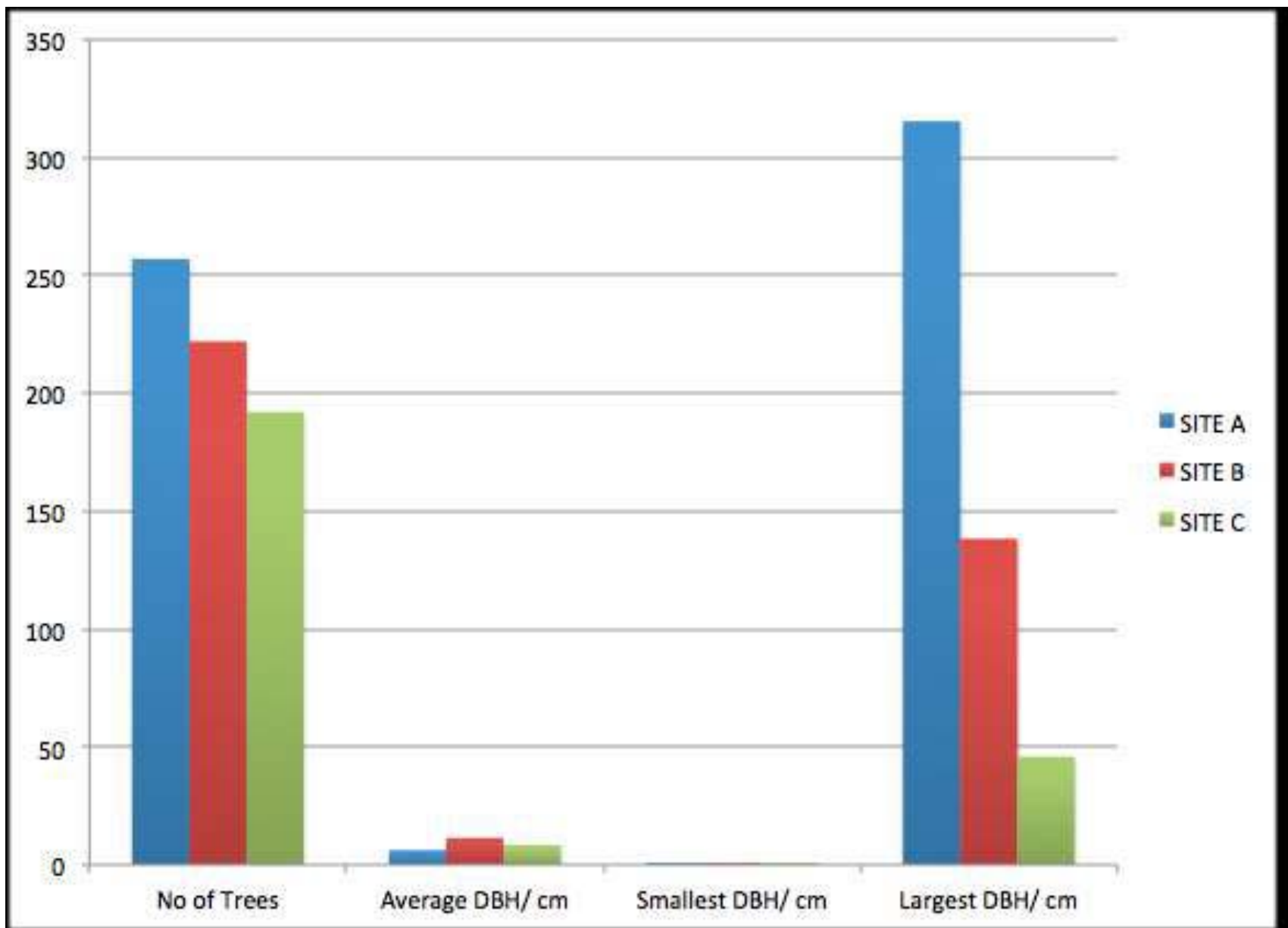


Reforestation activity by  
Corporation Primary

- Student Research can be “Real” Research

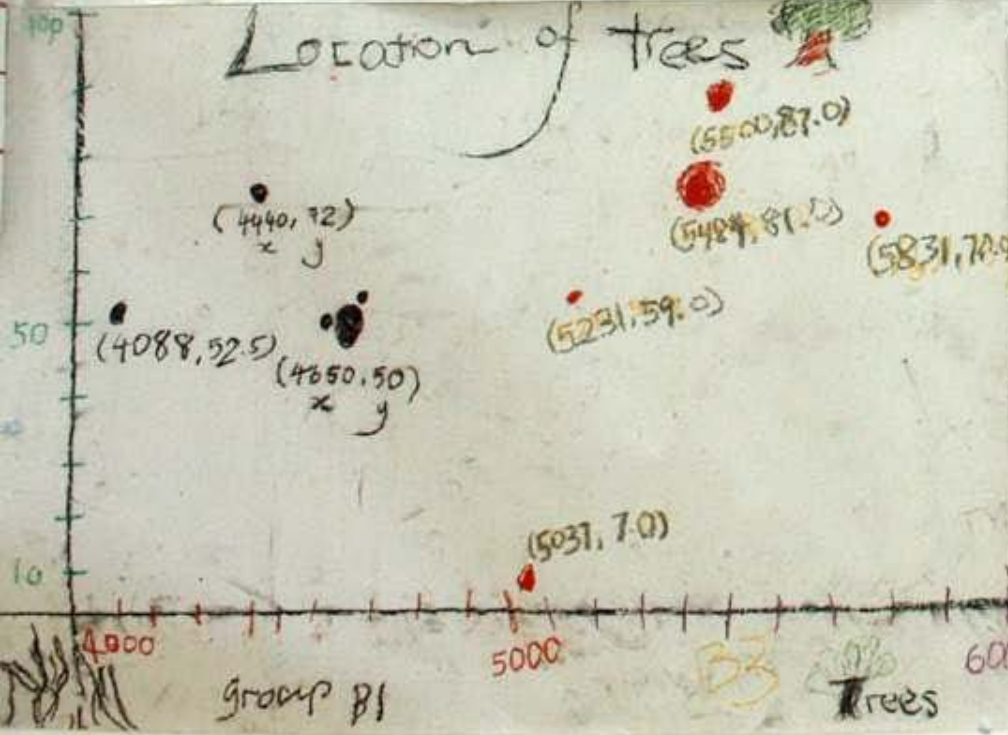


# STUDY OF FOREST STRUCTURE ALONG WALLACE TRAIL IN 2010 DURING LEARNING JOURNEY





Location of trees





Research has shown that taking the children outside the classroom and by focusing on hands-on activities, the children's academic performance increases in every discipline.

*Report from the "Closing the Achievement Gap" educational research project – Using the Environment as an Integrating Context for Learning (1998)*