Keeping Sediment Off The Reef

A project using vetiver grass to trap sediment and re-establish indigenous forest - Aneityum Island, Vanuatu

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Photo Port Patrick 1995

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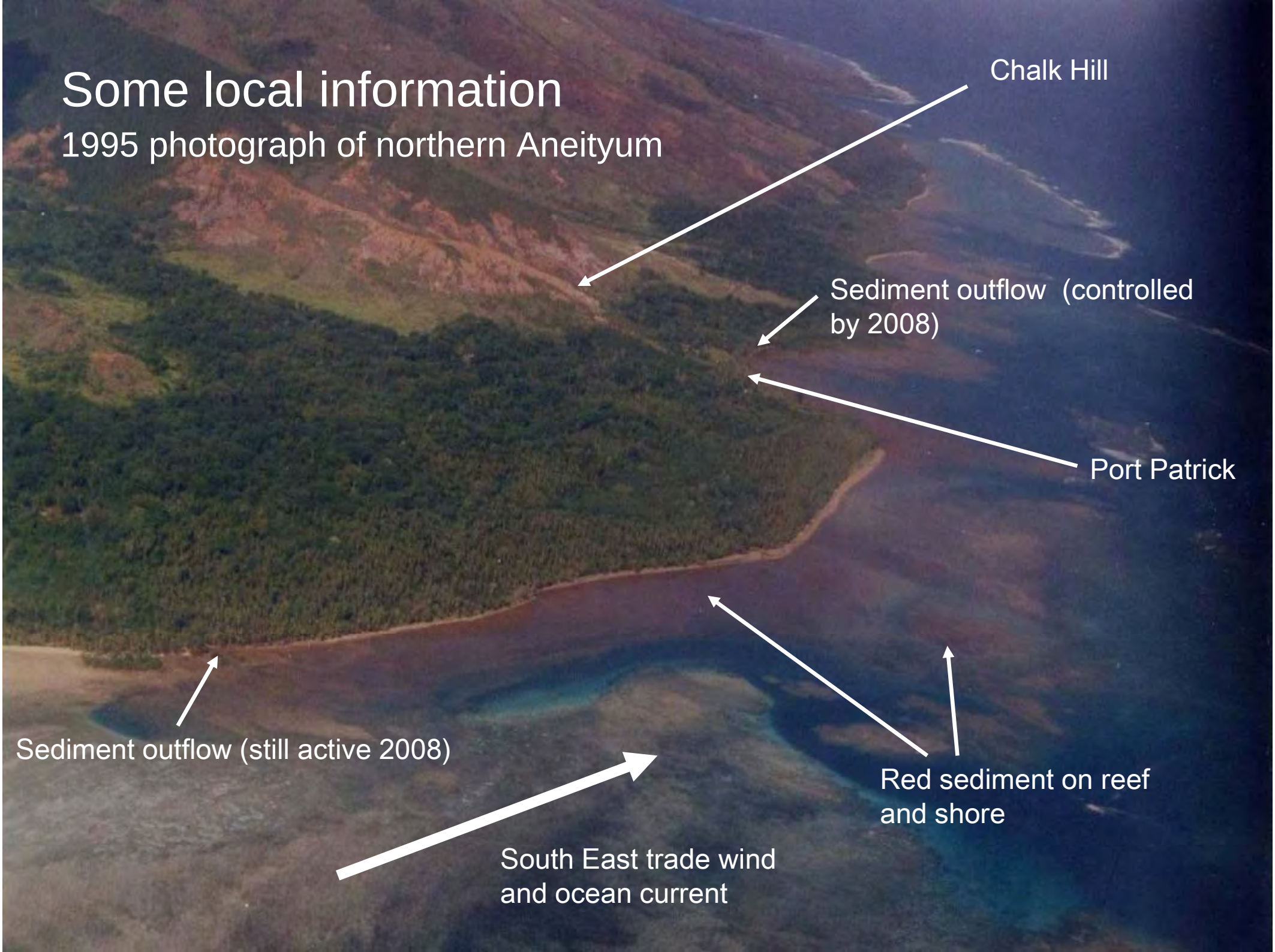
The Aneityum Erosion Control Project

A brief retrospective 6 years after NZAID funding ceased

- Initial work started in January 1995
- Earlier New Zealand funded forestry plantings had prevented new erosion sites forming.
- Trees could not be established in the infertile deep raw gullies and so red mud still reached the reef
- Trials with vetiver grass, already growing on the island, began.
- Vetiver grass nurseries were established and large scale planting was undertaken.
- Indigenous trees were established in soil trapped by the rows of vetiver grass.
- Project funding ceased suddenly in late 2002.

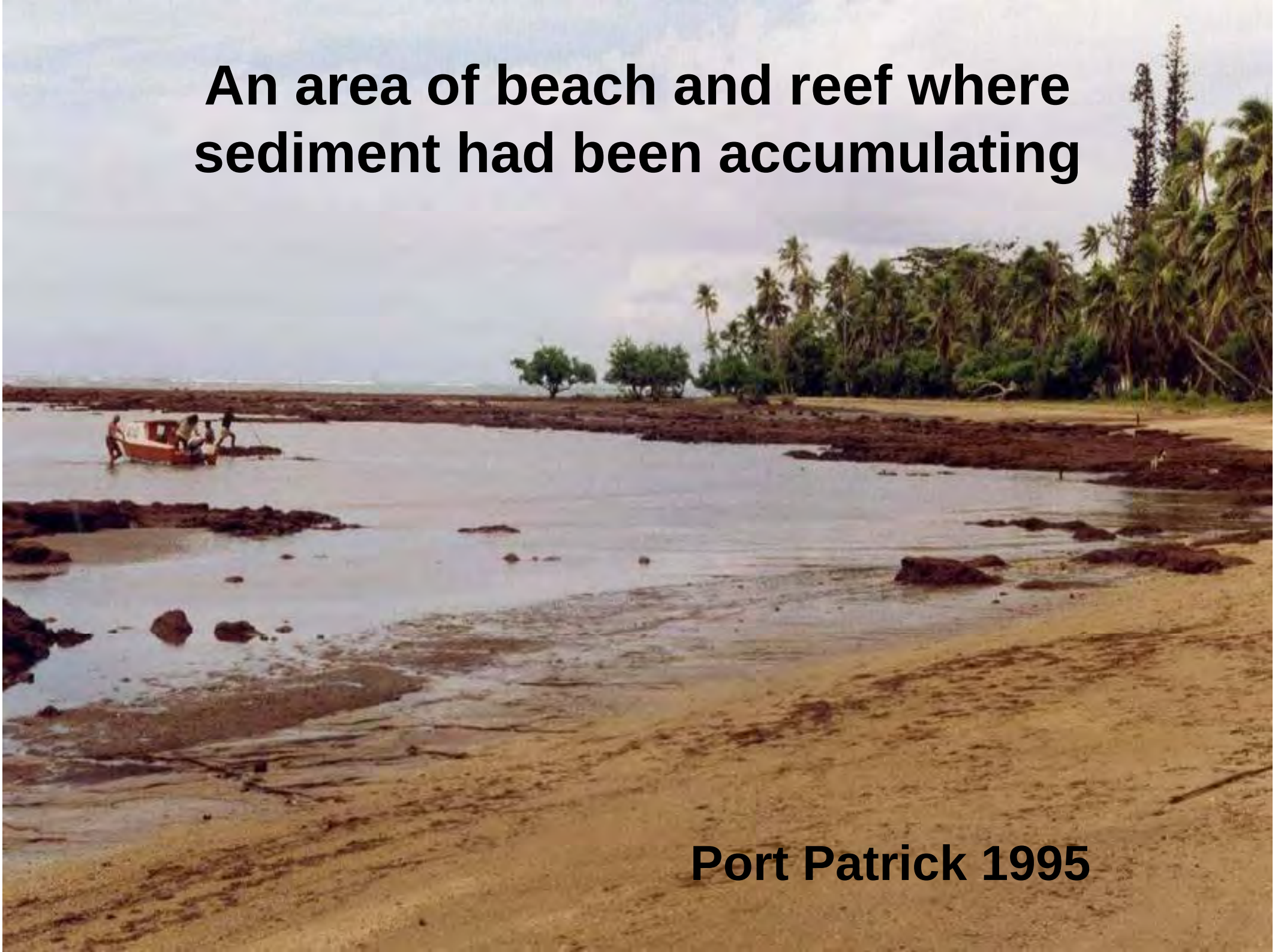

Some local information
1995 photograph of northern Aneityum
Chalk Hill
Sediment outflow (controlled by 2008)
Port Patrick
Sediment outflow (still active 2008)
Red sediment on reef and shore
South East trade wind and ocean current


Red sediments smothering old reef
Port Patrick - 1995 photo (from a distance of about 1.5 metres)

Some of the sediment sources

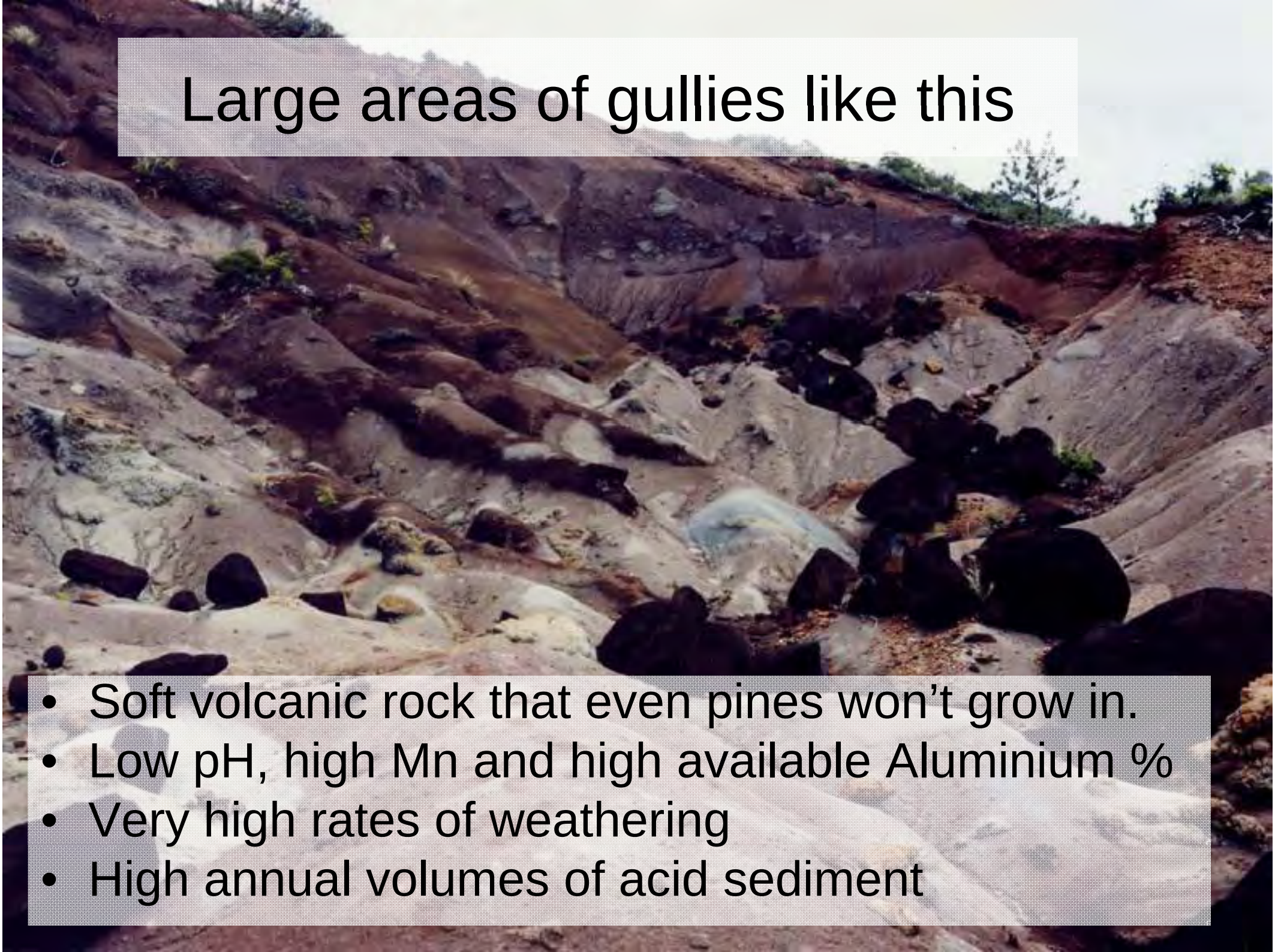
- about 50 ha of bare volcanic subsoil visible in this photo


A major source of sediment
5000 gal water tank gives scale
“Chalk Hill” 1995


An area of beach and reef where sediment had been accumulating
Port Patrick 1995

The scale of the problem – massive

Cruise ships often visit the lagoon seen here



Large areas of gullies like this

- Soft volcanic rock that even pines won’t grow in.
- Low pH, high Mn and high available Aluminium %
- Very high rates of weathering
- High annual volumes of acid sediment

Acacia spirorbis

- The ideal pioneer tree for this particular island
- An indigenous nitrogen fixing timber species
- Tolerates low pH and high available Aluminium
- Very tolerant of seasonal drought
- Fast growing but easily killed by fire

Establishing *Acacia spirorbis*

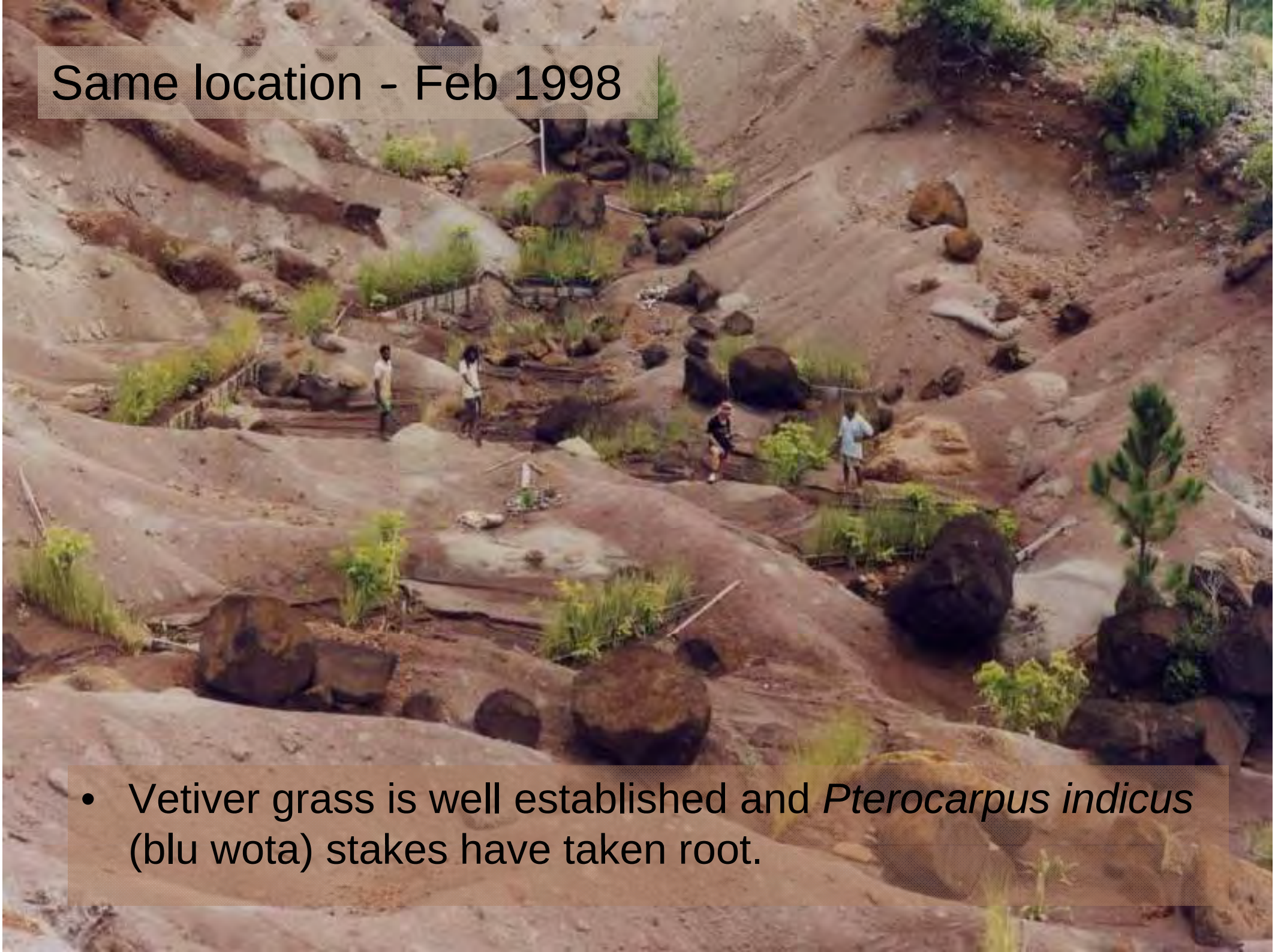
- Stiff stemmed vetiver grass traps sediment
- One year old seedling Acacia near spade


1998 – the same Acacia

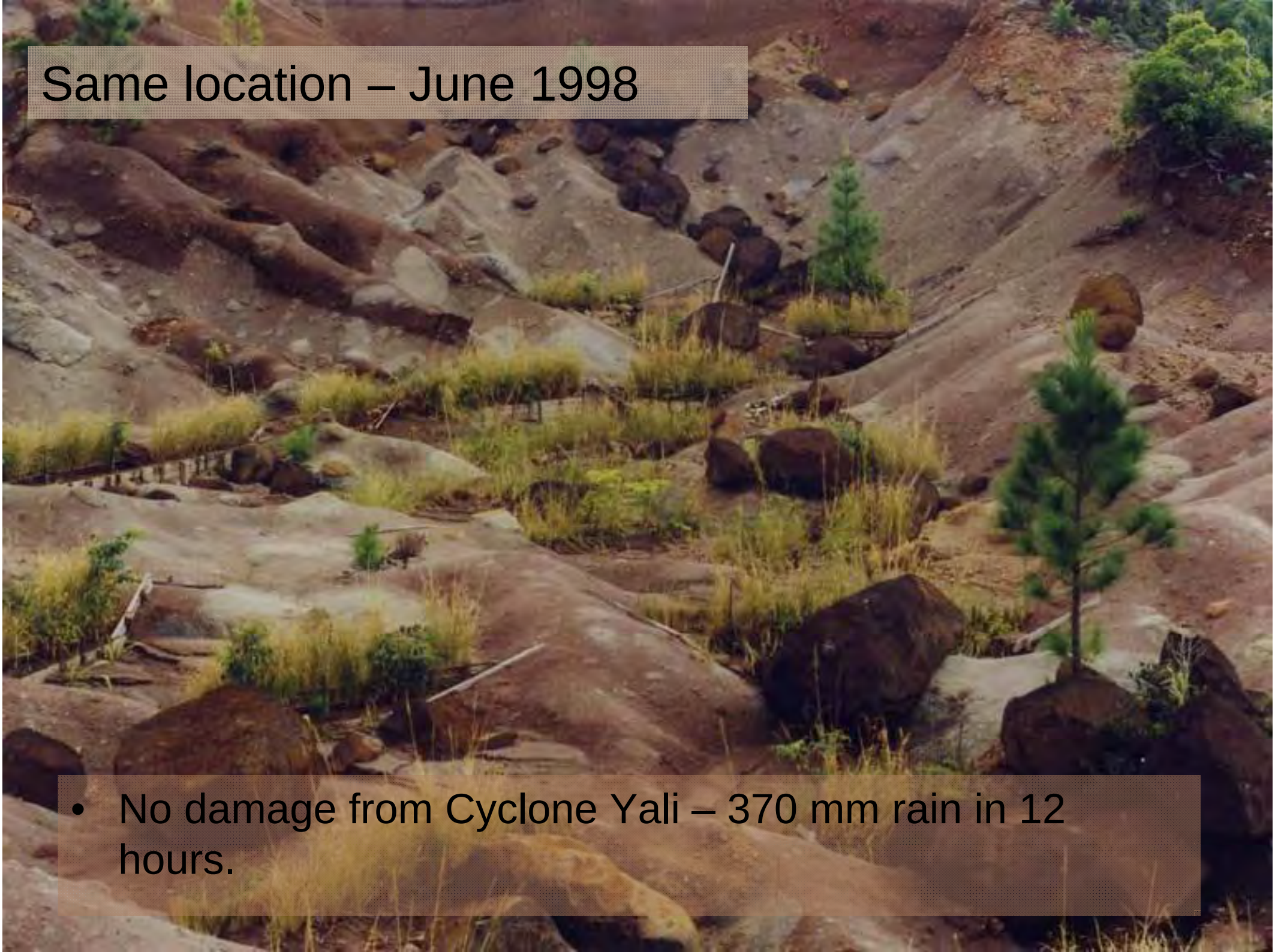

1999 – the same Acacia
• Vetiver grass continues to trap sediment
• *Acacia spirorbis* shades soil and provides nitrogen and leaf litter

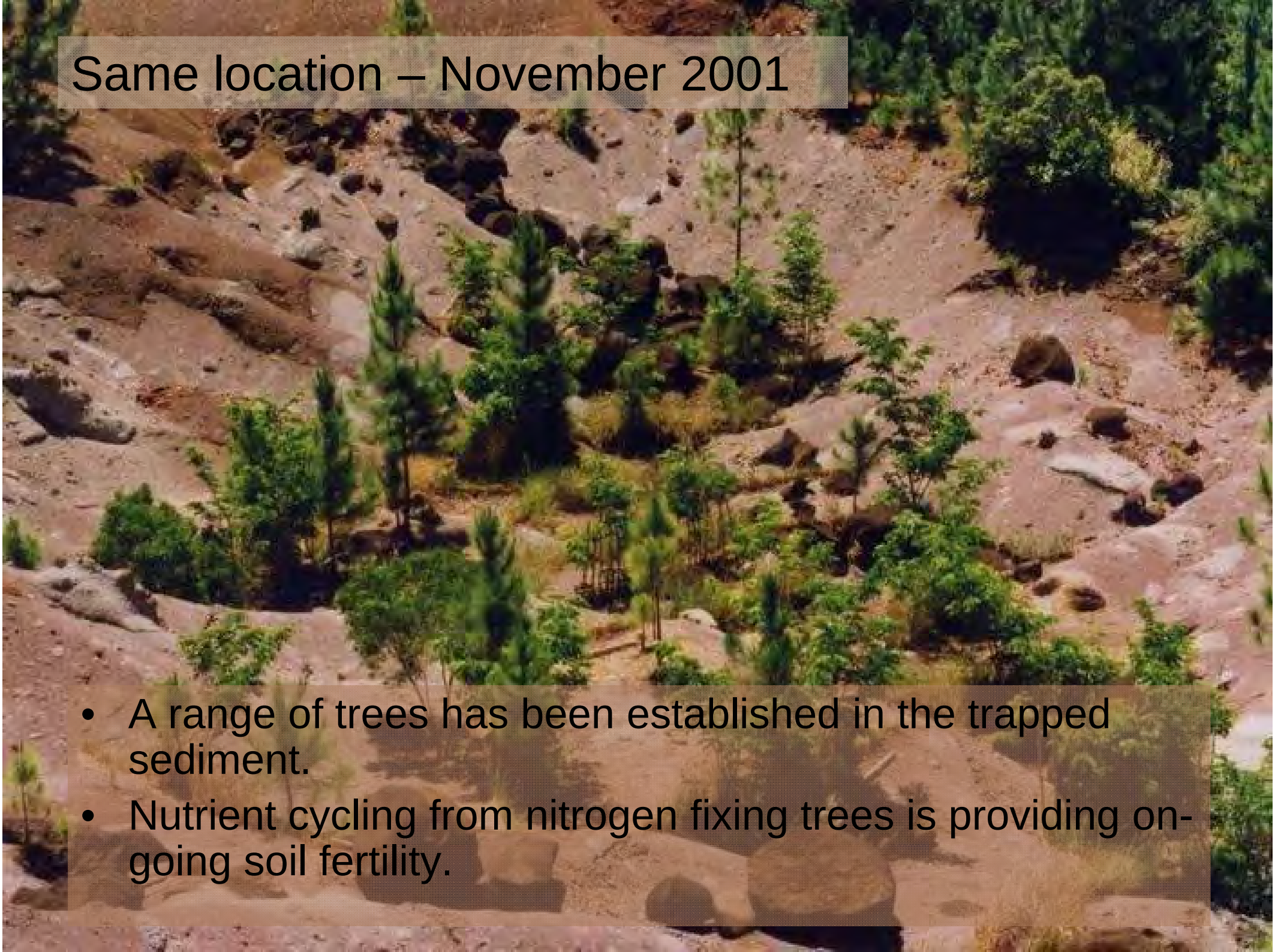
Port Patrick - eroding gully in toxic soft rock

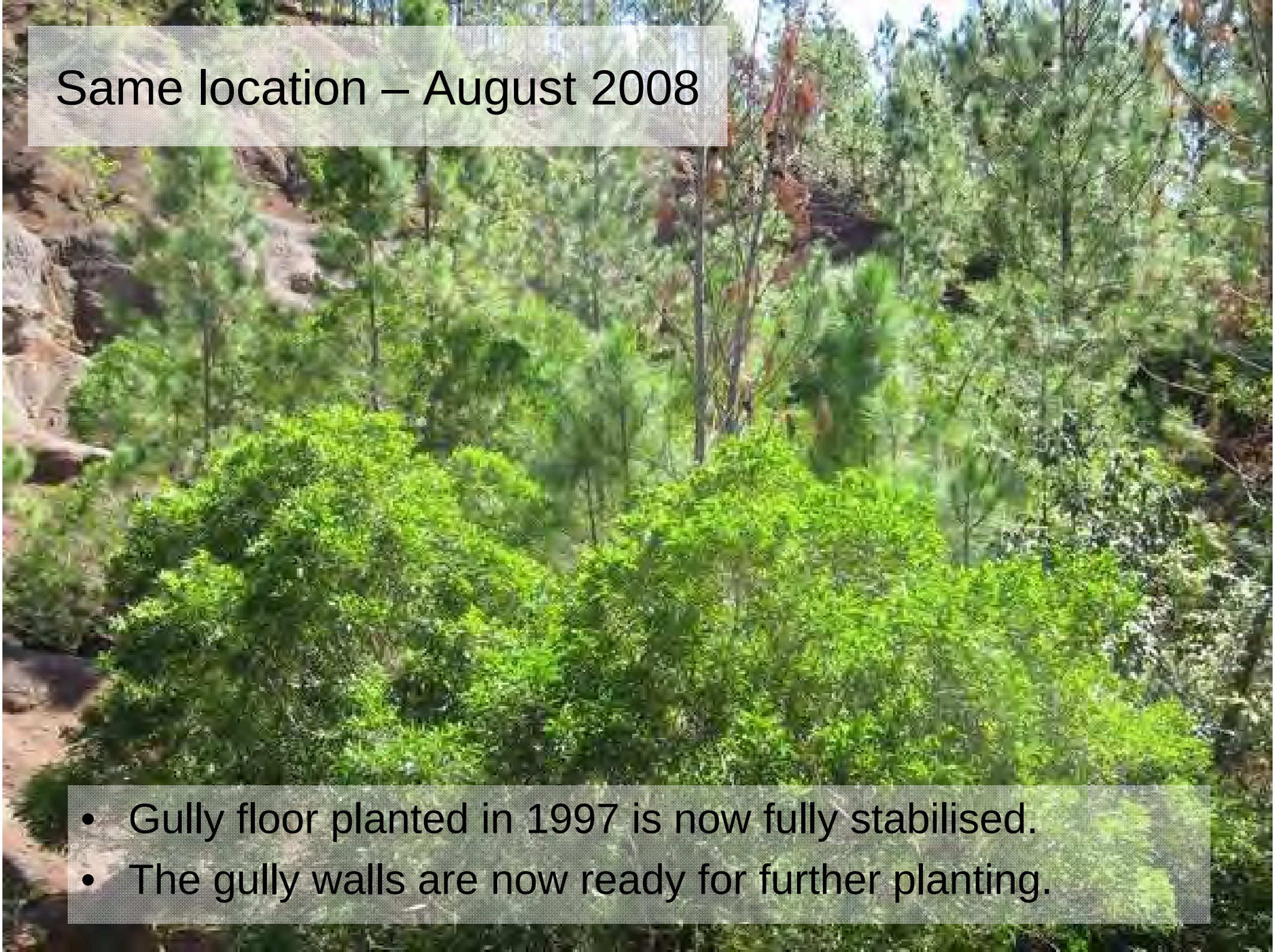
- 1997 - Initial vetiver grass planting



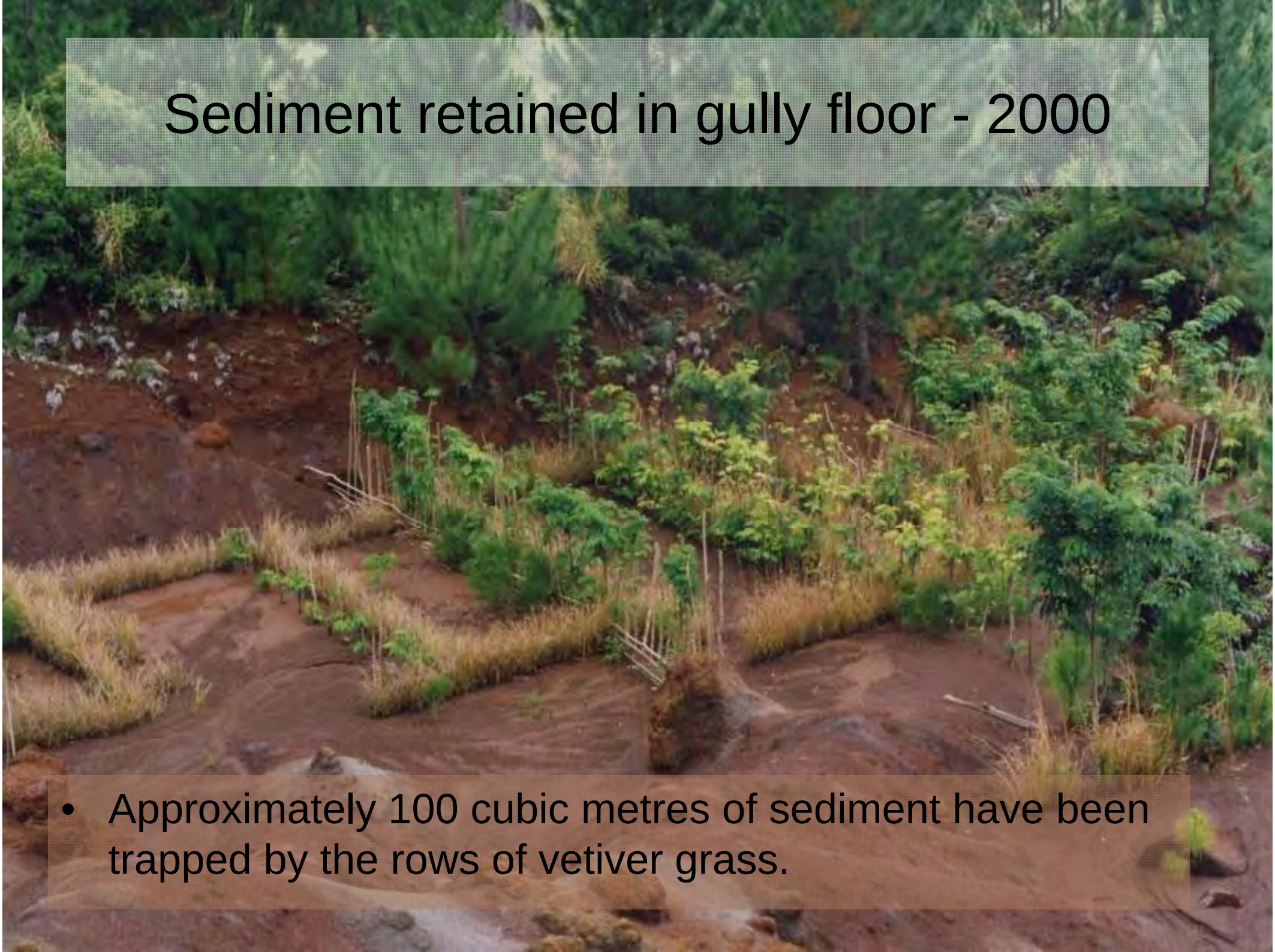
- Vetiver grass is well established and *Pterocarpus indicus* (blu wota) stakes have taken root.


Same location – June 1998
• No damage from Cyclone Yali – 370 mm rain in 12 hours.


Same location – November 2001
• A range of trees has been established in the trapped sediment.
• Nutrient cycling from nitrogen fixing trees is providing on-going soil fertility.

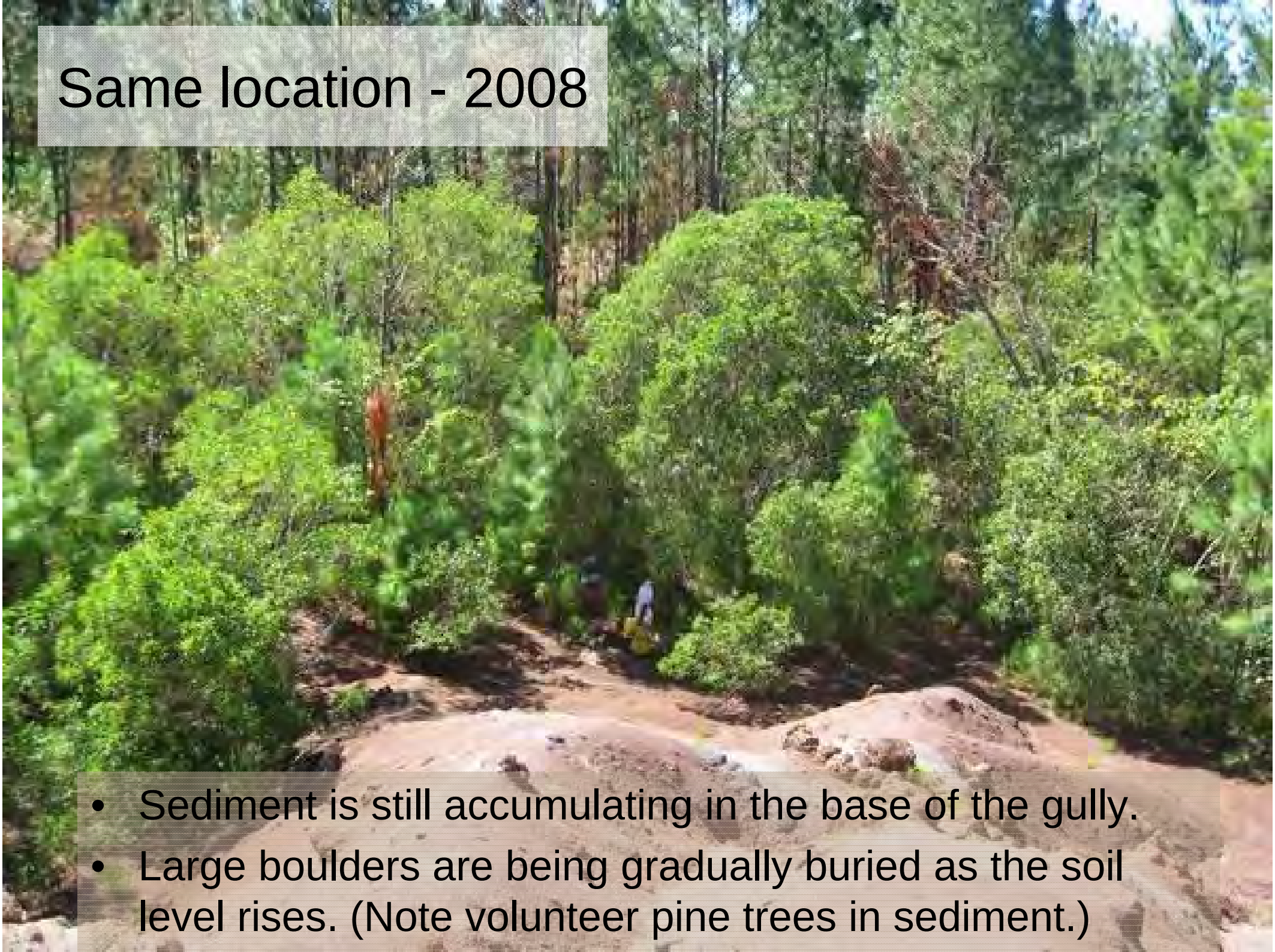

Same location – August 2008
• Gully floor planted in 1997 is now fully stabilised.
• The gully walls are now ready for further planting.

Sediment retained in gully floor - 2000



- Approximately 100 cubic metres of sediment have been trapped by the rows of vetiver grass.

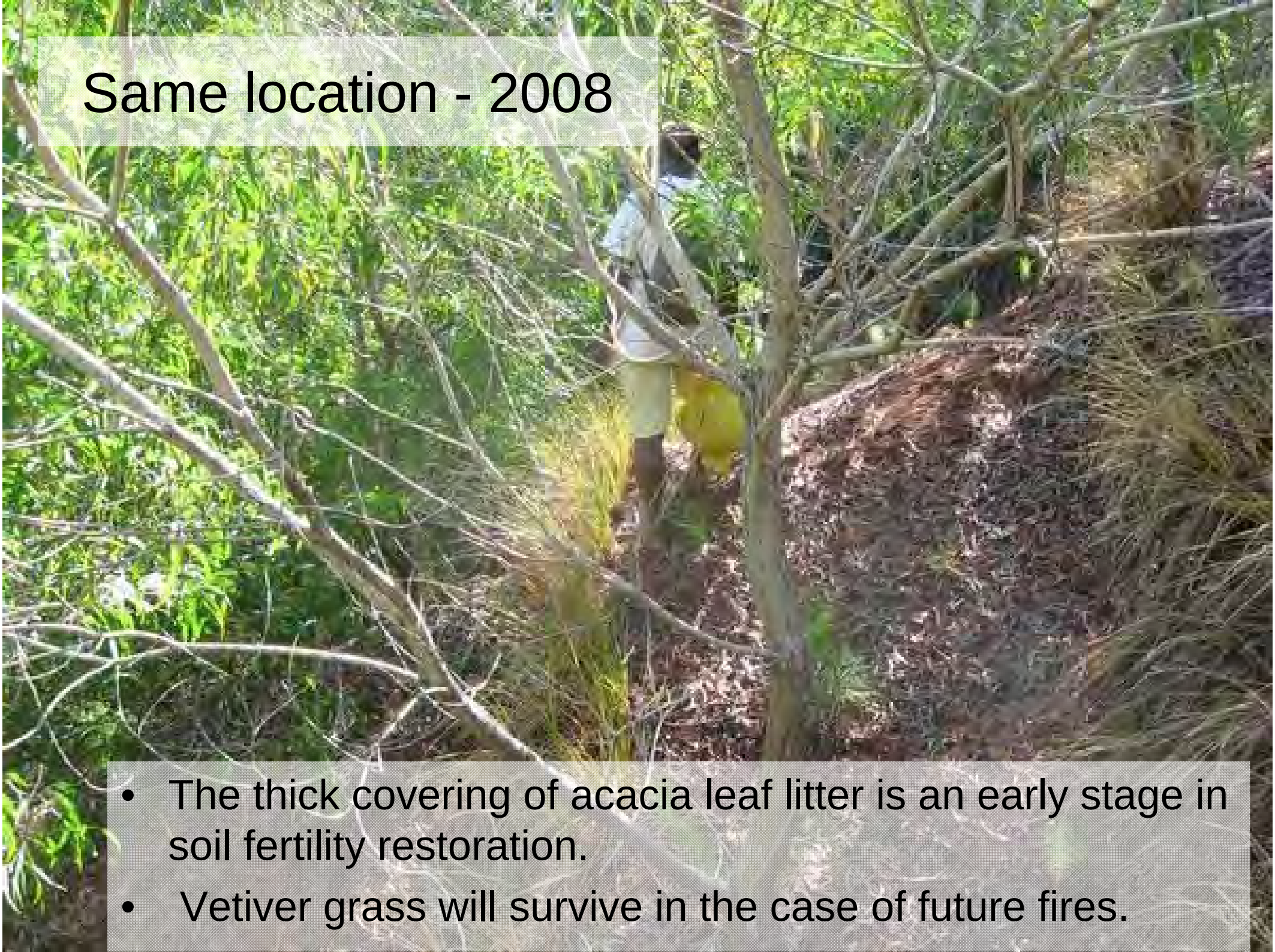
Same location - 2008



- Sediment is still accumulating in the base of the gully.
- Large boulders are being gradually buried as the soil level rises. (Note volunteer pine trees in sediment.)

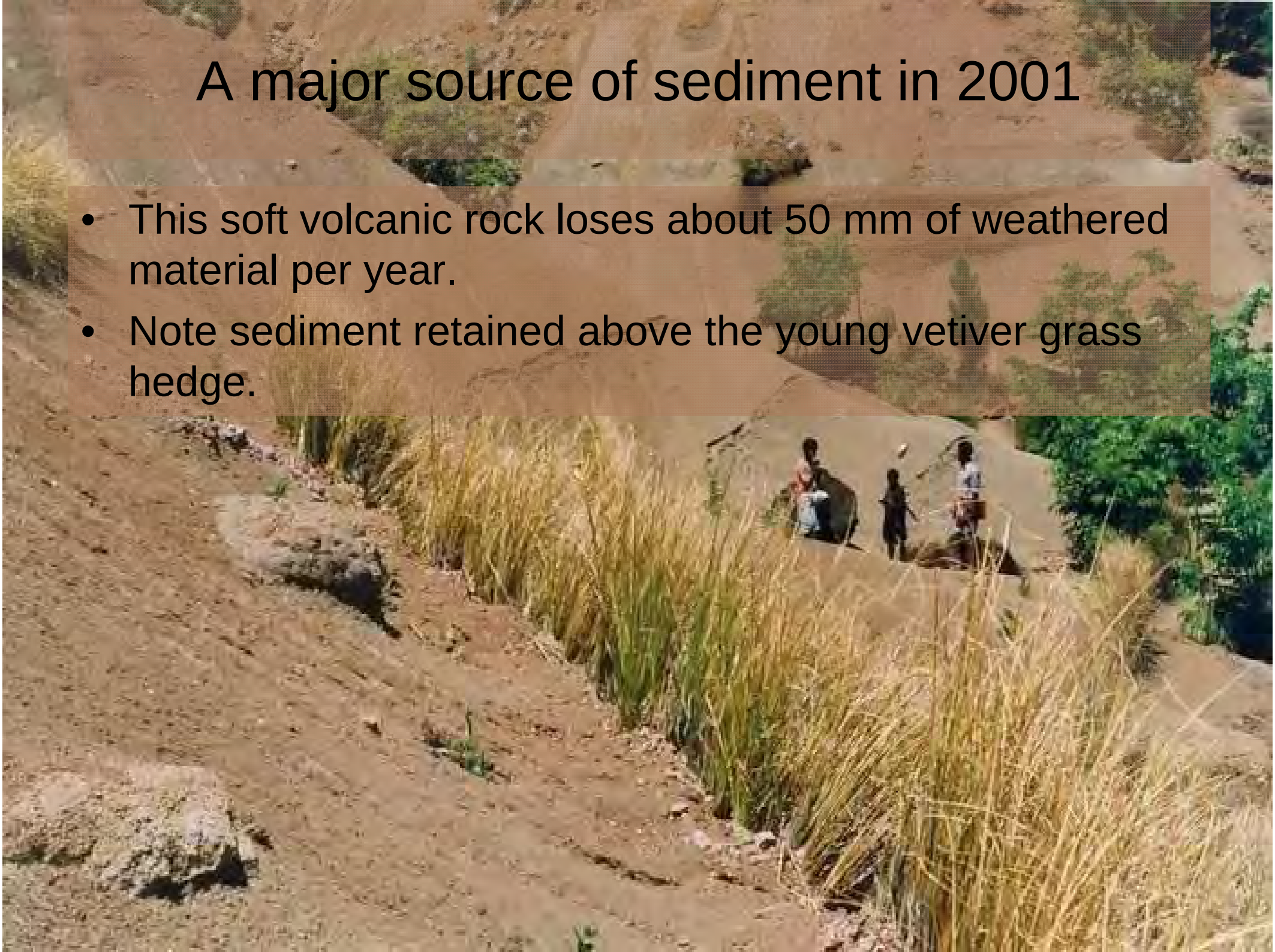
Chalk Hill - steep eroding slopes planted - 2001

- Vetiver grass rows are established a year before *Acacia spirorbis* seedlings are planted

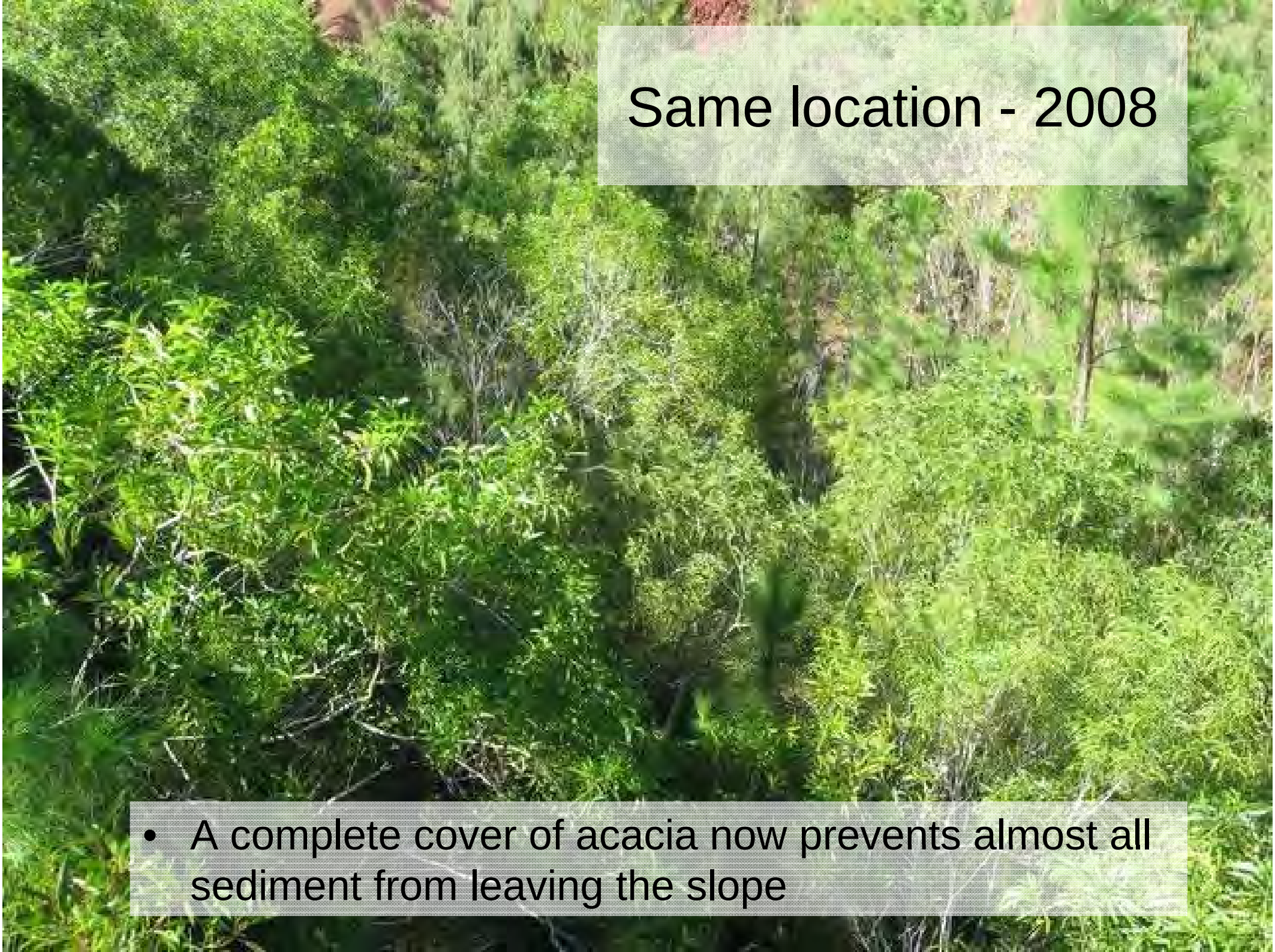


- The thick covering of acacia leaf litter is an early stage in soil fertility restoration.
- Vetiver grass will survive in the case of future fires.

A major source of sediment in 2001



- This soft volcanic rock loses about 50 mm of weathered material per year.
- Note sediment retained above the young vetiver grass hedge.



- A complete cover of acacia now prevents almost all sediment from leaving the slope

Natural Regeneration

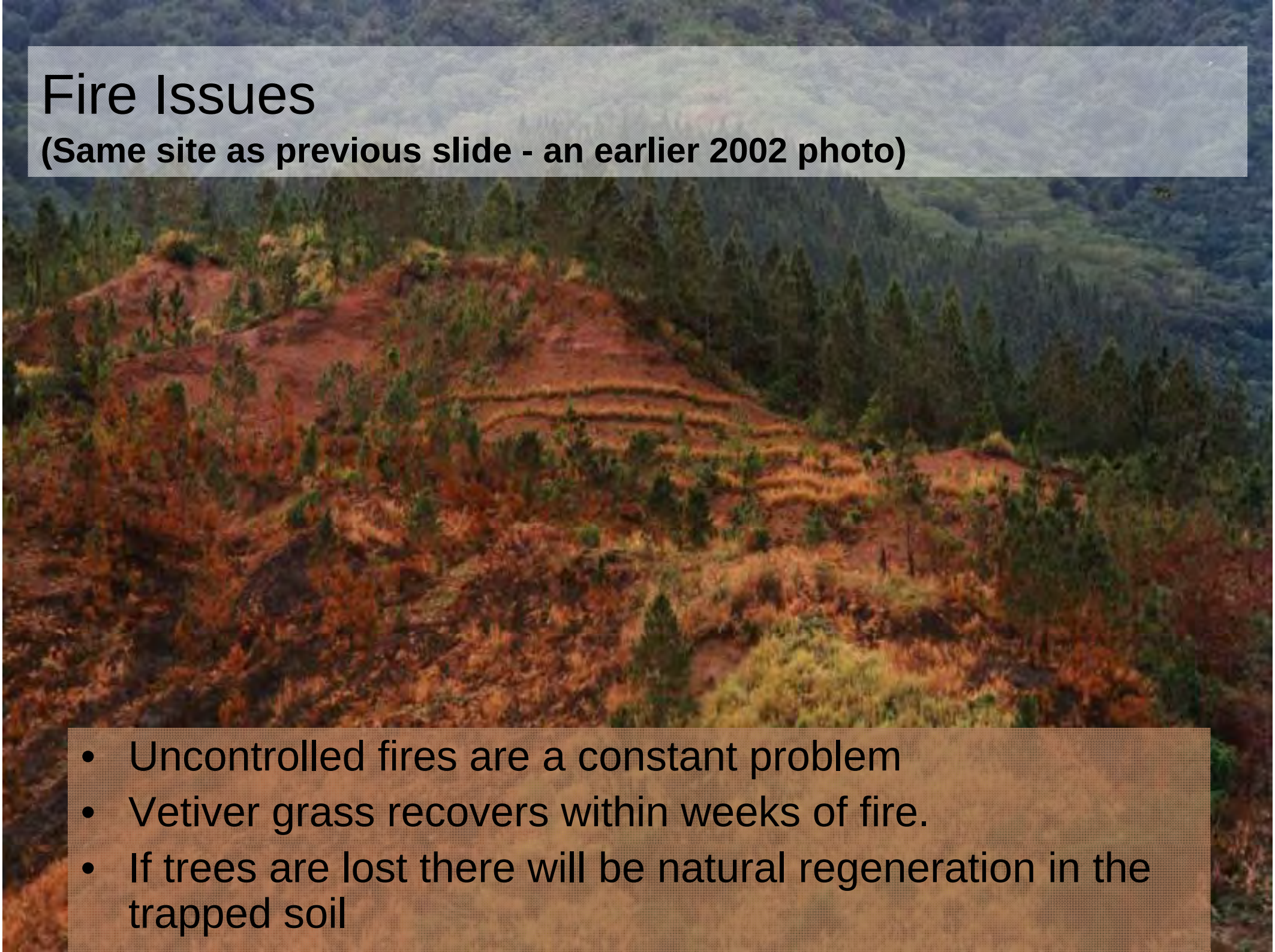
- On this exposed site both planted and volunteer trees are establishing in sediment trapped above vetiver hedges.

- Acacia and pines now blanket the slope. Vetiver survives as a back-stop in case of fire.


2008 - Same site as previous 2 slides
Bare eroding slope has been revegetated

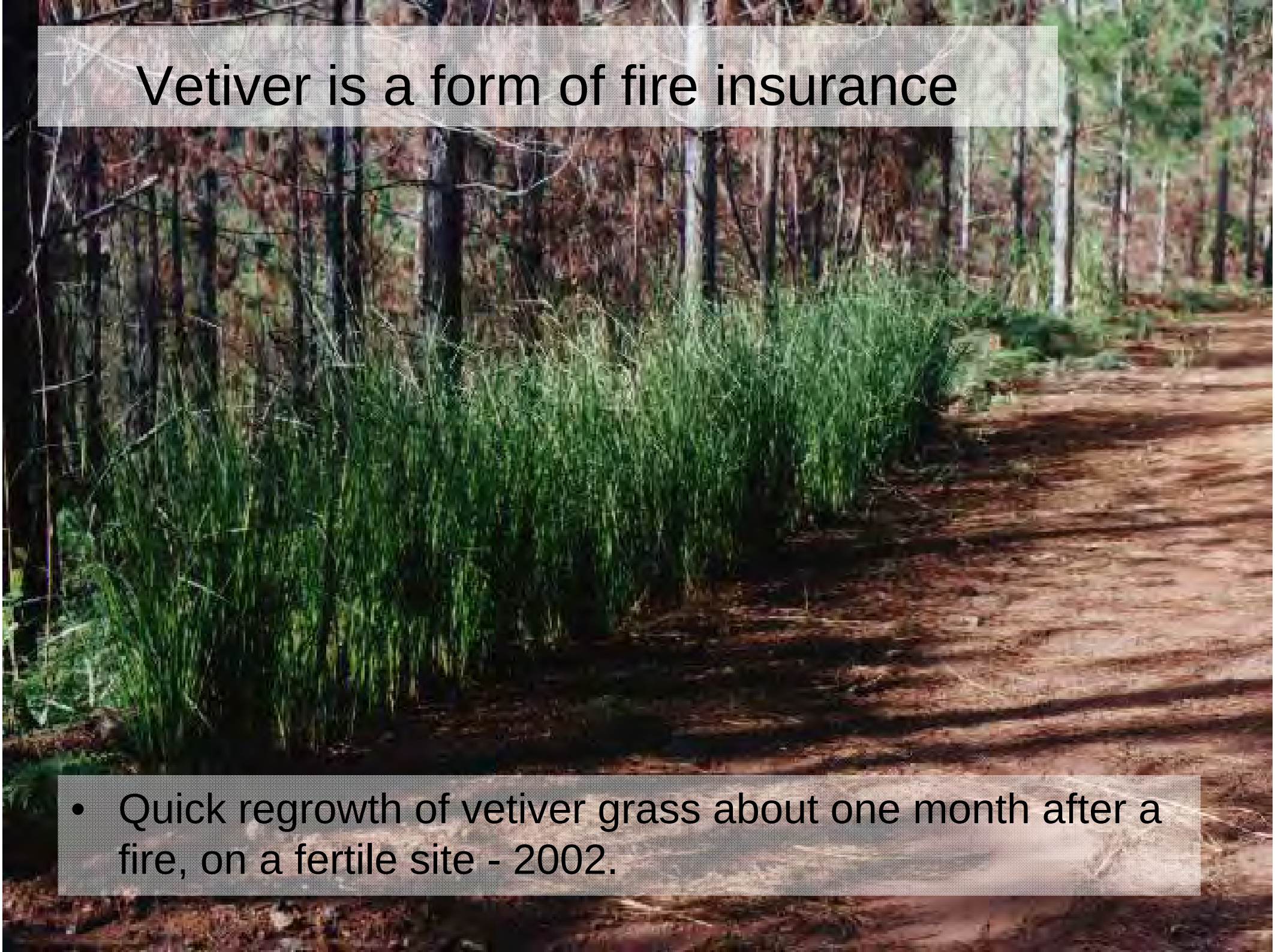
Fire Issues

(Same site as previous slide - an earlier 2002 photo)



- Uncontrolled fires are a constant problem
- Vetiver grass recovers within weeks of fire.
- If trees are lost there will be natural regeneration in the trapped soil

Vetiver is a form of fire insurance



- Quick regrowth of vetiver grass about one month after a fire, on a fertile site - 2002.

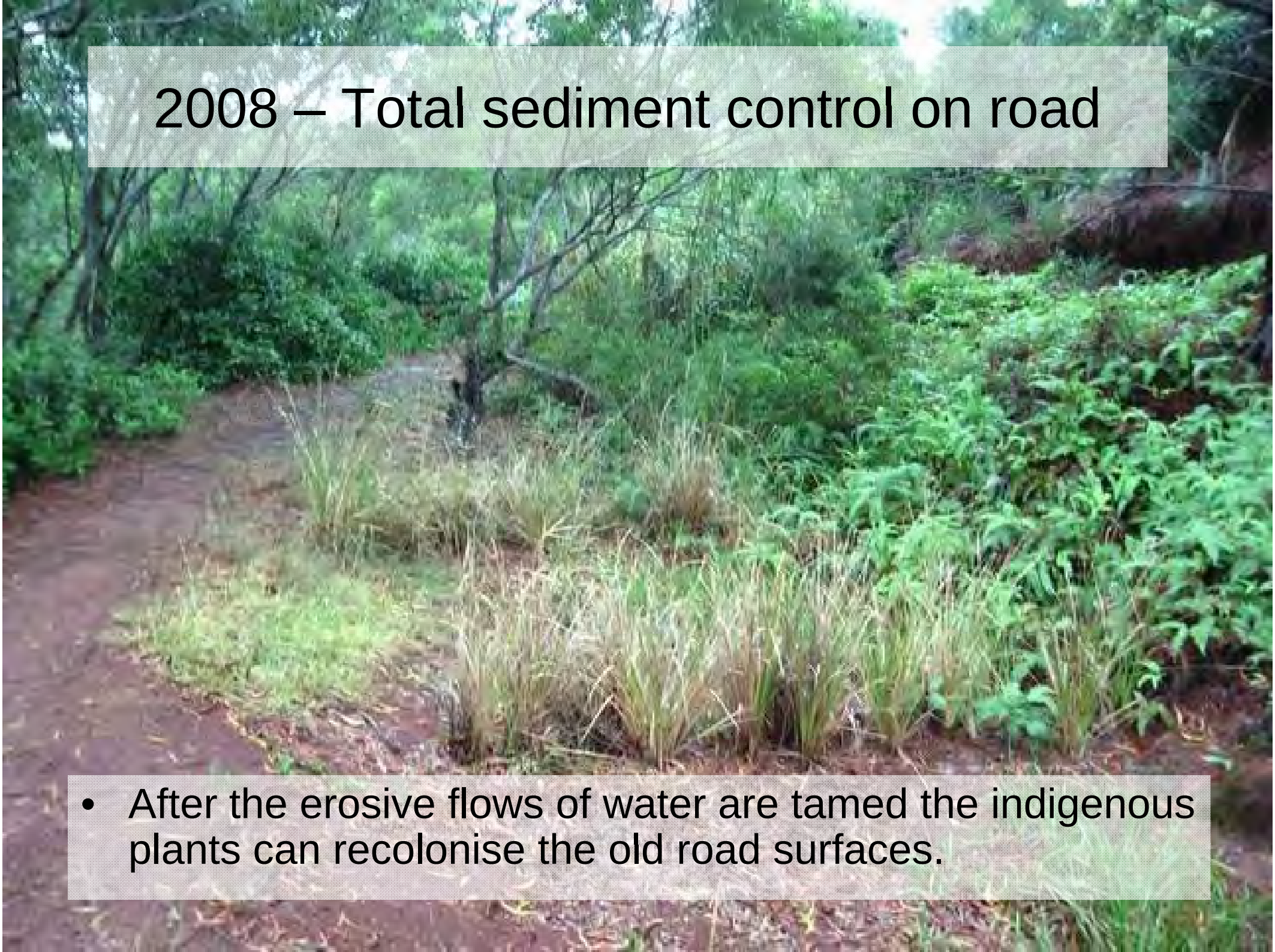
Burnt erosion control planting site

- Full recovery of vetiver hedges after this 2007 fire will retain erodible soil and allow natural regeneration of trees

Old logging road stabilised with vetiver hedges

- Sediment no longer reaches the sea from this formerly scoured out road.

2008 – Total sediment control on road



- After the erosive flows of water are tamed the indigenous plants can recolonise the old road surfaces.

2008 – Captured sediment being farmed

- This was a raw eroding gully before the erosion control work.
- The current demand for land close to the village is high.
- Cassava is now being cultivated in the sediment trapped by the 1996 vetiver grass plantings.

VETIVER GRASS FACTS

- It has no fertile seeds and must be multiplied by vegetative means
- It was introduced to this island of Aneityum in about 1912 and has not spread at all despite widespread early planting
- It will grow in very infertile soil
- Its stems and leaves filter out and trap sediment
- It resists grazing by animals

Vetiver can have a massive root system

In deep soils root depths of 2 metres are common.

These roots allow the grass to survive drought and resist scour in stream channels.

Vetiver’s major role on Aneityum

It has allowed indigenous vegetation to be successfully planted in trapped sediment on difficult sites. This photo was taken in 2002


Same site - 2008
Indigenous acacia and volunteer pine have now fully covered the gully

Changes in coastal conditions

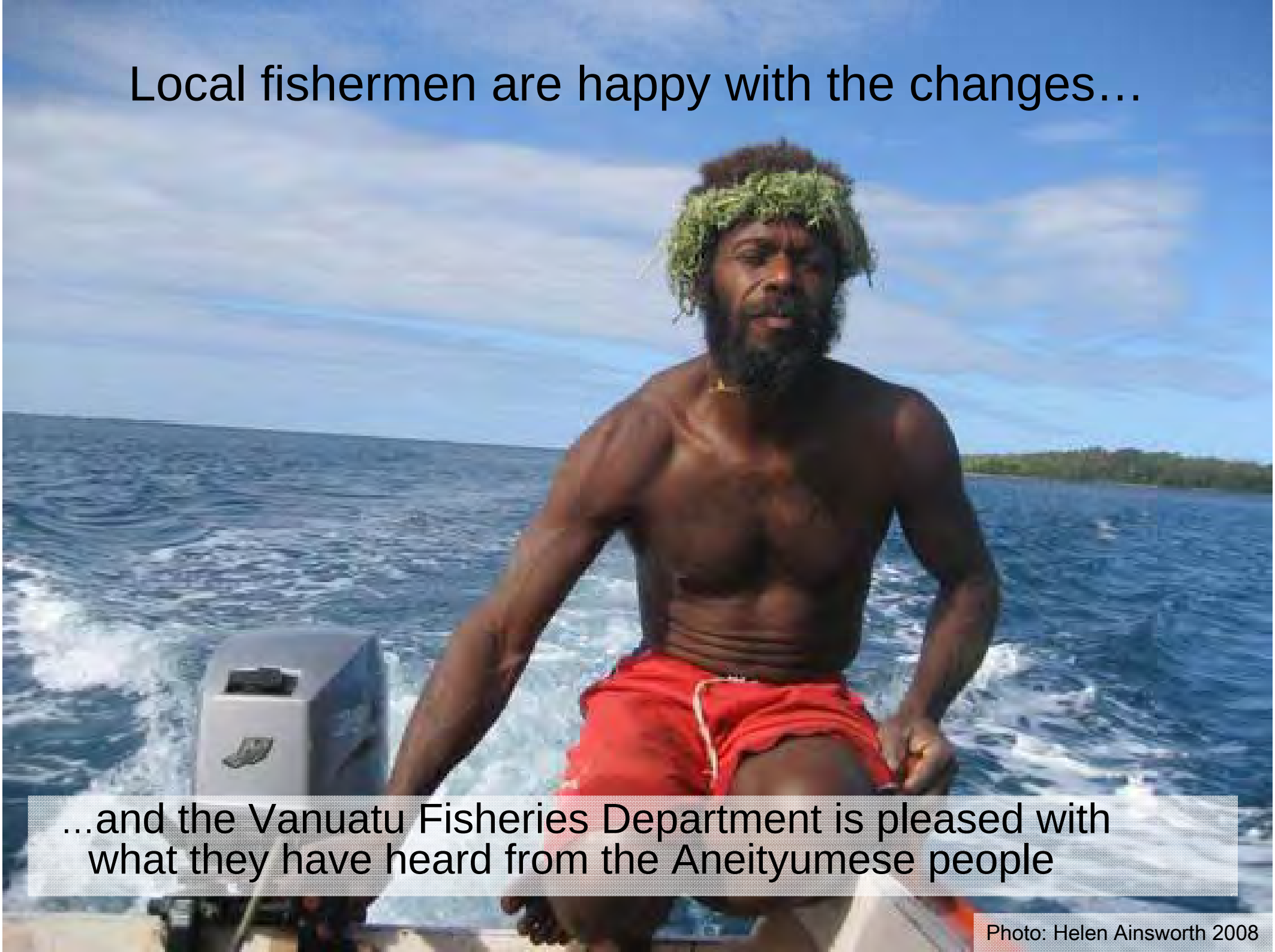
- Thick red mud covered much of this uplifted reef in 1995 – A footprint at Port Patrick

The same location - 2008

- Chief Navaluk expressing his thanks to the project for the improved state of the shore.

Clean water “down stream” from Port Patrick - 2008

Local fishermen are happy with the changes…



…and the Vanuatu Fisheries Department is pleased with what they have heard from the Aneityumese people

Photo: Helen Ainsworth 2008

The Future

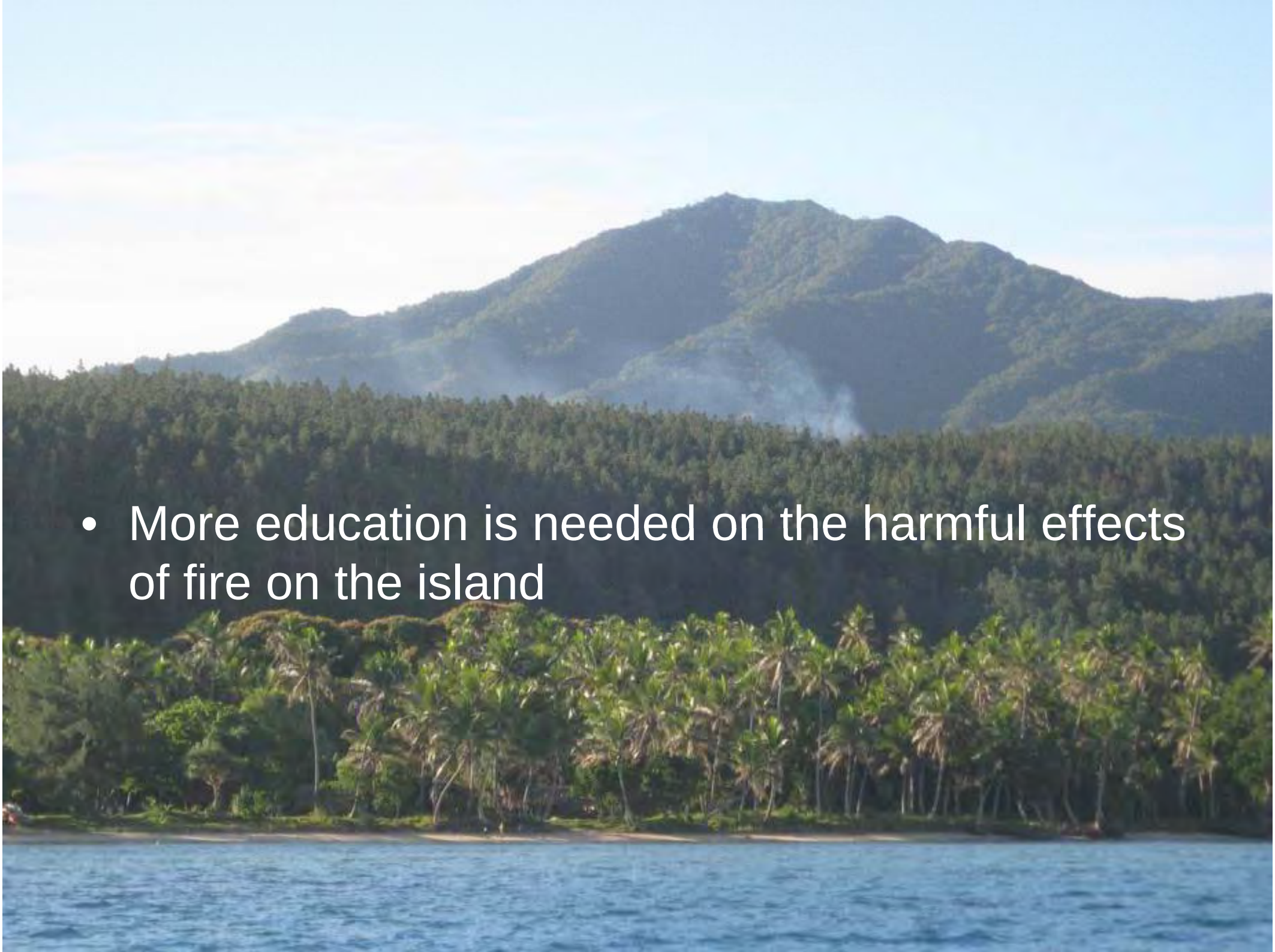
- In some areas too much red sediment is still reaching the sea – (“upstream” from Port Patrick)

- Sources of sediment still exist and these need to be revegetated to protect other reef areas

- More large gullies are still to be controlled
- More vetiver grass hedges are needed here to trap sediment in which to establish trees

More of this work is needed

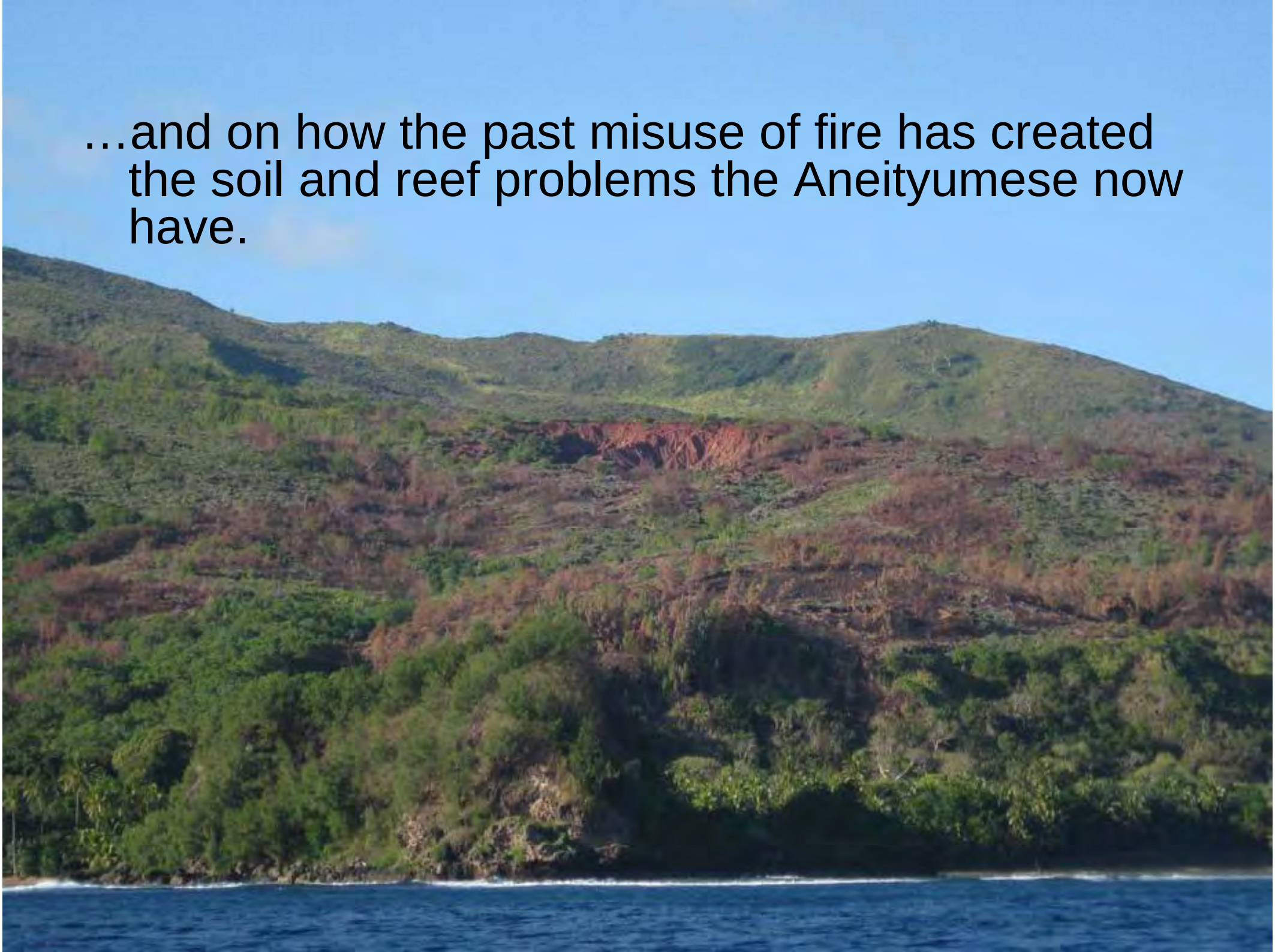
Seen here in the dry season, the trapped sediment is ready to be planted with nitrogen fixing *Acacia spirorbis* trees.



- More education is needed on the harmful effects of fire on the island

- Education on how healthy trees benefit the soil and thus the lagoons...

…and on how the past misuse of fire has created the soil and reef problems the Aneityumese now have.



Reef Health Monitoring

- With a fast growing population Aneityum needs local protein sources such as these goat fish.
- A healthy reef system is essential
- The Fisheries Department, in association with Peace Corps, are already monitoring coral reefs on Aneityum
- They are keen to monitor the impact of any future soil erosion control work there.

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Photograph: Katie Thomson, Peace Corps, Vanuatu

Acknowledgements

- The results of this project reflect the dedication and effort of the small band of workers who carried on with minimal supervision for 7 years, growing many thousands of plants, carrying heavy sacks of grass and trees to remote sites and wearing out numerous taro spades. These include Henry Kathecau, Henry Naumu, David, Lauthep, Peter and the many other men and women who pitched in and helped make a difference to their island's future. Thanks team.
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