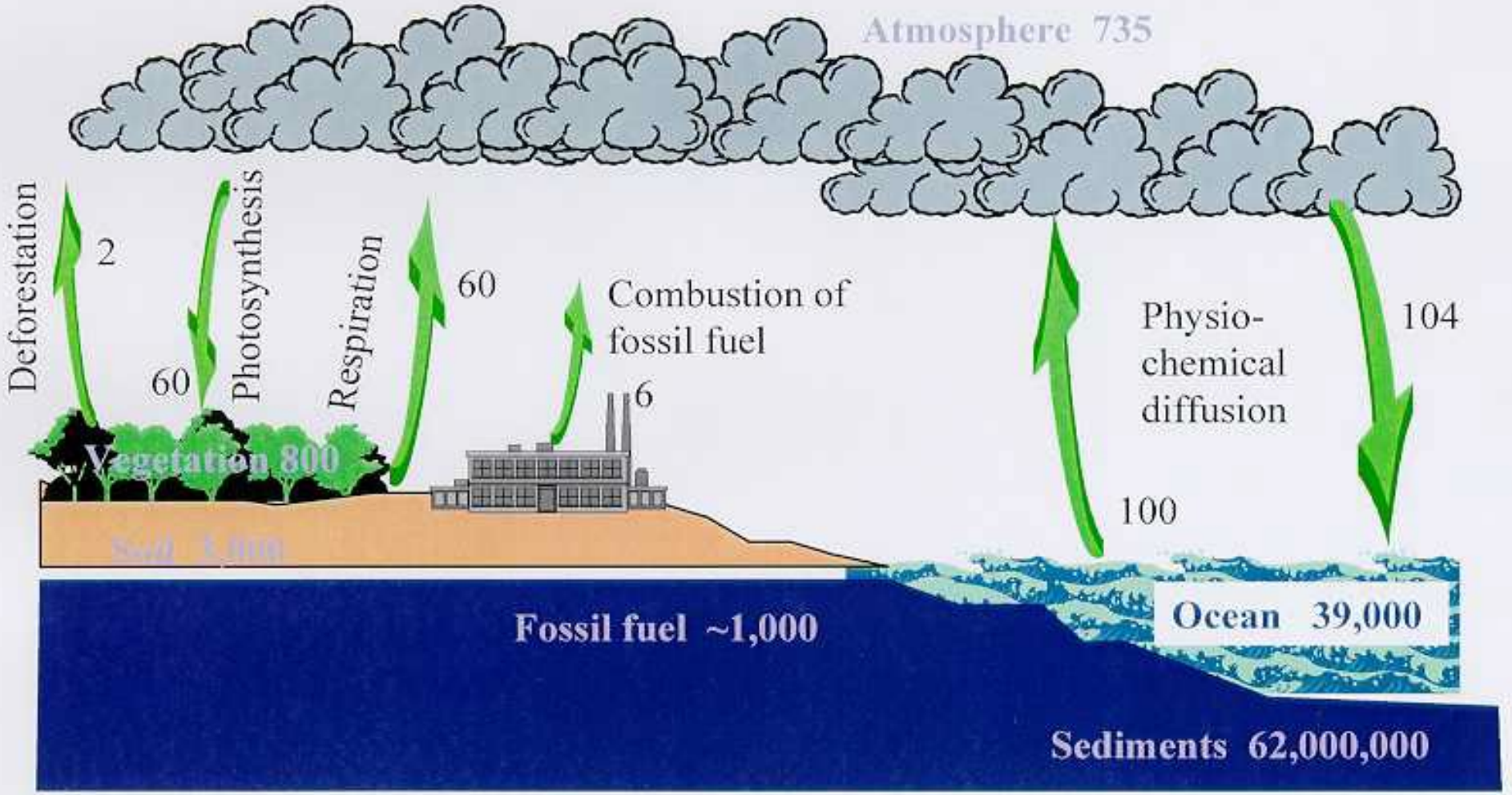
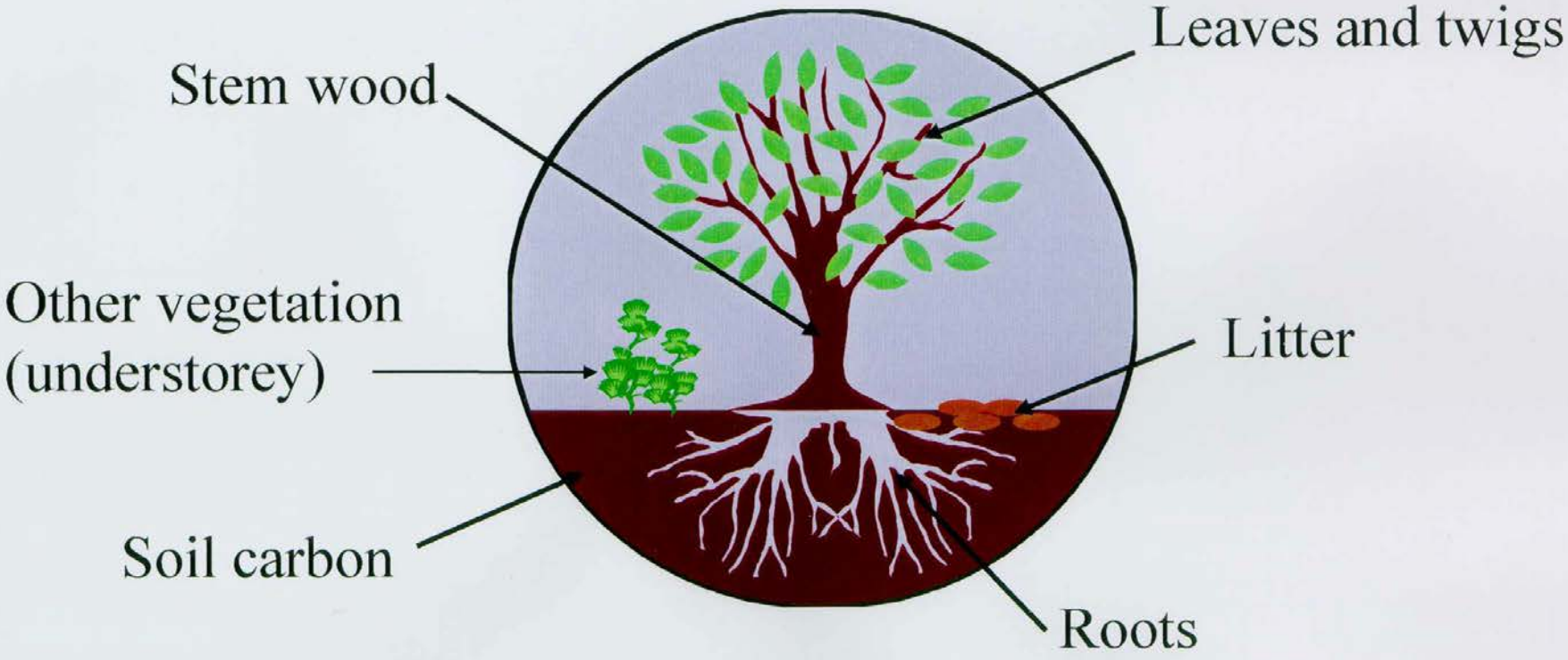

BP

The carbon cycle



Major pools of forest carbon



The Potential for Tree Crops and Vegetation Rehabilitation to Sequester Carbon in Western Australia

Presentation by

Dr Syd Shea
Executive Director
Department of Conservation and Land Management,
Western Australia

Seminar

“Responding to Climate Change”

23 March 1999

Official: 1998 is the hottest for a thousand years

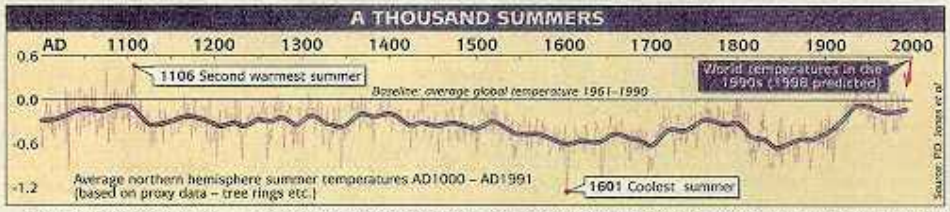
BRITAIN HAS experienced the hottest year in 1998 for the past 1,000 years, according to leading British scientists.

A team at the University of East Anglia has reconstructed the temperature peaks of every year in the last millennium, and these scientists are confident 1998 will be the warmest. Their research shows this year will have been hotter than 1106, the previous record summer in the northern hemisphere.

It is already certain to be the hottest year in the 140-year global temperature record that has been compiled from instrumental readings. In spite of Britain's own soggy summer, there have been record heatwaves and forest fires in many countries.

BY MICHAEL MCCARTHY
Environment Correspondent

But scientists at the university's Climatic Research Unit (CRU) are convinced that, as 2000 approaches, 1998 will also prove to have been the hottest year of this millennium.



The scientists have put together the annual average summer temperatures of the last 1,000 years from "proxy indicators" – measurements of tree-ring growth and analysis of ice cores, which give information about the meteorological conditions deep in the past.

The record, published in the scientific journal *The Holocene*, shows that the 1990s were the hottest decade since before William the Conqueror landed.

The research will add further credence to global warming being caused by industrial gases, such as carbon dioxide from vehicle exhausts and power station emissions.

The research is published as ministers and officials from 180 countries begin a two-week conference in Buenos Aires to try to carry forward last year's Kyoto treaty aimed at countering climatic change.

The scientists at the CRU, led by Professor Phil Jones, are in a unique position to assess 1998 as the millennium's hottest year because they are also responsible for updating and maintaining the modern instrumental temperature record for the world, which goes back to 1855. Their data for this year already show that 1998 will beat the previous record – 1997 – by such a significant margin.

The five hottest years in the modern global temperature record are now all from this decade – in descending order: 1998, 1997, 1995, 1990 and 1991.

"The bottom line is that we believe the last three to four years have been the warmest of the millennium, and 1998 to have been the warmest of all," Professor Jones said.

1,000 summers, page 3

How the early swallow proves global warming

Birds are yardstick for changes in climate

BY JOHN INGRAM
ENVIRONMENT CORRESPONDENT

ONE swallow may not make a summer but it could help prove that global warming is taking place.

Ministers are considering using the arrival date of the summer's first swallow as a yardstick for climate change. The proposal is included in a report commissioned by the Department of the Environment as part of its quest to find "environmental indicators" — measures by which the Government and public can test Britain's green performance.

The latest research shows that swallows are arriving on average nearly two weeks earlier than in the 1950s. But the real acceleration has come in the 1990s with the birds being spotted a week earlier than ten years ago.

This coincides with a dramatic increase in temperatures worldwide. The seven warmest years since records began 150 years ago have all occurred in the past decade. Earlier this week scientists confirmed that 1998 will be the hottest year in the past 1,000 years, easily surpassing the previous record holder, 1997.

The man behind the swallow research, Tim Sparks of the Institute of Terrestrial Ecology, said: "Summer migrants are getting here earlier. Research in Surrey also shows that trees are coming into leaf 11 days earlier on average than in the 1960s.

"Global warming is playing a major role in this. These birds and trees are sensitive to temperature and this decade has been the warmest on record. For every one degree increase in spring temperatures, swallows arrive two to three days earlier. If we see the expected four degree increase by the year 2100, swallows could by be regularly getting here by mid-March."

Mr Sparks was backed by the authoritative British Trust for Ornithology whose newly-released Garden BirdWatch Handbook declares: "Our summer visitors do seem to be arriving earlier in many areas than they did in the 1940s and 1960s."

Details emerged as officials from 180 countries continued negotiations in Buenos Aires to tackle global warming by finding ways to reduce emissions of greenhouse gases such as carbon dioxide.

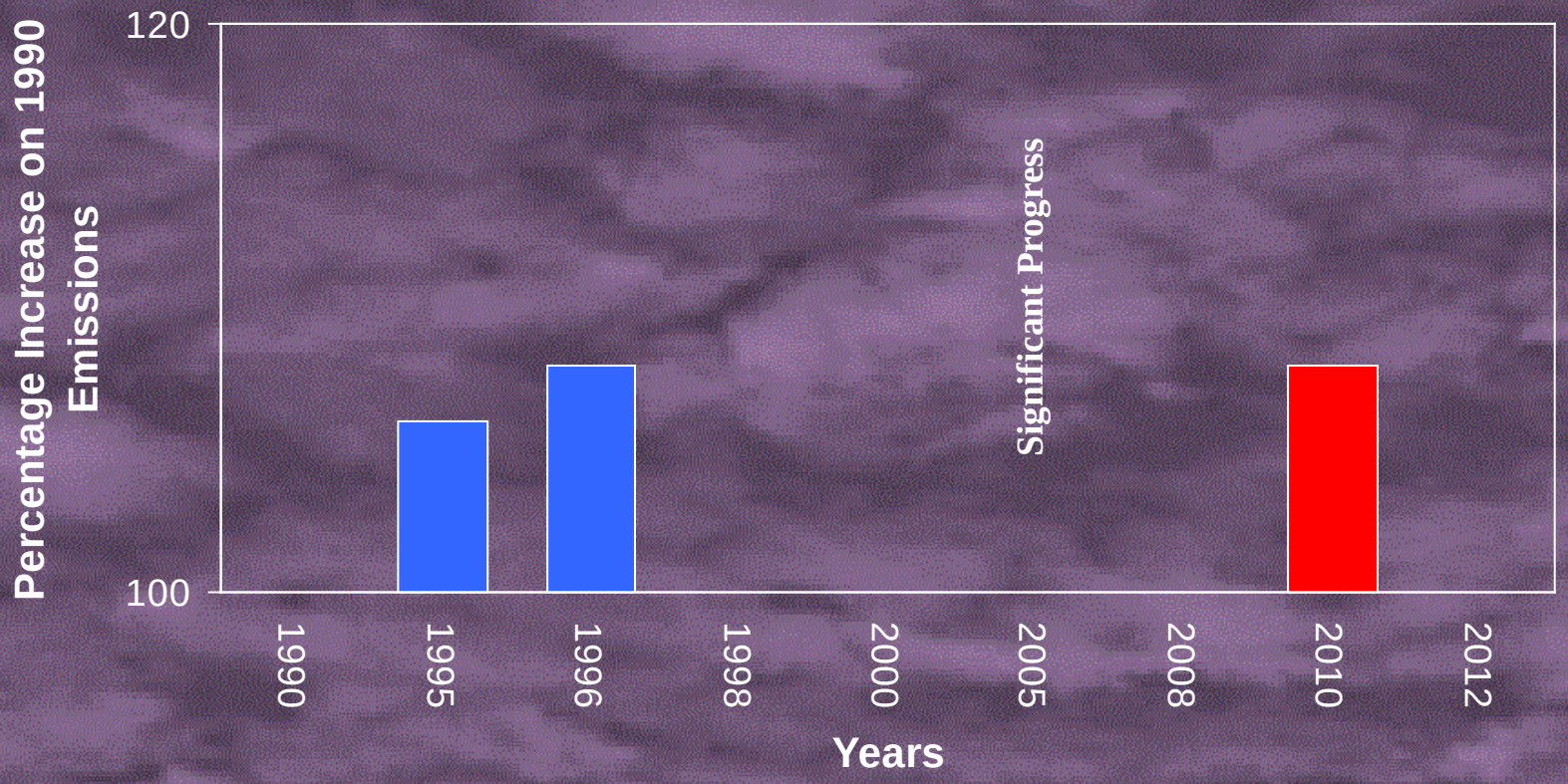
British ministers want a series of indicators to help them assess how rapidly global warming is advancing.

They commissioned a report which proposes 35 "barometers" from the natural world. Mr Sparks said: "Swallows are a good indicator because their arrival is sensitive to temperature."

Other indicators include temperatures, river flows, potato yields, the health of beech trees, breeding success of garden birds such as robins as well as wren populations because the tiny bird is vulnerable to cold winters.

● Deadly tropical diseases such as dengue fever, malaria and cholera could spread to the West as a result of global warming, Harvard scientist Dr Paul Epstein warned yesterday in a report for the World Wide Fund for Nature.

Australia's Kyoto Targets



Australia's Kyoto Targets

Current proposed resource projects in Western Australia could consume Australia's allowable growth in emissions of approximately 40 million tonnes of CO_2

Extract from Kyoto Protocol - Article 2

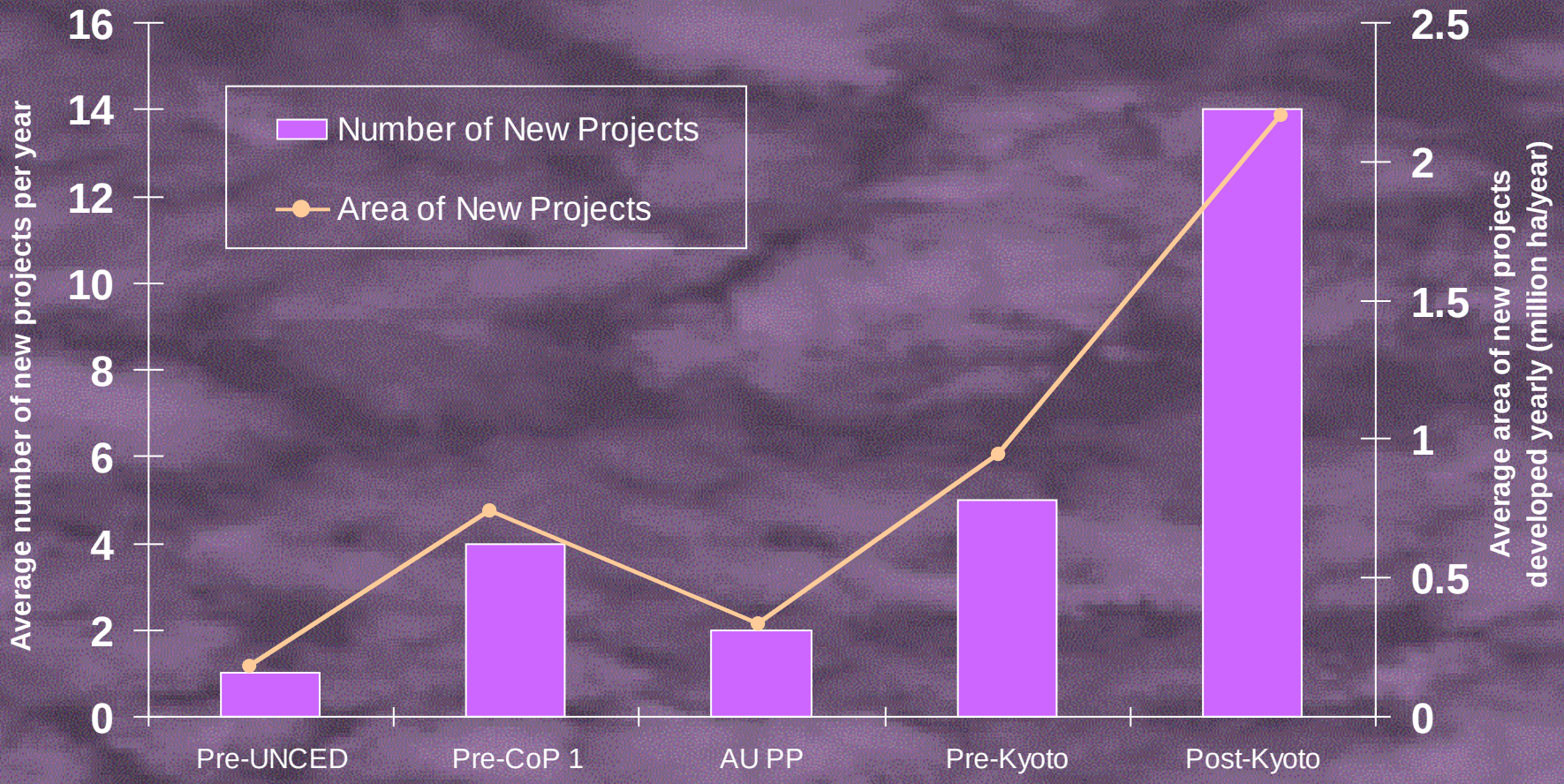
Each Party included in Annex 1 in achieving its quantified emission limitation and reduction commitments under Article 3, in order to promote sustainable development, shall:

(a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:

……..…

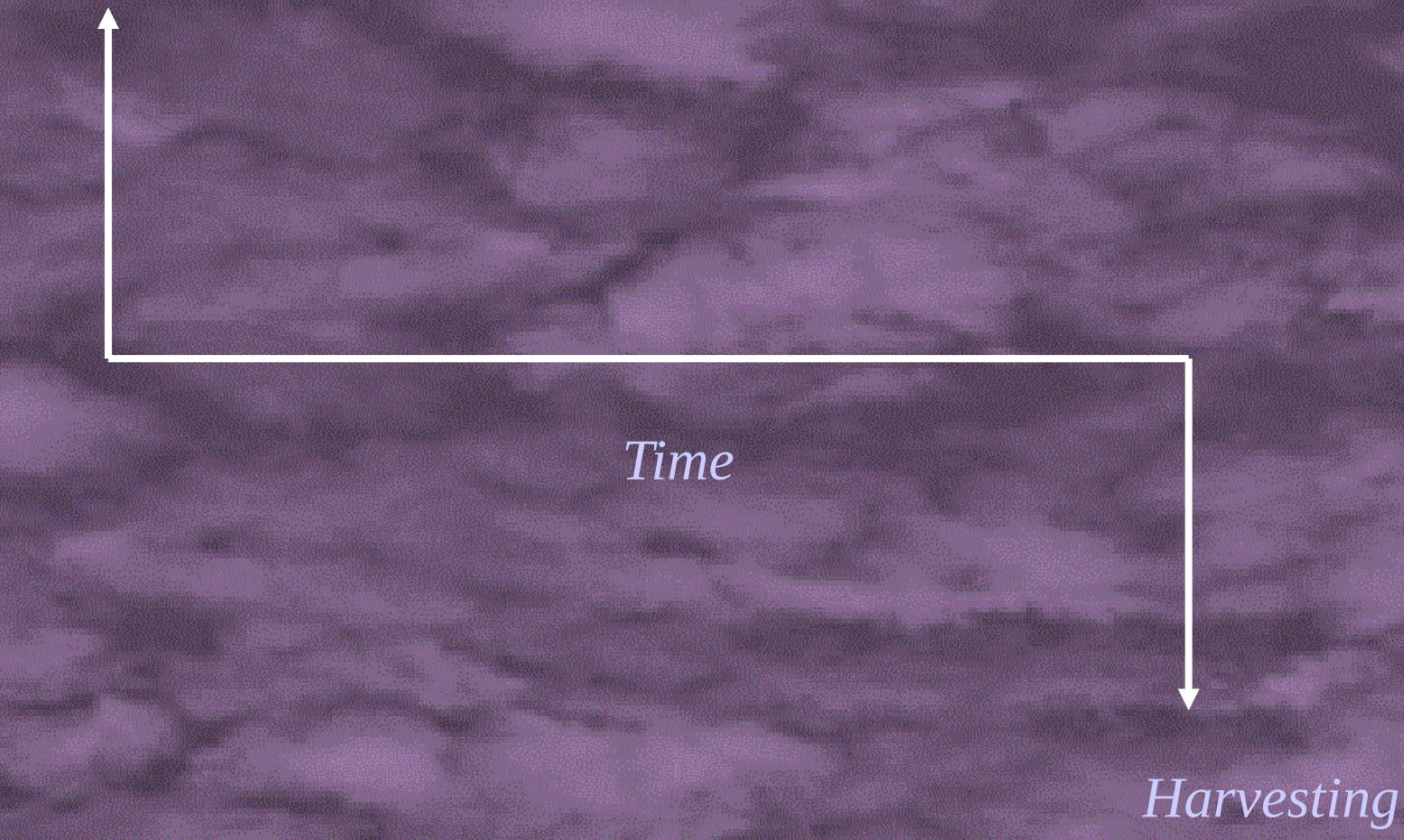
(ii) Protection and enhancement of sinks and reservoirs of greenhouse gases ….taking into account ….promotion of sustainable forest management practices, afforestation and reforestation.

Carbon Sequestration Projects

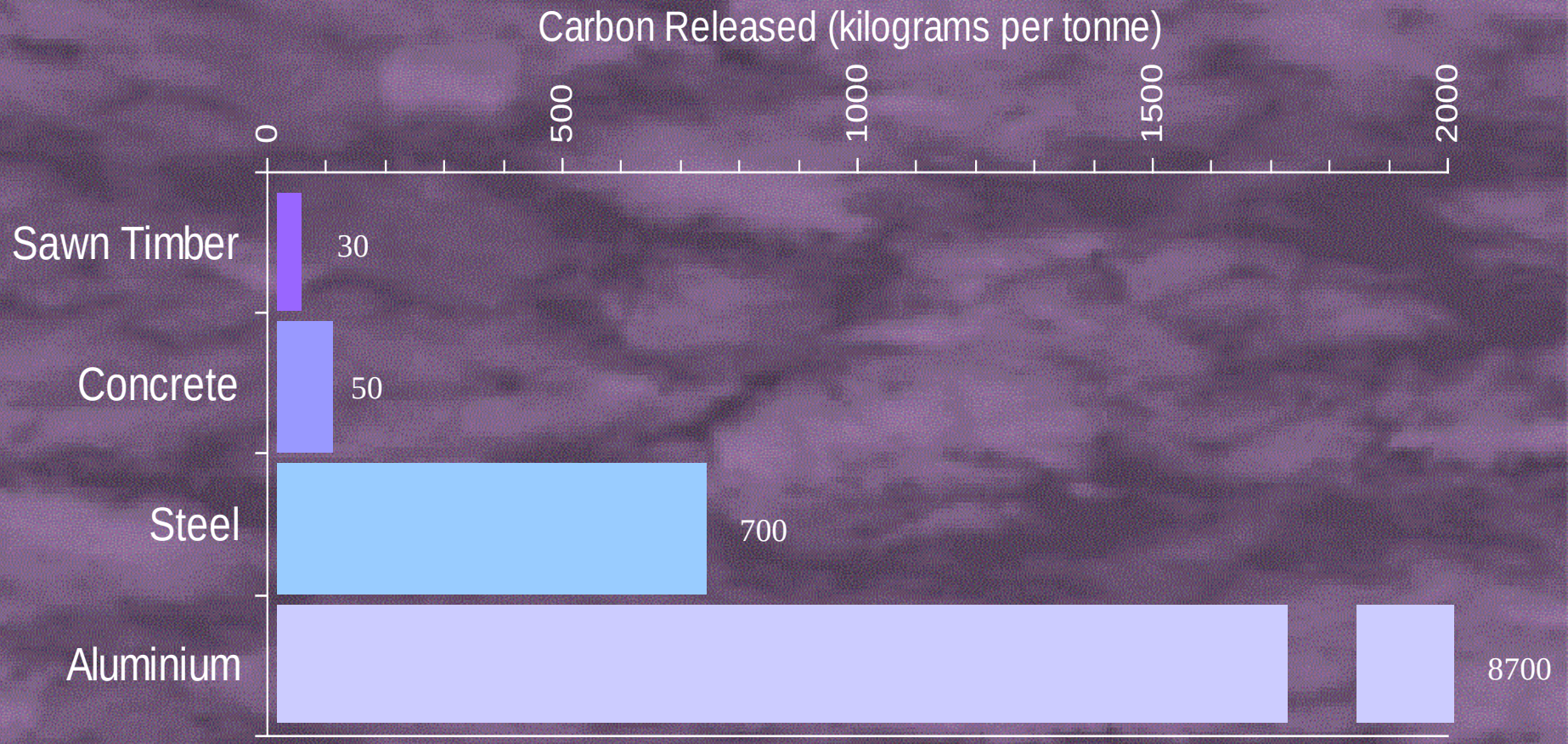


- Carbon Sequestration - Science and Governance

The Current Rules



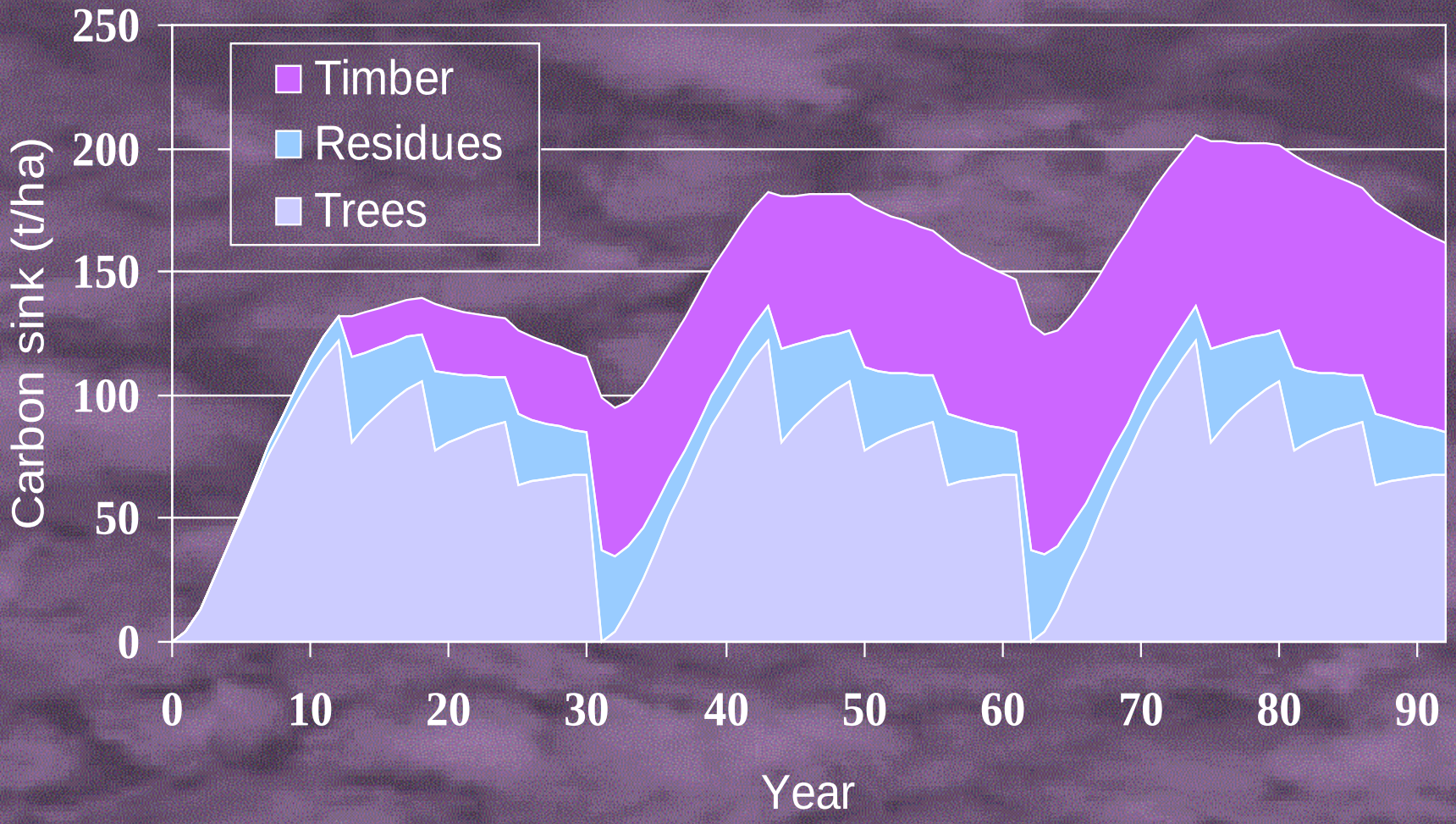

To infinity
and
beyond


Carbon Released (kilograms per tonne)
0
500
1000
1500
2000
Sawn Timber
30
Concrete
50
Steel
700
Aluminium
8700

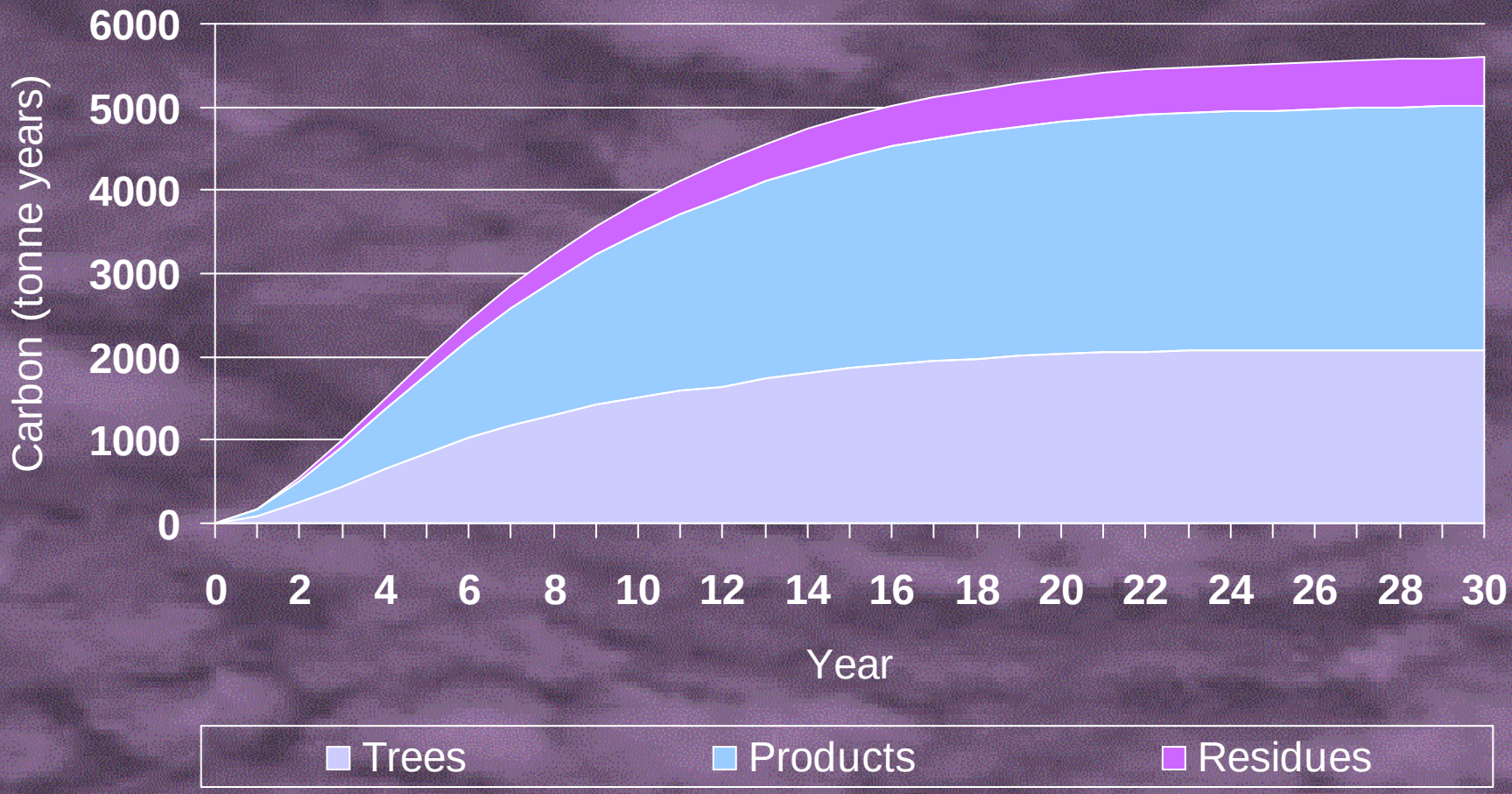
Shinto Shrine Sink Sequestration Strategy

- Measuring Carbon Sinks -

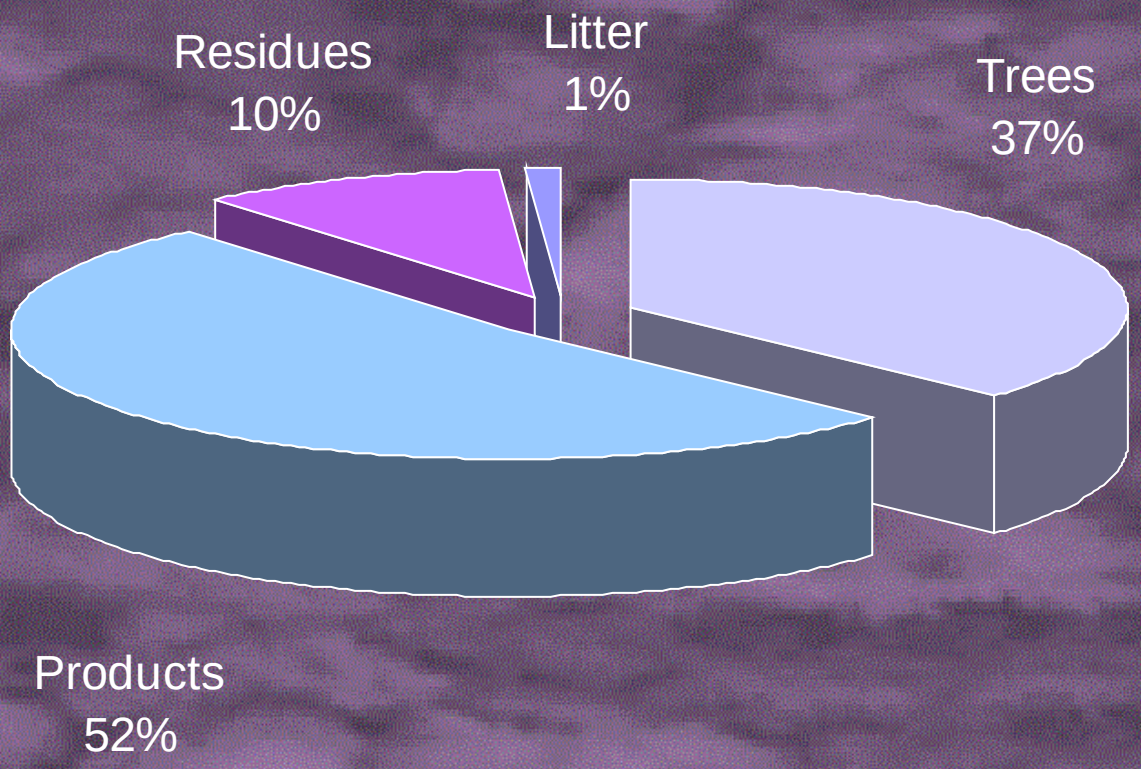
Carbon sinks from Maritime Pine



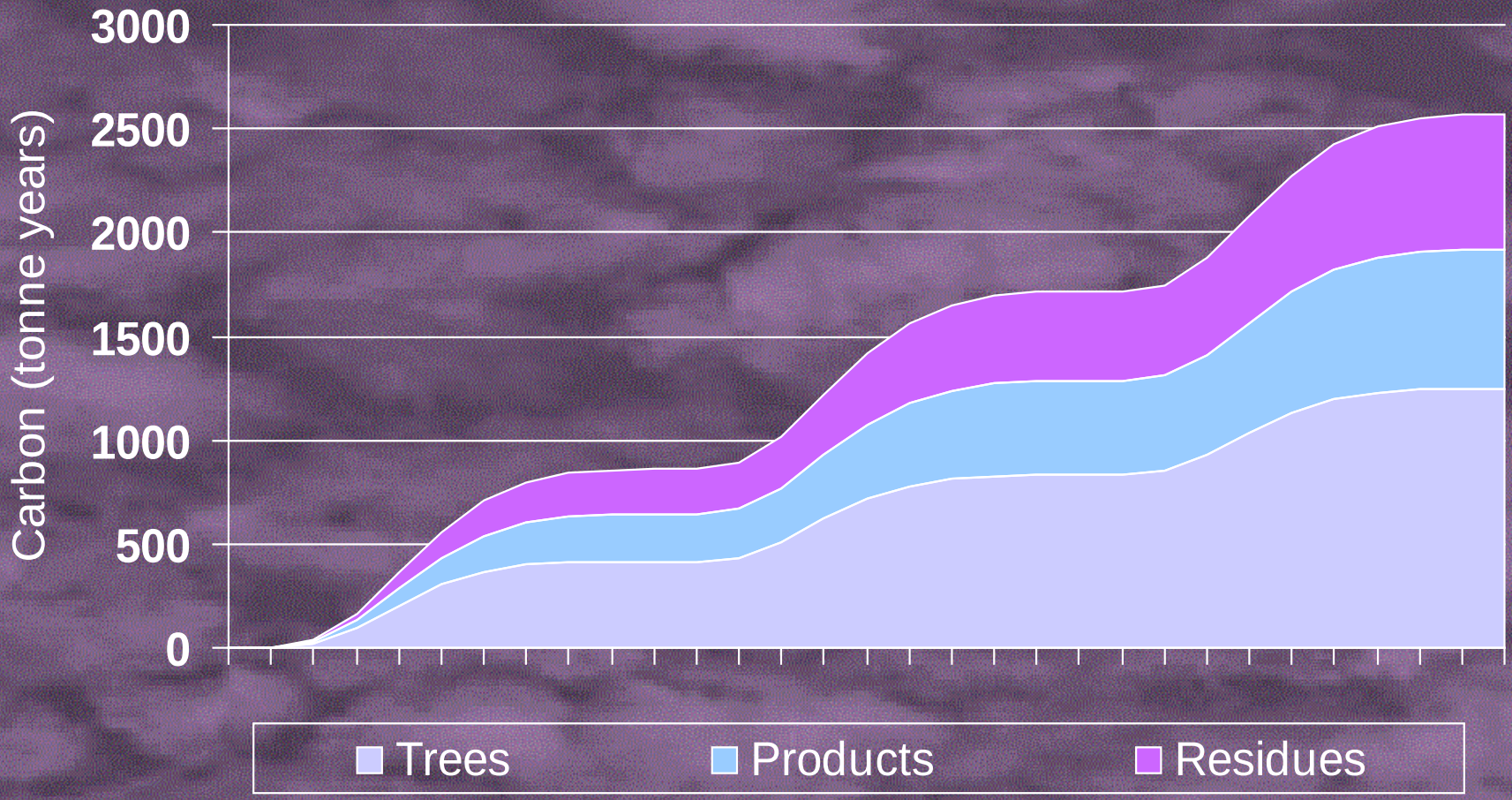
Cumulative carbon storage for one hectare of Maritime Pine (tonne years)



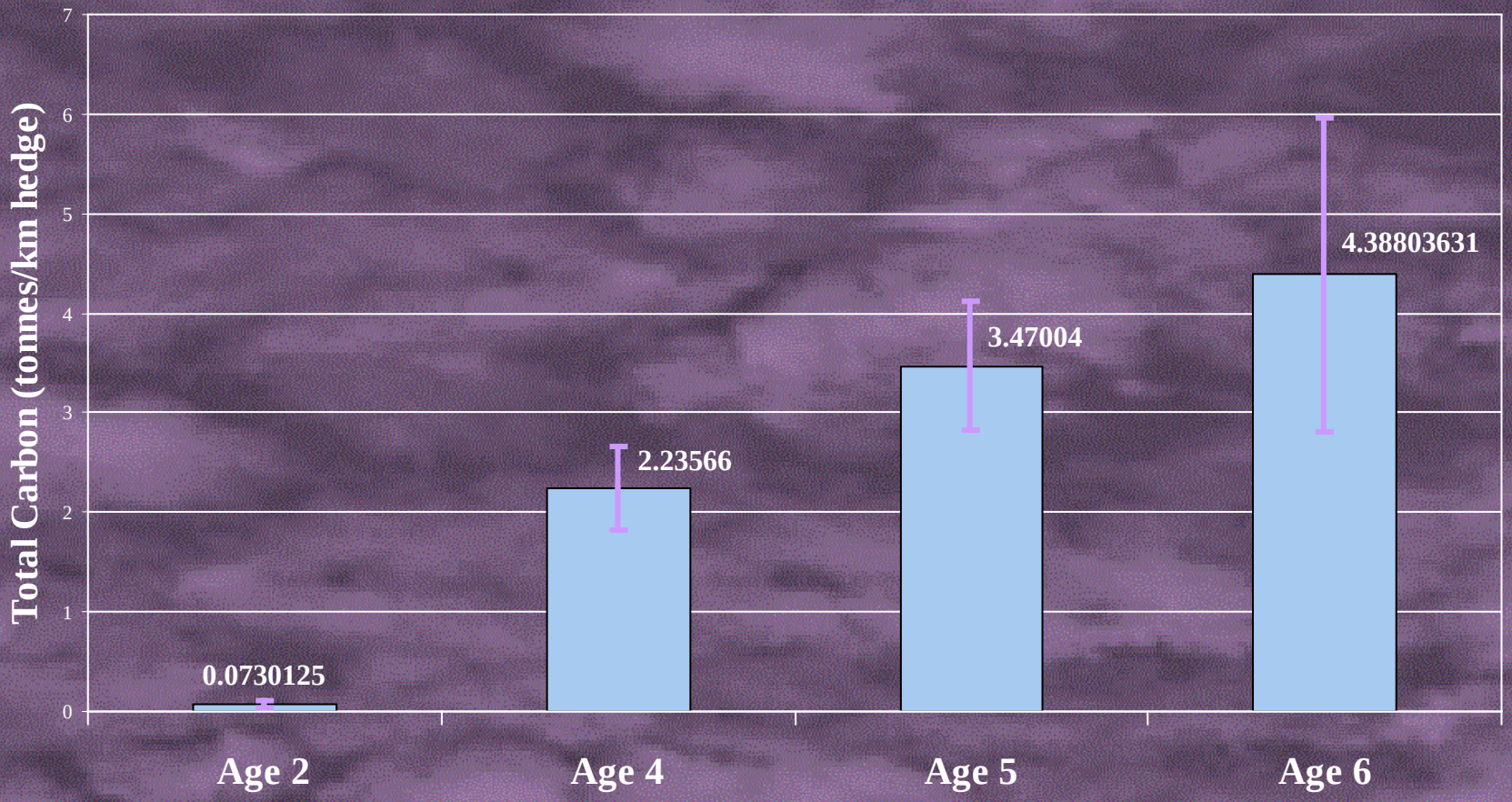
Contribution of each pool to carbon storage (tonne years) for one hectare of *P. pinaster*



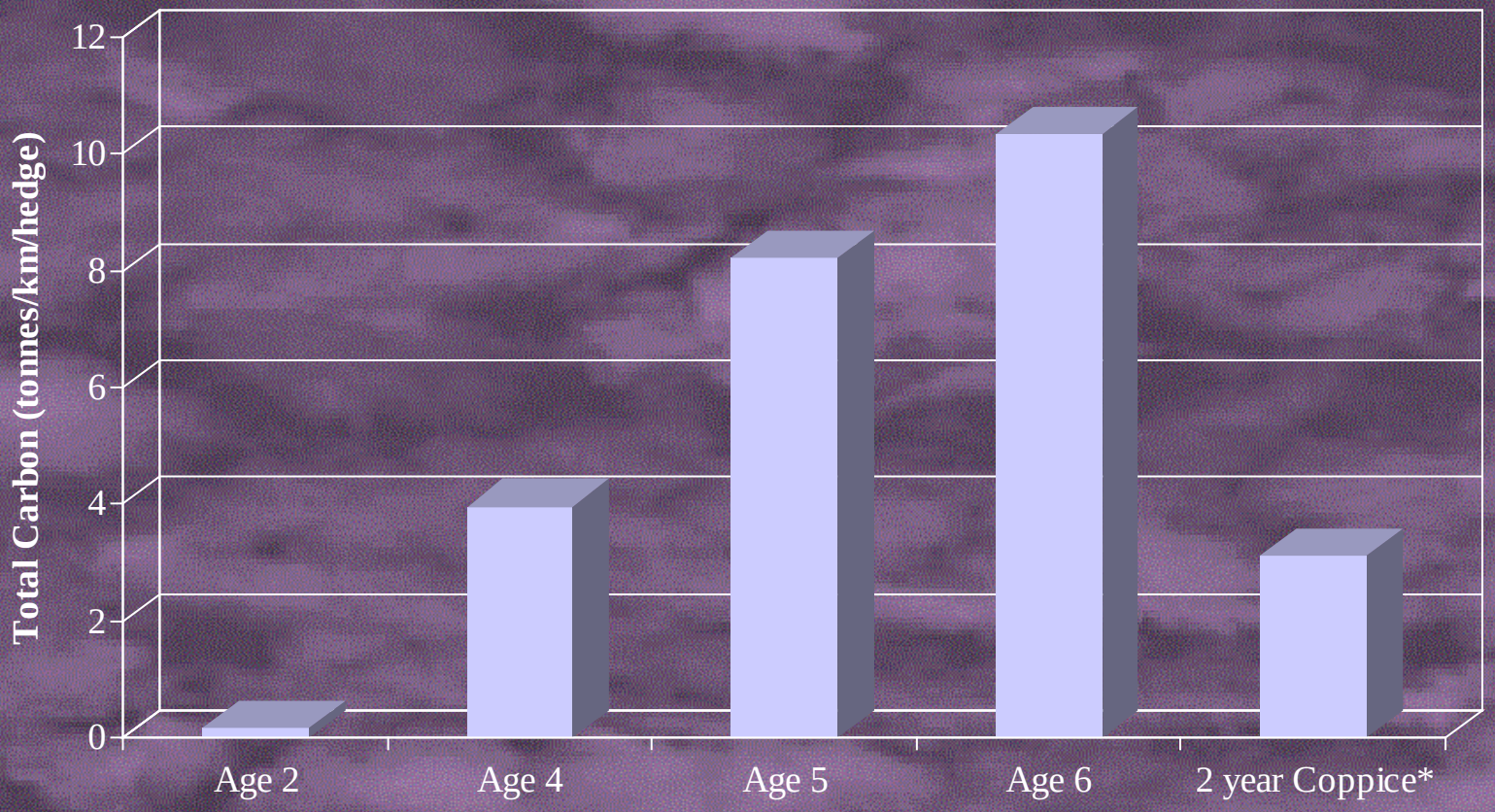
Cumulative carbon storage for one hectare of *Eucalyptus globulus* (tonne years)



Total below ground carbon per kilometre of hedge for *Eucalyptus plenissma* at different ages with standard deviation

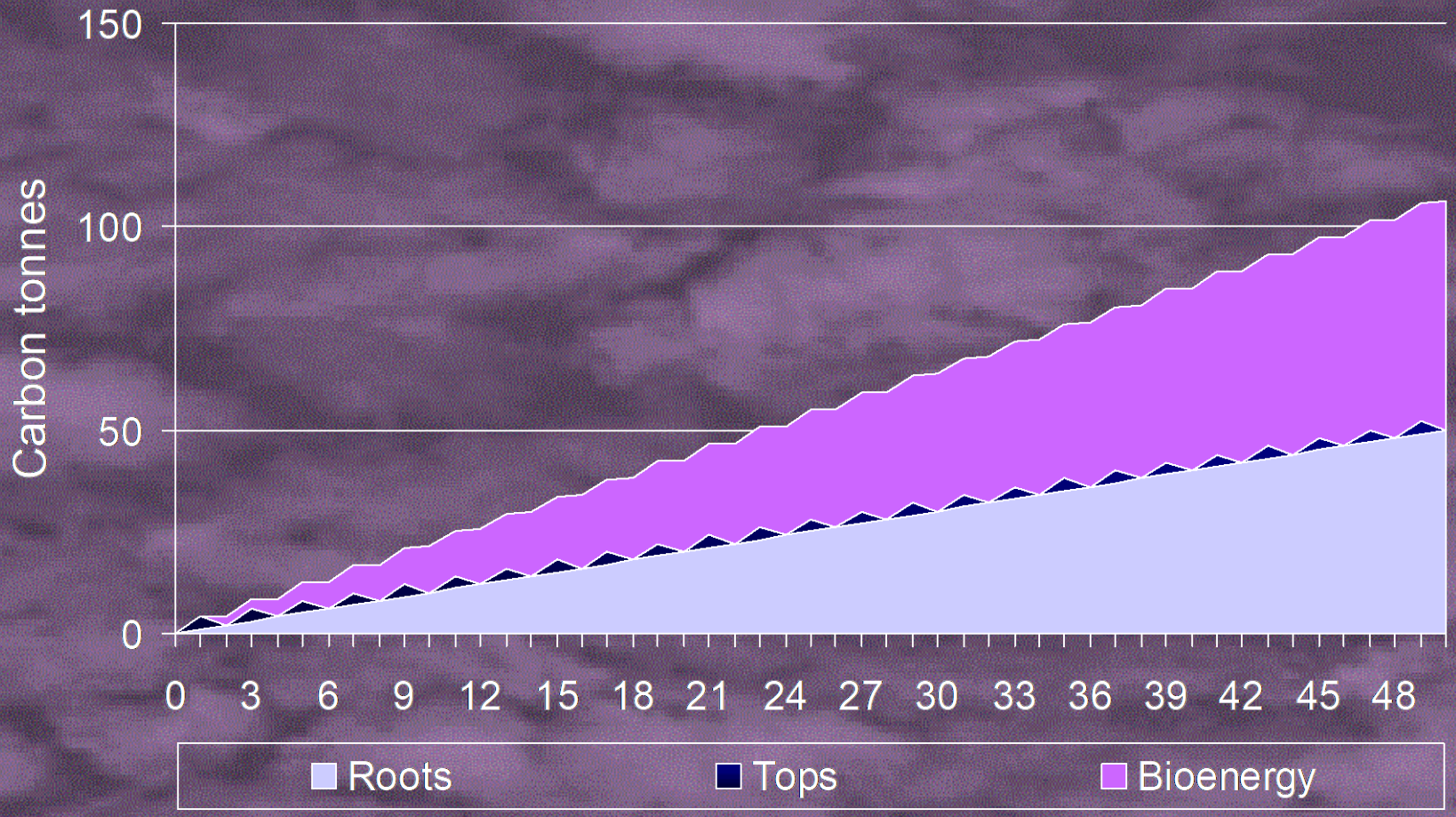


Total Carbon (tonnes per kilometre of hedge) contained within the above ground wood of E. plenissma at various ages

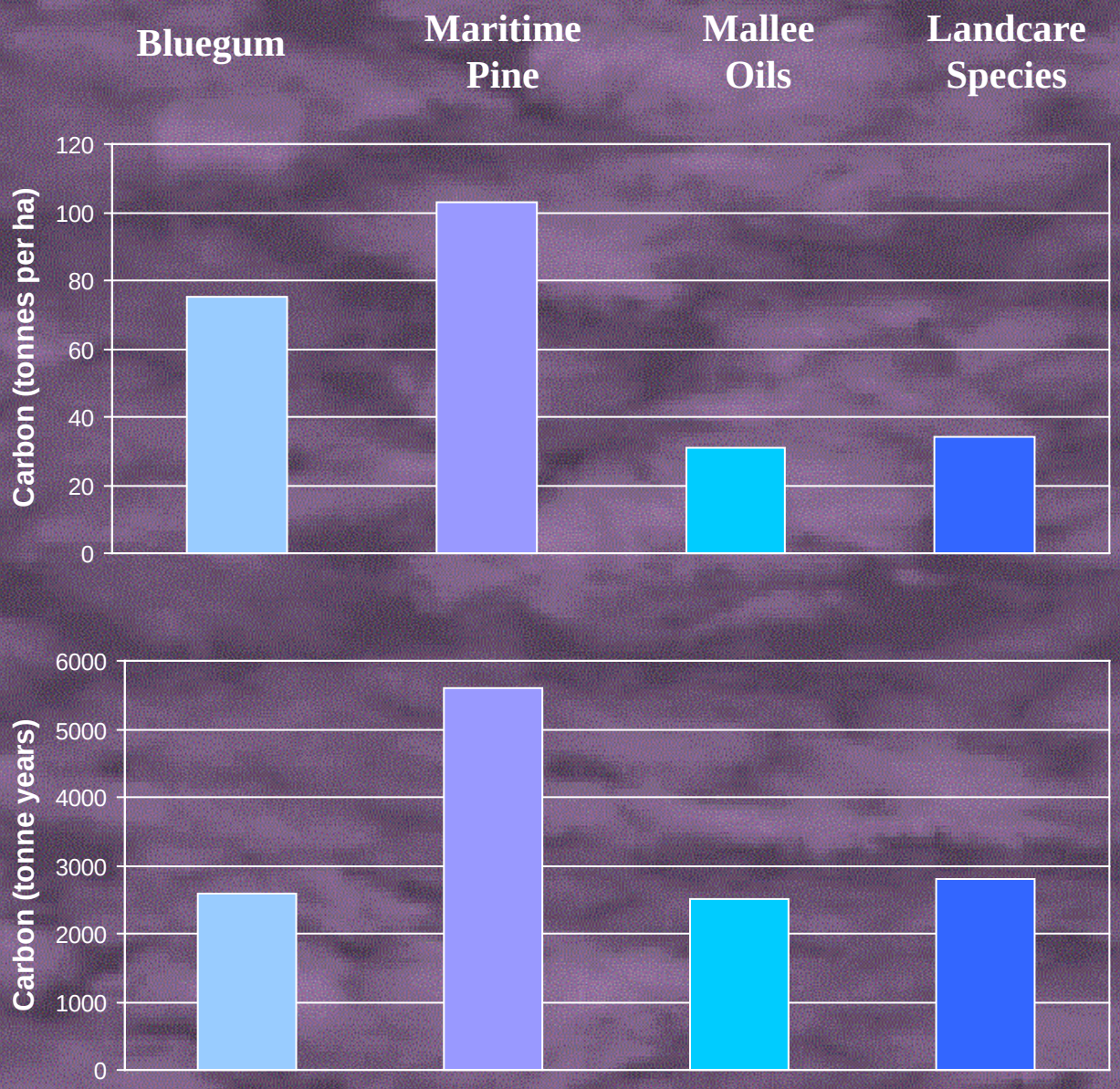


* Trees first harvested at 3 years of age

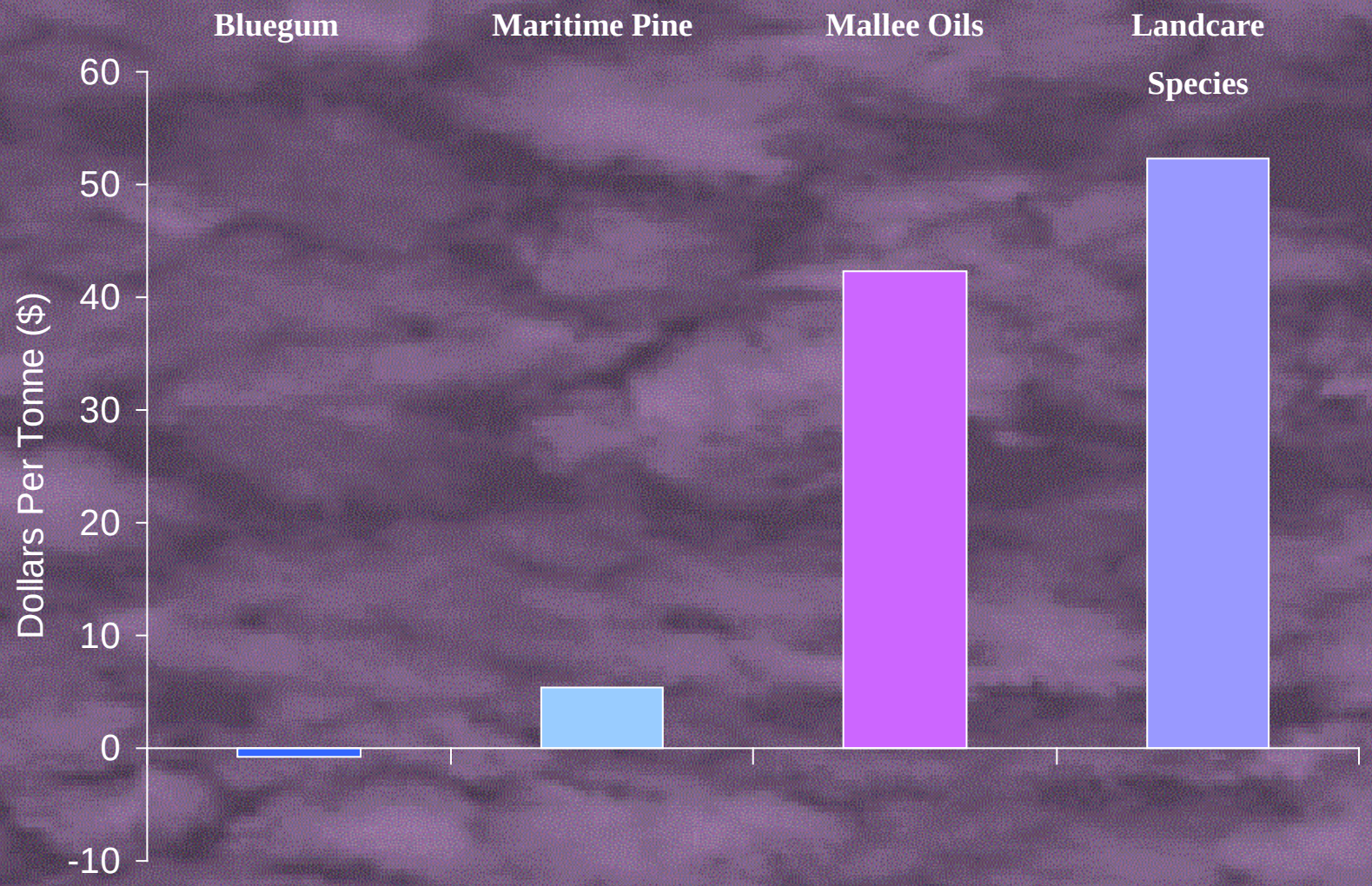
Cumulative carbon sequestered from one hectare of mallee eucalypts when the above-ground biomass is used for fuel



Carbon Sinks for Different Species

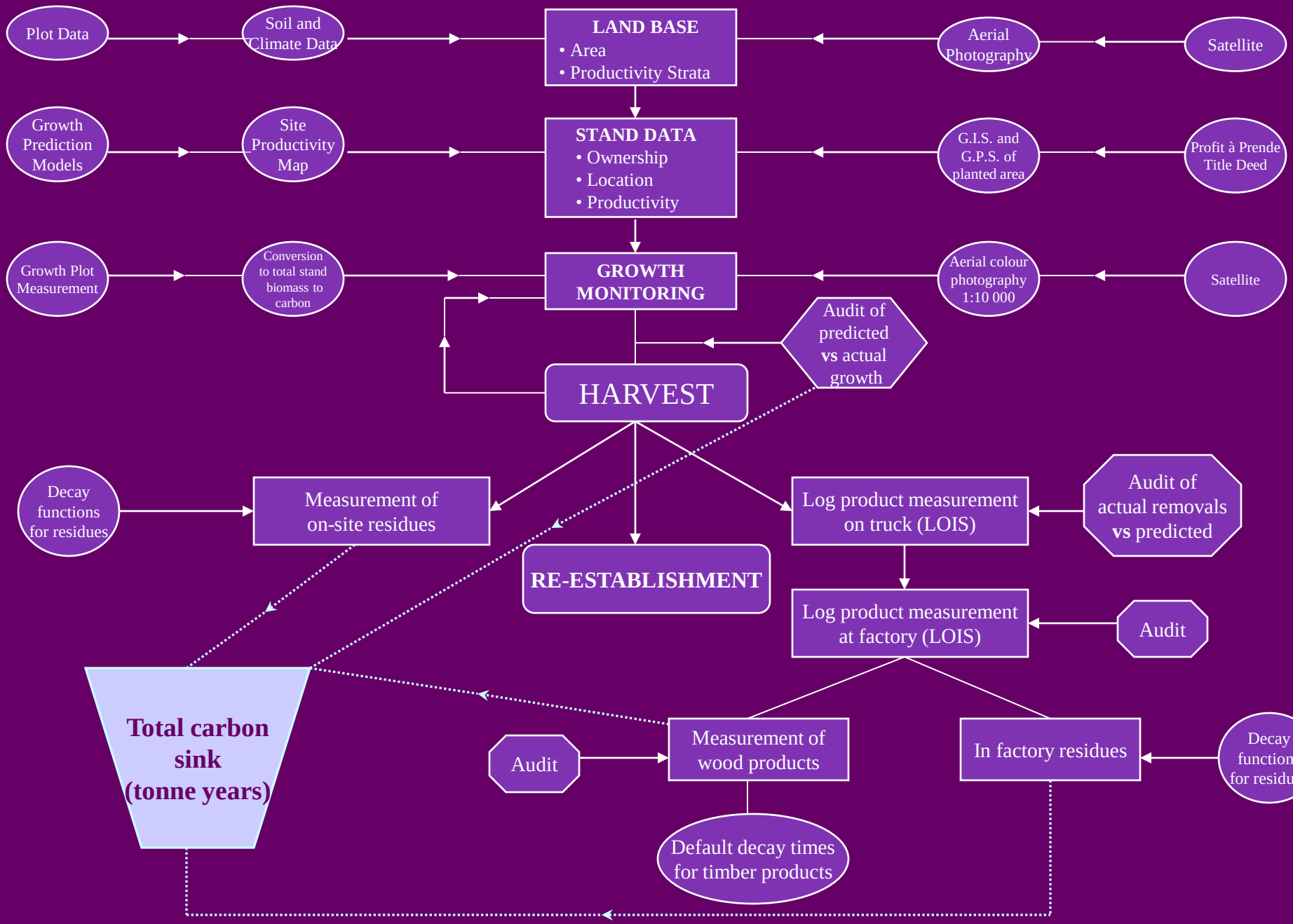


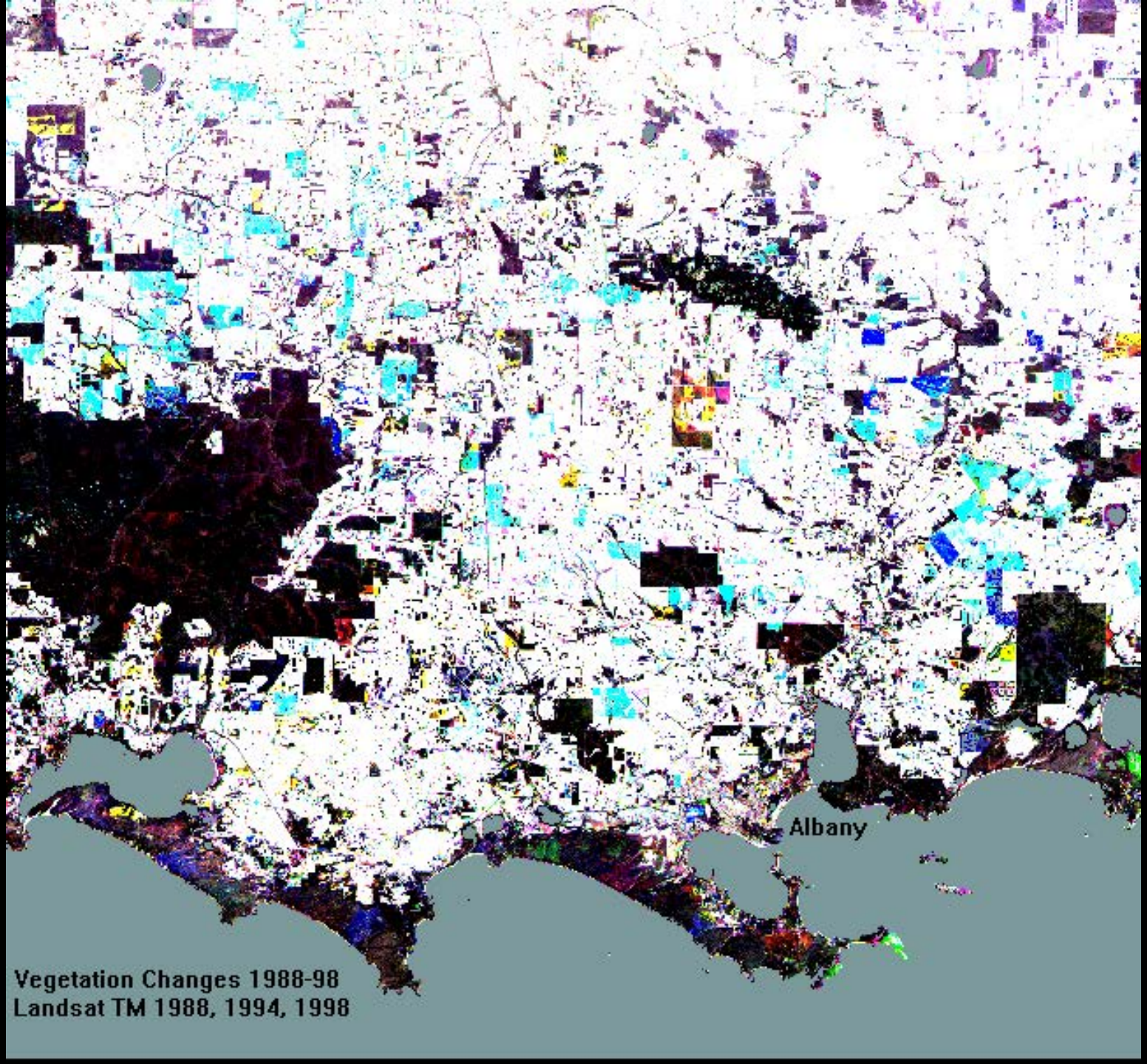
Cost of Sequestering a Tonne of Carbon



- Monitoring and Verification -

Forecasting, Monitoring and Verification of Carbon Flows in Tree Crops from Establishment to Product Decay




Albany
Vegetation Changes 1988-98
Landsat TM 1988, 1994, 1998

CALM SHAREFARMS LOWER WEST

JACKSON

Nelson Loc's 2868, 2869 & 2870.

PLANTATION PLAN LEGEND

P.97 TREE CROP AREA E.globulus G.P.S. CAPTURE.	SEALED ROAD
P.96 TREE CROP AREA E.globulus G.P.S. CAPTURE.	UNSEALED ROAD
EXISTING BUSH G.P.S. Capture inside tree crop area only.	POWERLINE, PYLON
SALT AFFECTED G.P.S. CAPTURE.	SWAMP
PRIVATE PLANTING	DAM
CALM PLANTING	WATER POINT
FENCE	BUILDINGS
CADASTRAL BOUNDARY G.P.S. CAPTURE	CADASTRAL BOUNDARY NON G.P.S. CAPTURE

STATISTICAL REPORT

Categories	Area (ha)
P.97 TREE CROP AREA	372.5
TOTAL AREA	372.5

SHIRE: BOYUP BROOK
MAIN ACCESS ROAD: CRAIGIE ROAD
FIRE CONTROL DETAILS
OWNER:
CONTACT:
FIRE CONTROL CONTACTS:
1.
2.
3.
FIREBREAKS
10m BOUNDARY
10m ADJOINING 1st CLASS ROADS
10m ADJOINING 2nd CLASS ROADS
6m INTERNAL BETWEEN COMPARTMENTS
6m INTERNAL

NB.- The surrounding location boundaries have been determined using 50 series mapping and are for schematic purposes only, there may be inconsistancies between the G.P.S. plot and the Cadastral data. If this is important for the intended use then the matter must be resolved by reference to RMS.

DEPARTMENTAL PLAN FOR OPERATIONAL USE ONLY.

Part of CALM 1/50 000 map: 2230-4
Part of CALM 1/25 000 map: 2230-4SW & SE

G.P.S. (Global Positioning System).
The Global Positioning System used is a real time differential G.P.S. which obtains accuracy of +/-1.5m.

G.P.S. Surveyed By: JOHN MOSAJ	Date: MAY 97
Plan Compiled By: S. MOUNTFORD	Date: JULY 97
Plan Checked By:	Date:

SCALE 1:25 000

1000 800 600 400 200 0 500 1000 metres

PROJECTION: TRANSVERSE MERCATOR C.M. 117 E
HORIZONTAL DATUM: AUSTRALIAN GEODETIC DATUM 1966
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM 1971.

CALM
CONSERVATION AND LAND MANAGEMENT

PREPARED BY: FOREST MANAGEMENT BRANCH UNDER THE DIRECTION OF DR. SYD SHEA, EXECUTIVE DIRECTOR OF THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT, WESTERN AUSTRALIA.

FORM P2
APPROVAL NO. B1629
WESTERN AUSTRALIA

TRANSFER OF LAND ACT 1893 AS AMENDED

PROFIT A PRENDRE

[Under s.34B Conservation and Land Management Act 1984 as amended]

DESCRIPTION OF LAND (Note 1)	EXTENT	VOLUME	FOLIO

ESTATE AND INTEREST (Note 2)

ENCUMBRANCES (Note 3)

OWNER (Registered Proprietor) (Note 4)

GRANTEE (Note 5)

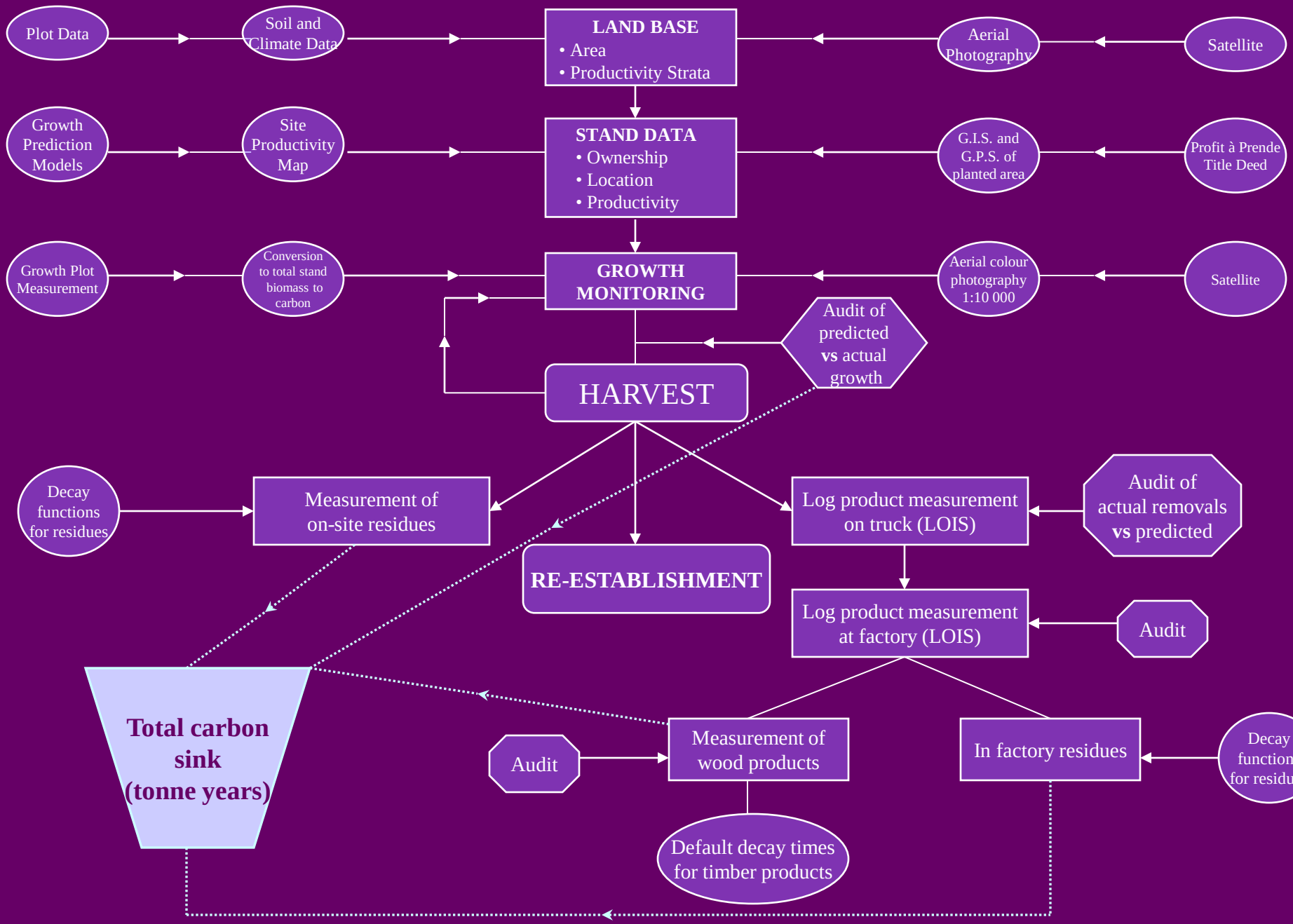
EXECUTIVE DIRECTOR OF THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT a body corporate constituted by the Conservation and Land Management Act 1984 ("the Act") of Corner of Hackett Drive and Australia II Drive, Crawley Western Australia.

TERM OF PROFIT A PRENDRE (Note 6)

40 years, subject to earlier termination in accordance with clause 8, commencing on and including the First day of January 1998.

The Owner hereby Grants a Profit a Prendre to the Grantee for the term specified above over the land described above subject to the encumbrances shown hereon in accordance with the terms and conditions contained in this Deed.

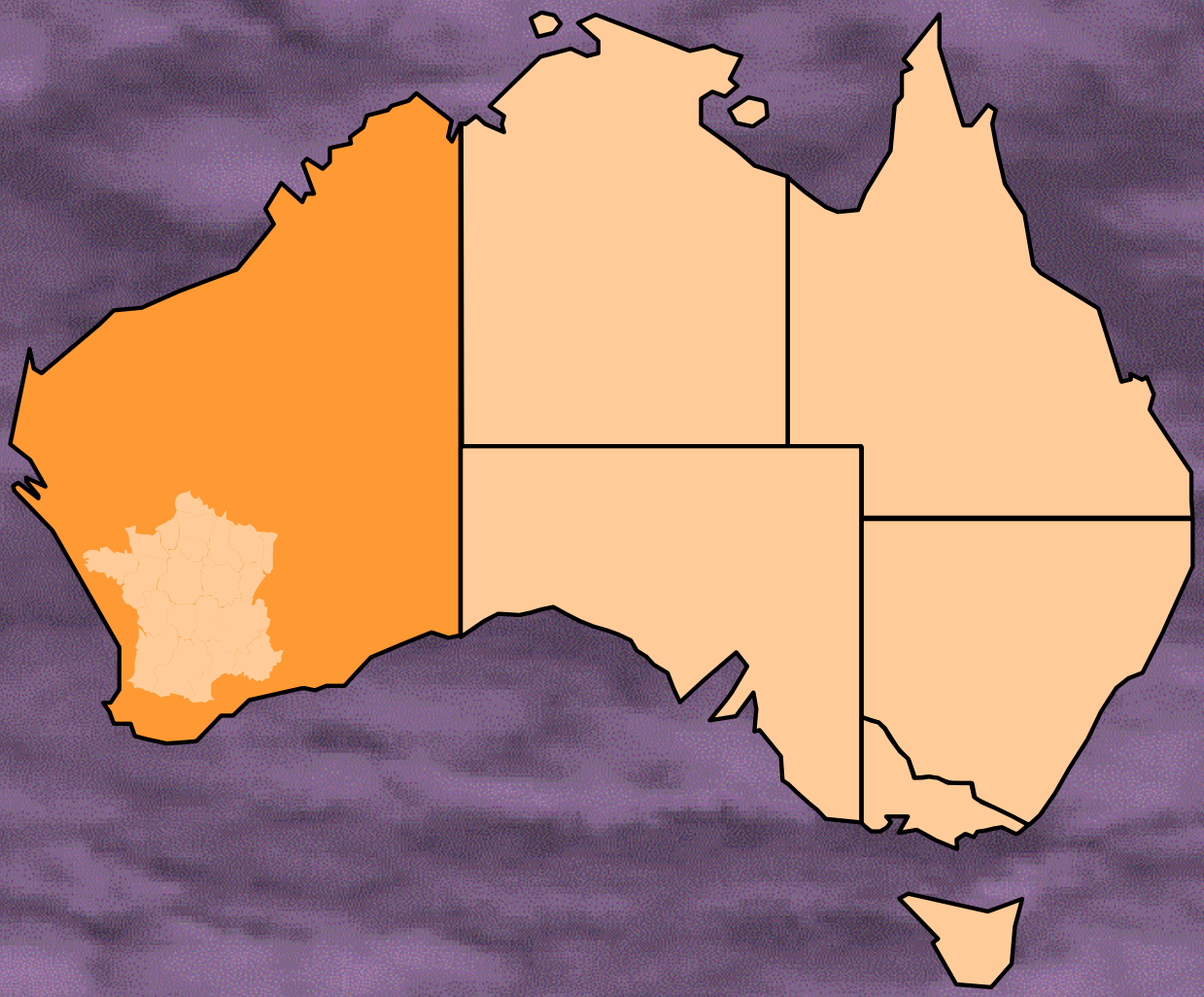
Forecasting, Monitoring and Verification of Carbon Flows in Tree Crops from Establishment to Product Decay

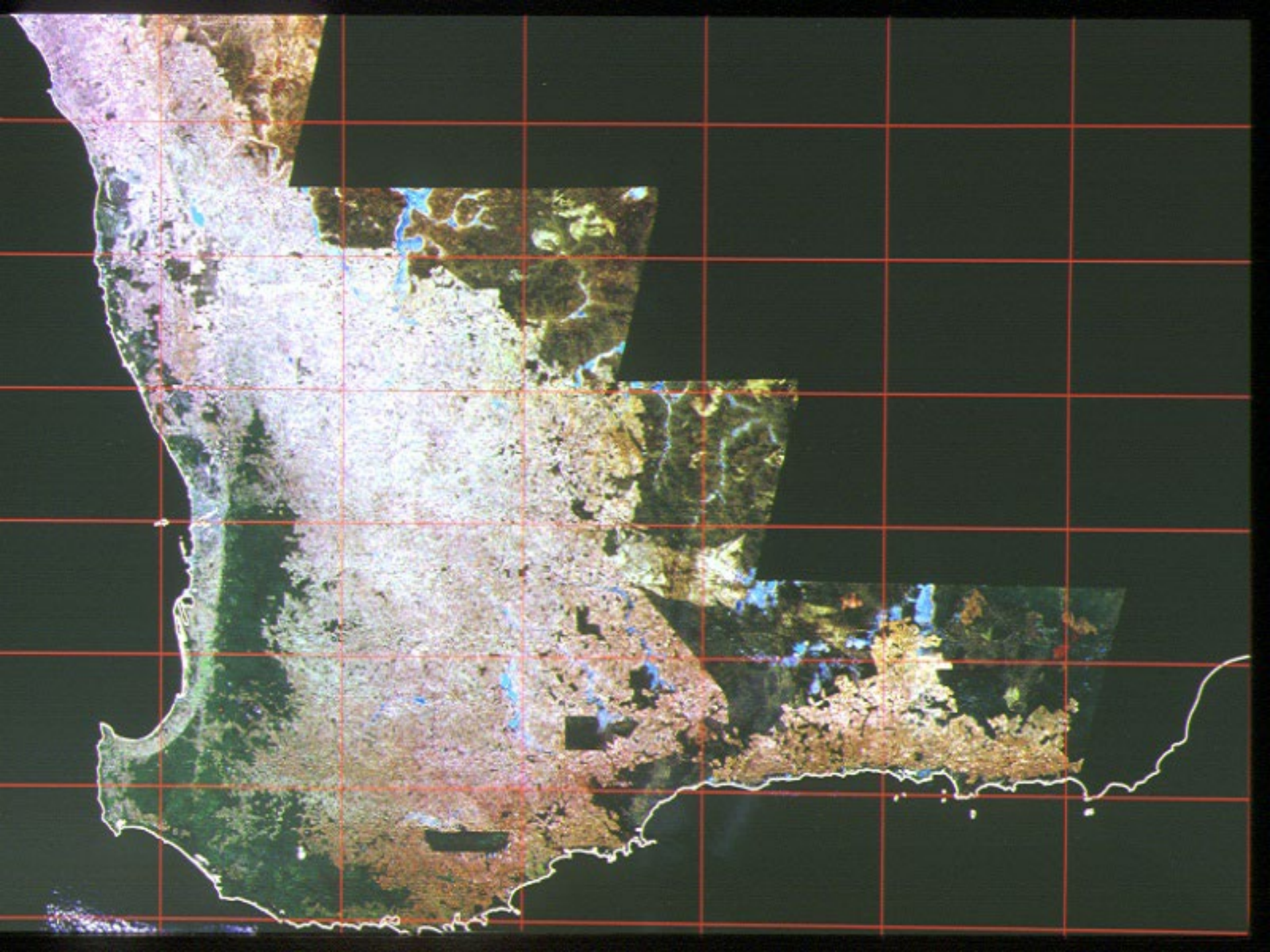


- Critical Elements of Carbon Sequestration Strategies -

Land Availability

France occupies a land area about a quarter the size of Western Australia



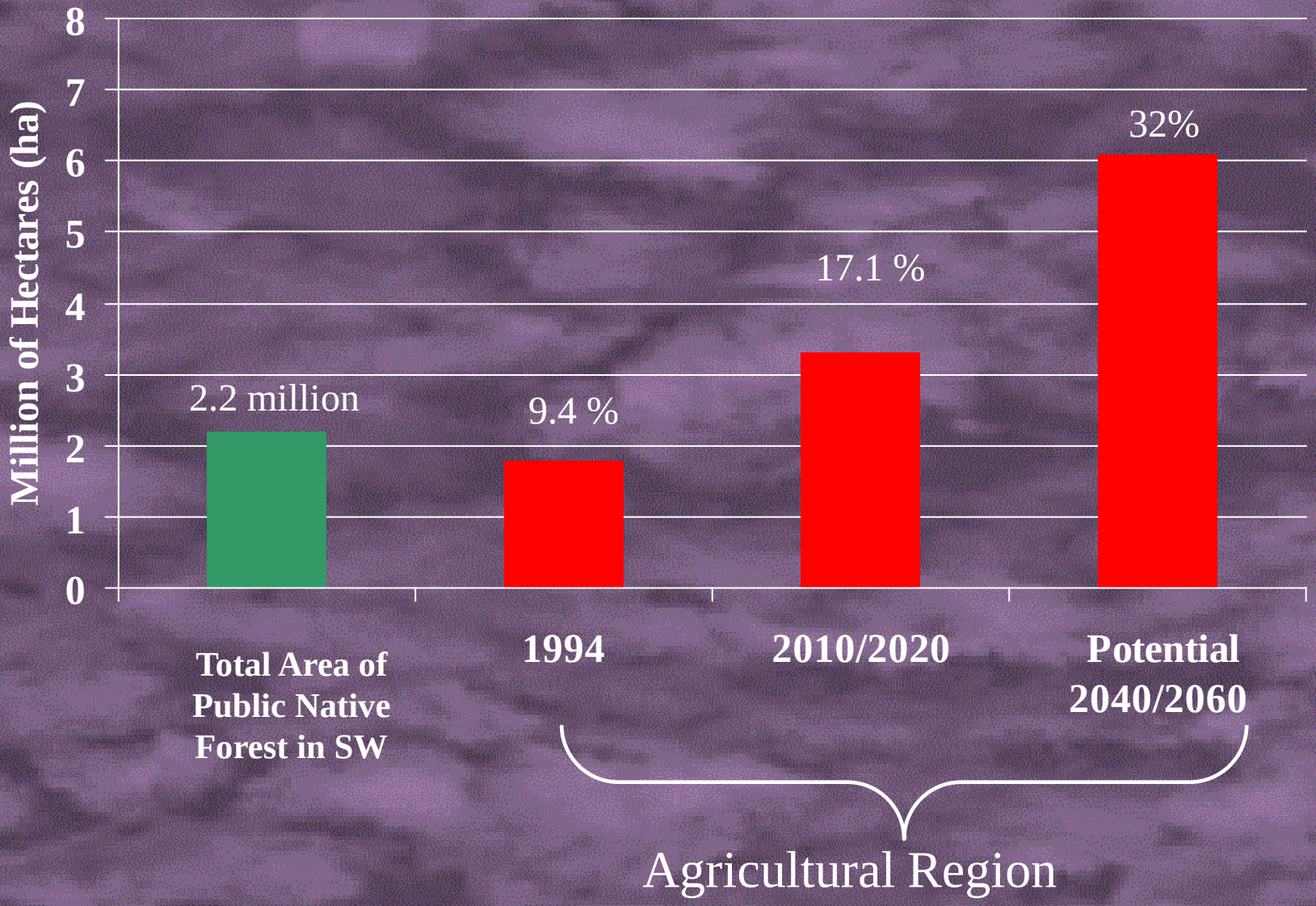


CALM has joint ventures with 1500 farmers

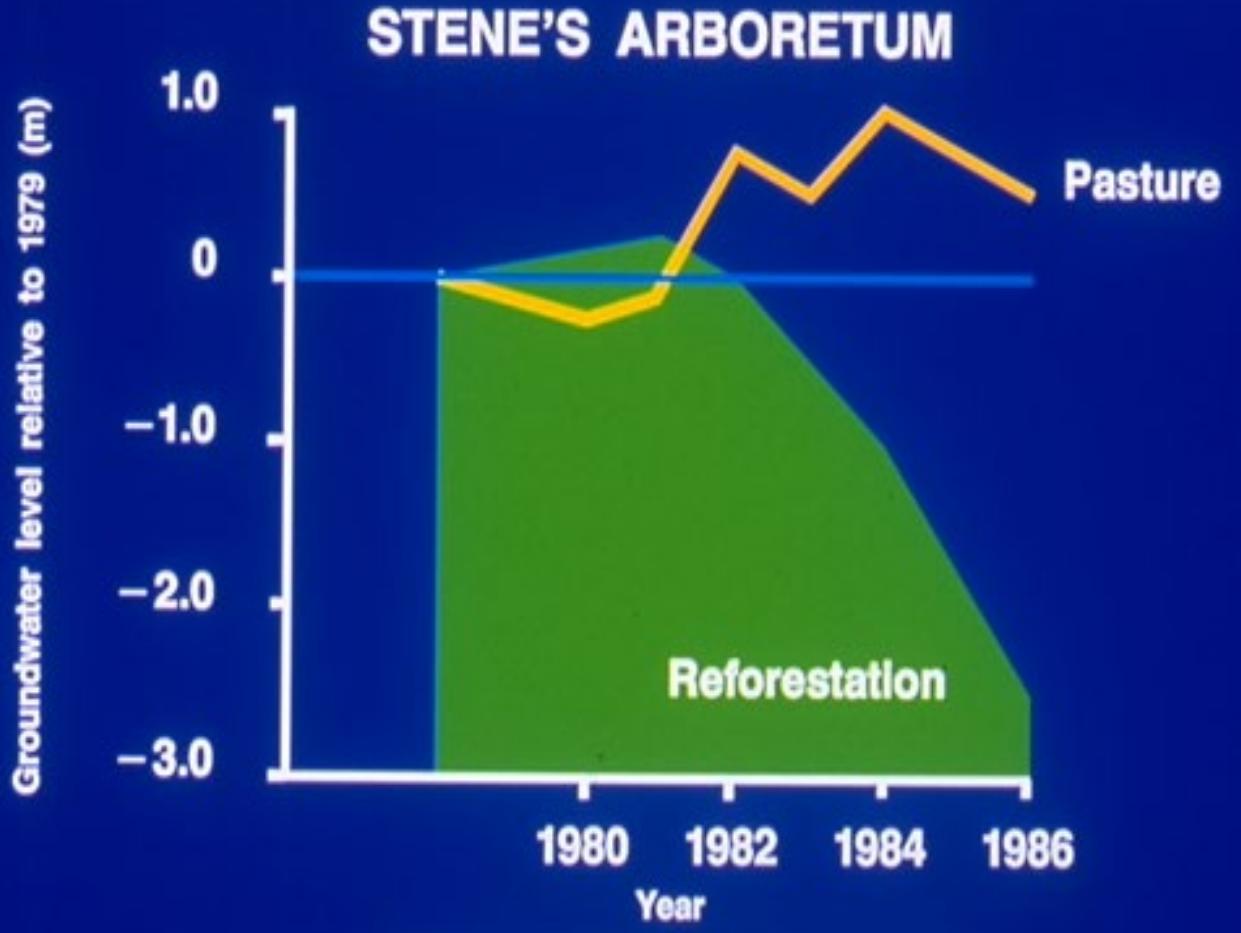
CALM has contracts with 84 land management contractors

Integration with Environmental and Economic Objectives

Areas of Land Effected by Secondary Salinity

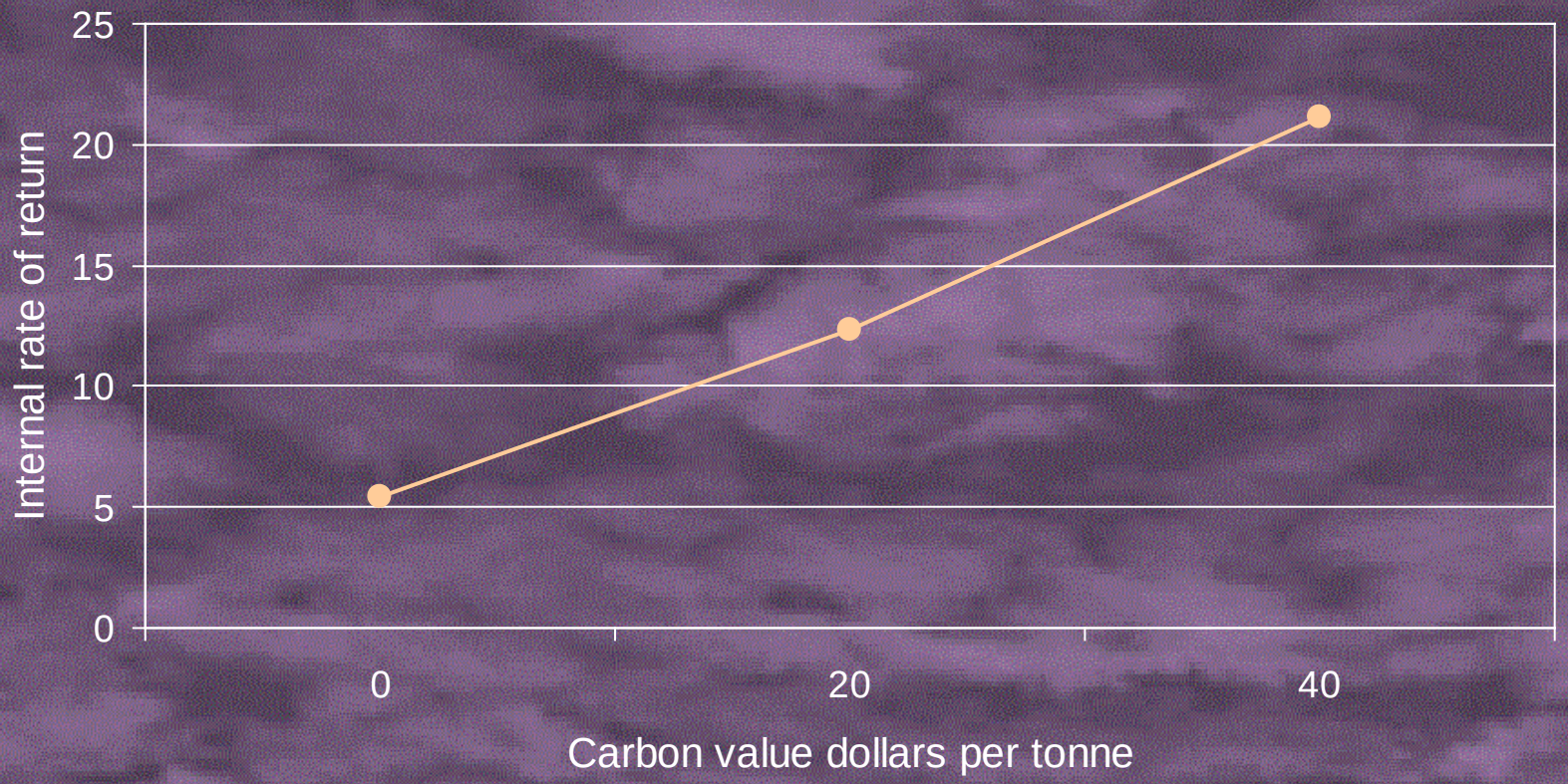


THE EFFECT OF TREE CROPS ON WATER TABLE LEVELS



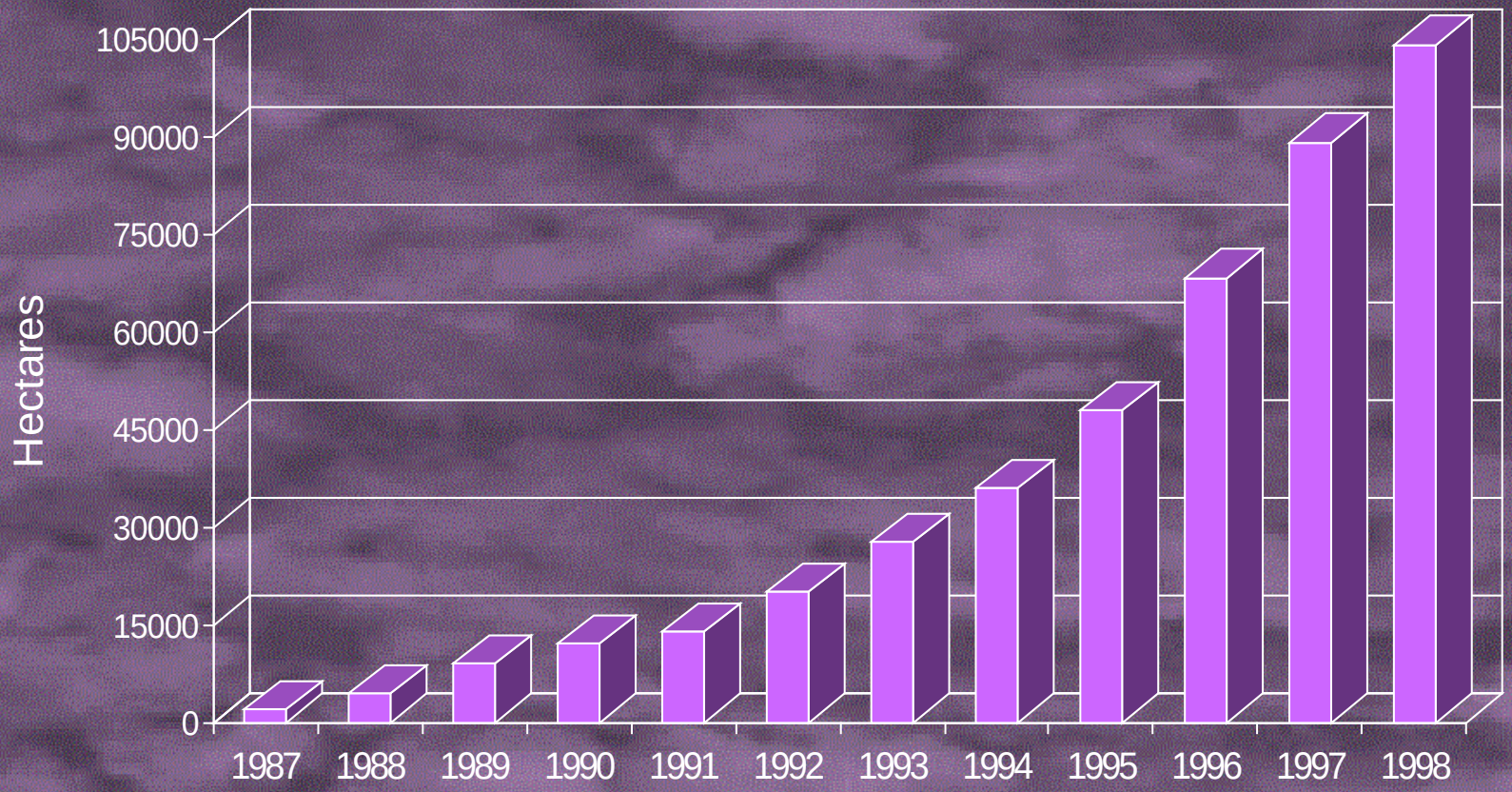
Water Authority of Western Australia
July 1989
Report No. WS 33

Return from Maritime Pine at Different Carbon Prices

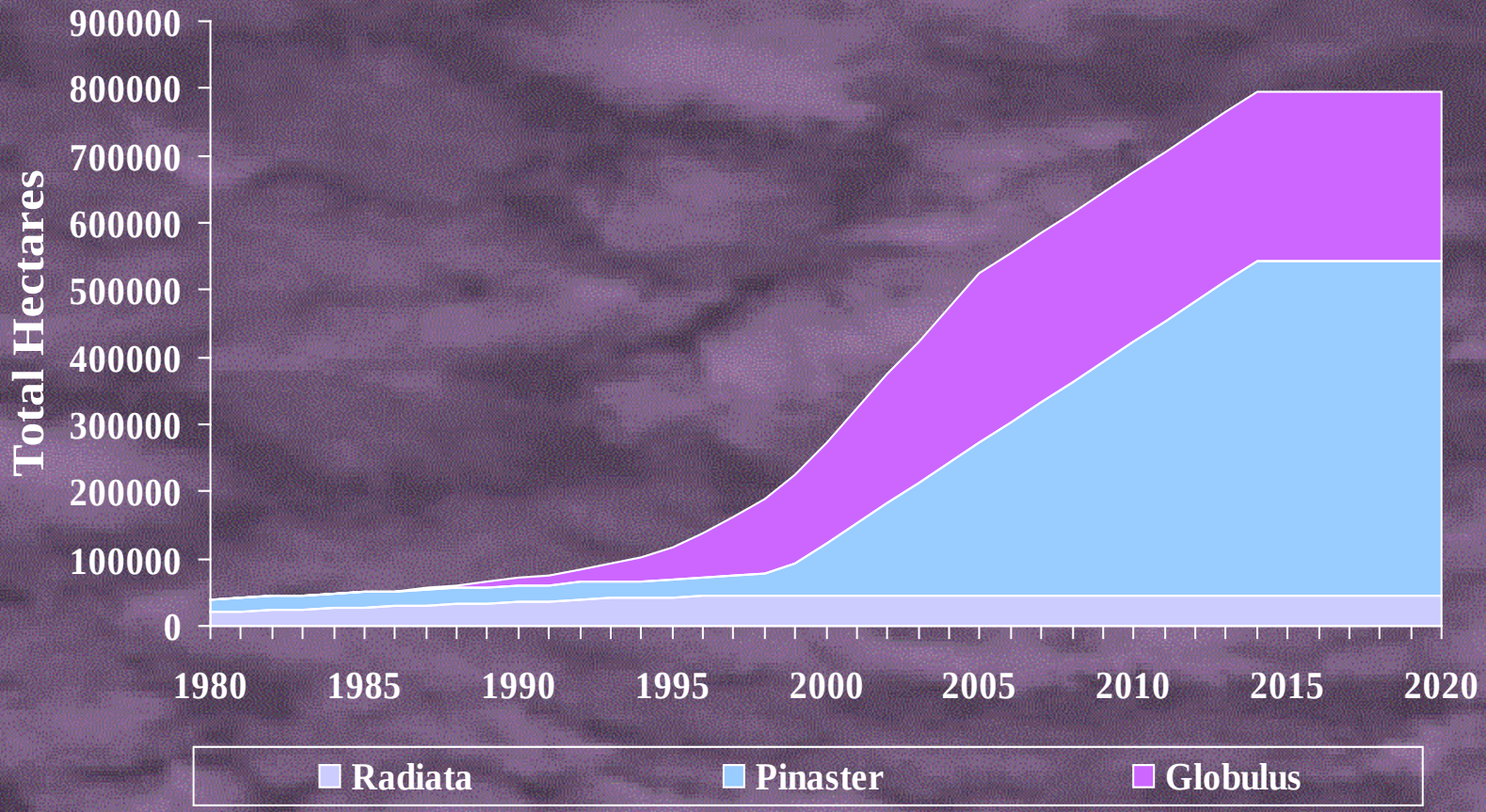


Implementation rate and scale

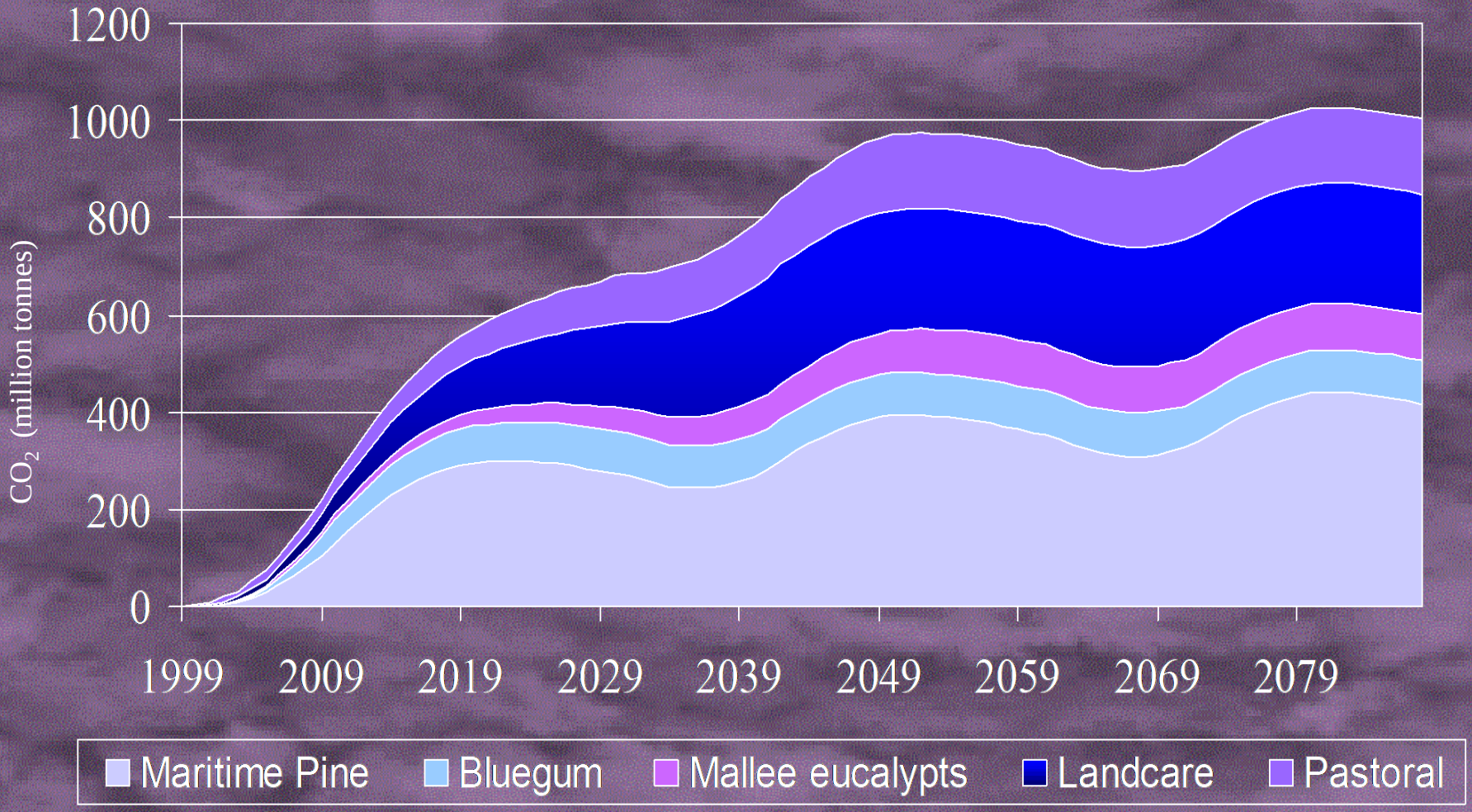
Total area of *E. globulus* in WA



Predicted Growth of Tree Crop Plantings in Western Australia



Cumulative CO_2 pool over 90 years



Australia's Kyoto Targets