

Kylie Dudley.

“What is the difference between the vegetation in Native bushland and introduced Radiata pine plantations?”.



An excellent report in
all aspects.

- Skills
- Methodologies
- Research - mostly primary
- Scientific method
 - Observe
 - Record
 - Analyze
- Logical sequence of information.
- Relevant conclusions

100
I thoroughly agree with
this mark. Marvellous
work - the best I have
ever seen. I loved the tape!!
G. Lindsey.

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subject:

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Introduction;

"What is the difference between the vegetation in native bushland and introduced radiata pine plantations?". At first the question seems easy, 'native bushland nearly always has more vegetation than introduced pine', I made this hypothesis from observation. This inspired me further, not only to do my S.G.P on "what are the differences?" but also "why do these differences in vegetation exist?".

I chose the Sunny Corner State Forest as my area of study because of its locality (i.e. within riding distance so it did not involve the efforts of my parents), and also an area of native bushland which had been kept as a reserve by the State Forest for Charles Sturt University students to study.

Sunny Corner is located in the Central Tablelands some 40kms east of Bathurst. This particular area is immediately south of the Great Western Highway. The area has an elevation between 1180m-1200ms a.s.l. so it receives a high rainfall during winter with frequent snowfalls and a moderate summer with an even fall of rain all year round.

During my project I encountered many difficulties but the biggest was taking on the task of trying to identify plant species. With the help of a park ranger, books and Dr Goldrey (from C.S.U - who has written a book on the area), I managed to identify the main species.

My aims were to; study the types/percentage of vegetation, research the vegetation layers found, study diversity of vegetation, identify the main species and make a conclusion of the differences in the vegetation in each area. My last aim was to discover why these differences in vegetation actually occurred.



Physical descriptions of the two areas studied. (2)

Bush: The canopy of the sclerophyll plot is fairly open and dominated by Brown Barrel and Ribbon Gums (to a height \approx 40m) with scattered Snow Gums and wattle. The well developed understorey has saplings of the species that form the canopy & some hickory. The thick green cover is dominated by bracken, tussock, perennial herbs and native Geraniums.



pine: The *Pinus Radiata* forms a uniform semi-closed canopy up to about 25 m high except in the gullies. The under-story consists of spindly weeds, a few younger self-sown pines, blackberries, hardy weeds, bracken, a few acacias, hickory and a fairly thick layer of dead pine needles on the forest floor.





C A S T L E T E N

Kirkconnell House
KIRKCONNELL AFFORESTATION CAMP
Dept. Corrective Services

KIRKCONNELL

native bushland

WESTERN

TO SYDNEY

TO BATHURST

"Cloverlea"

"Cherry Tree"

"Linden Lea"

FP 6H71
56 "Warrabee"

FP 1838

FP 512350

FP 389481

FP 6138

D.P. 234324

SD 633303
"Turets"

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Cross-Sectional view of pine area. (5)

1cm on map = 750m.

AREA studied:

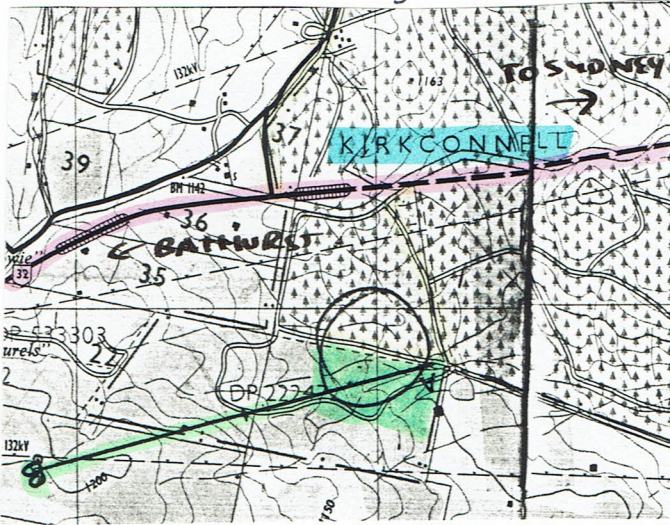
GRID Ref: 657.975
(Meadow Flat topographic map)

$$V.E = \frac{\text{Horizontal scale (HS)}}{\text{vertical scale (VS)}}$$

$$V.E = \frac{1:8333\frac{1}{3}}{1:750} = \frac{100}{9} = 11\frac{1}{9} \text{ or } 11.1.$$

MAP 1.

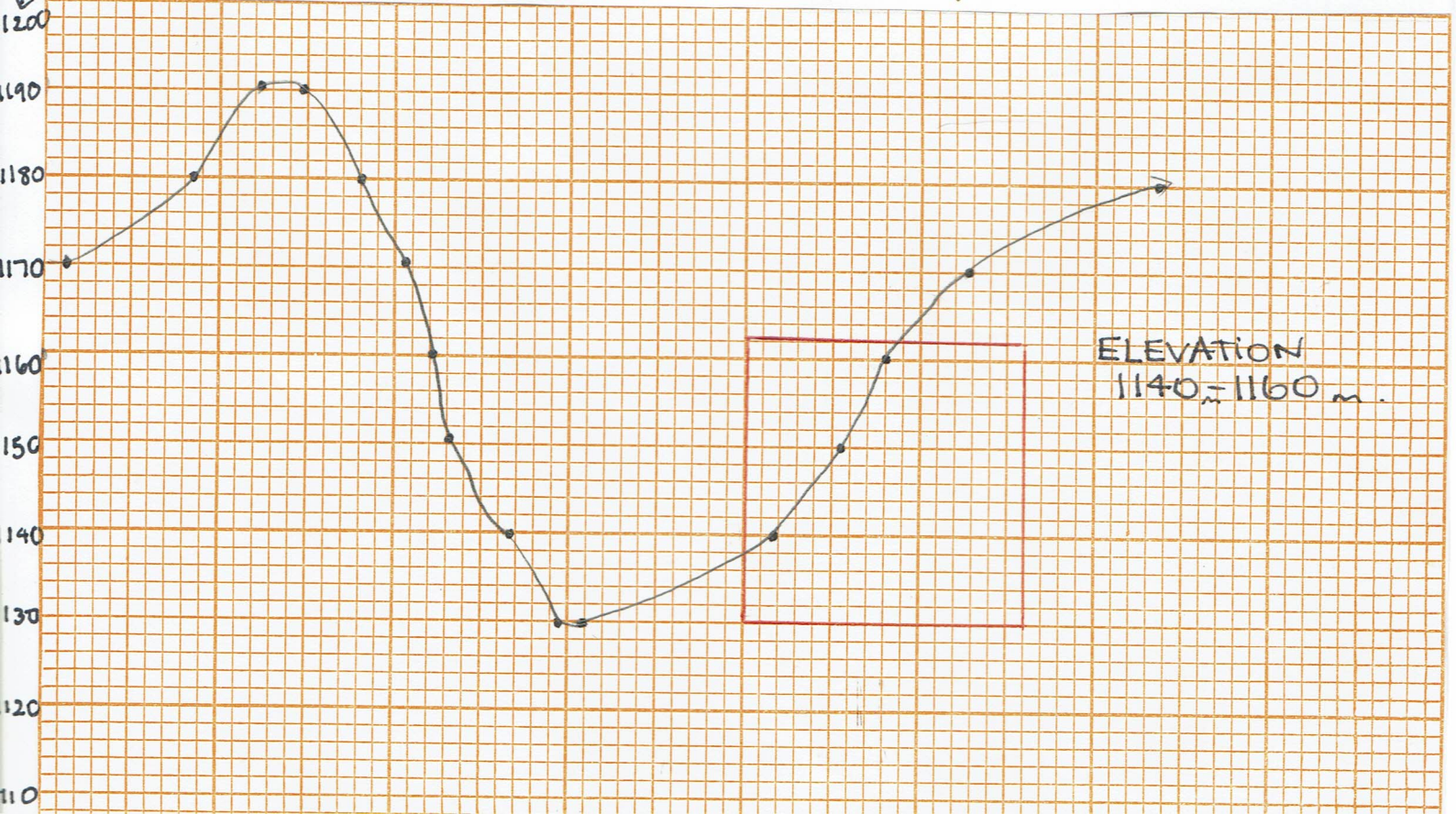
↑ adjoins map 2.



I did this to give you a good idea of the terrain my project is in, since slope is related to vegetation. See below red box - this compared with the bush area shows you the slope is very similar where I did my research i.e. roughly over $\approx 330m^2$ at each location.

Handwritten signature

Elevation



Cross-Sectional view of bush area.

1cm on map = 750 m

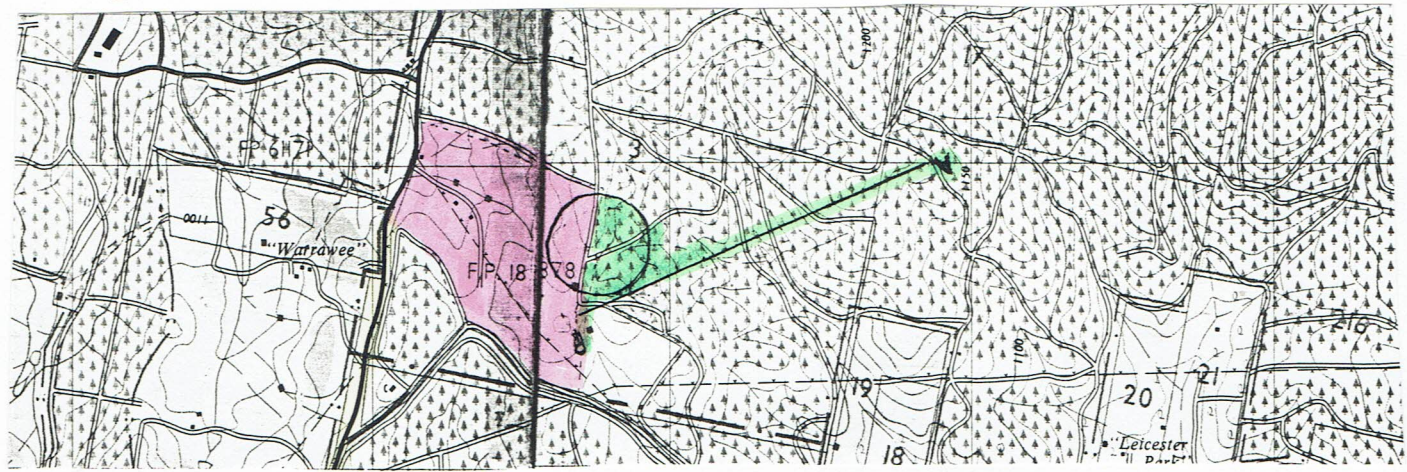
AREA STUDIED:
GRID REF: 650 958.

$$V.E = \frac{\text{Horizontal scale (Hs)}}{\text{vertical scale (Vs)}}$$

$$V.E = \frac{1 : 8333 \frac{1}{3}}{1 : 750} = 11 \frac{1}{9} \text{ or } 11.1$$

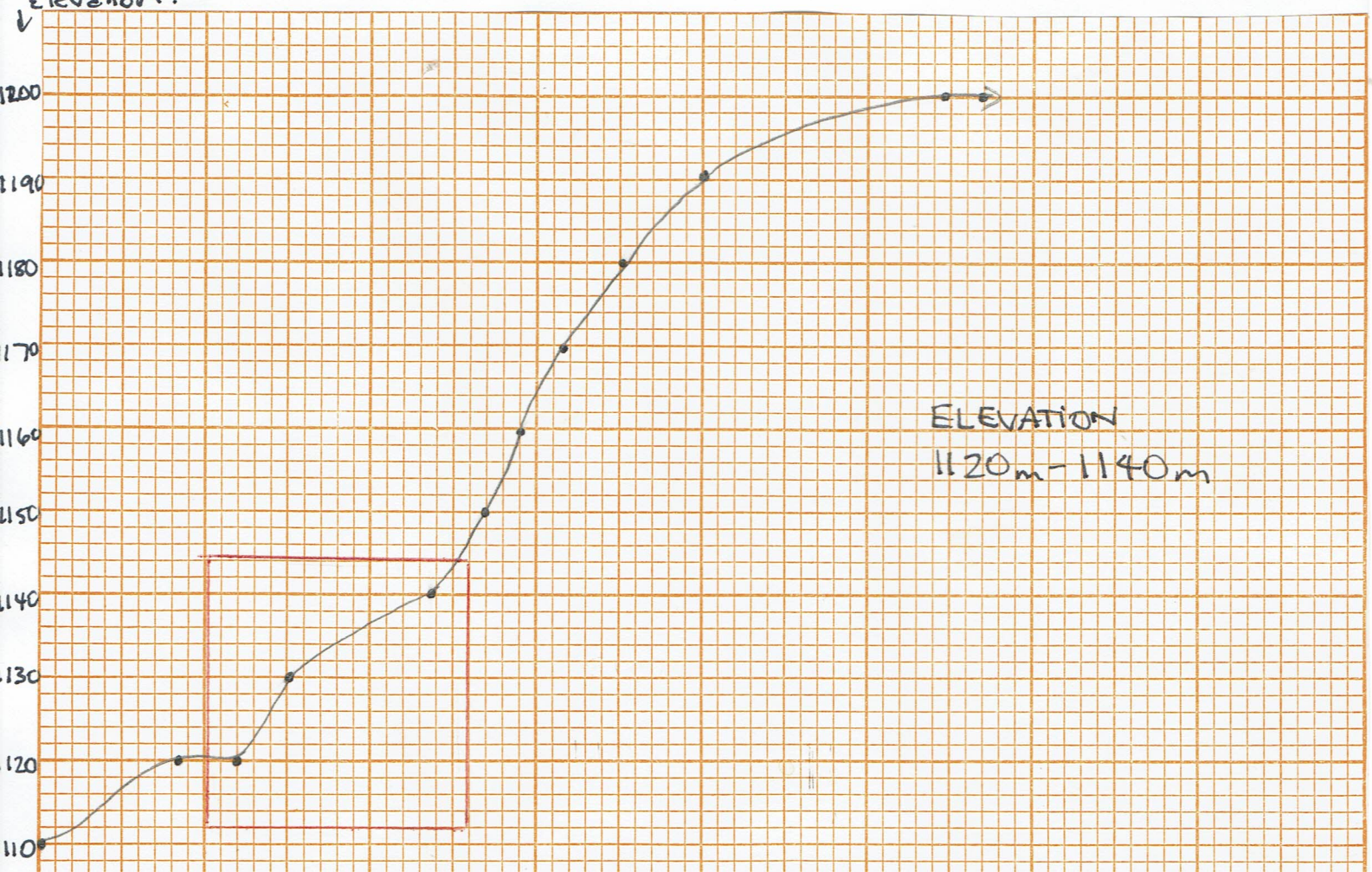
MAP 2: 1 : 750

- KEY: to map
- our property \approx 85 acres.
 - minor tarred road.
 - area studied
 - Great Western Highway (see other map).



↑ Adjoins Map 1.

Elevation.



① Steps taken to ensure a good comparison.

Factors Affecting vegetation . - aspect . - slope - relief - profile (of canopy)
- pH of soils - human activities .

① Aspect - I calculated the percentage of sunlight hitting the forest floor by taking a photo directly up at the sky from the ground.

NOTE: The bush allows sunlight through the leaves .



NOTE: The pines are fairly dense and allow little sunlight to pass through.



Method: calculate the % of sunlight on each photo by cutting out both the blue and black bits. This can be weighed (science dept. scales 3 dec. places, you work out the percentage by calculating the weight of blue sky compared with the weight of the whole photograph .

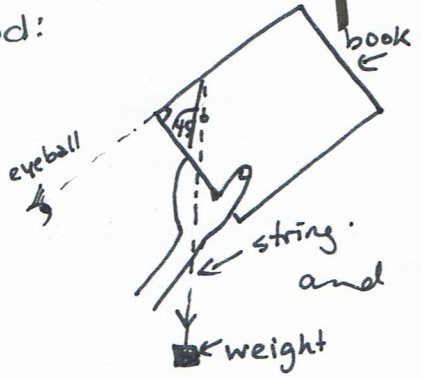
Results:

Pine
28.75% sunlight
through canopy.

Bush
46.89% sunlight .
through canopy.

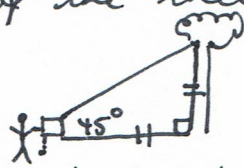
profiles.

Method:

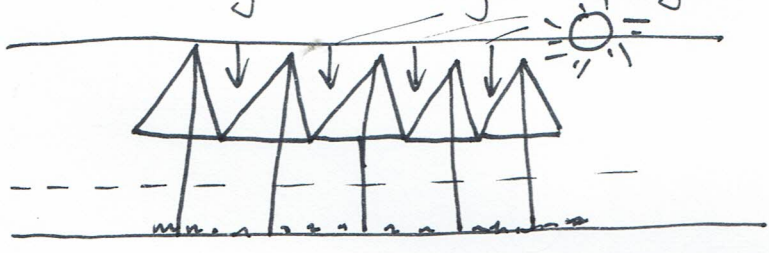


I faced out an area of 20 metres across by 5 metres deep and drew the whole area - to calculate the higher trees I used the sine rule and the "book method" as drawn left.

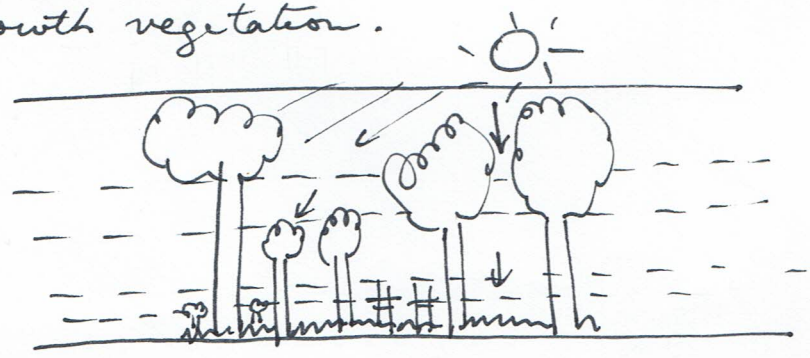
You move the book (actually walk backwards until the string lies up with 45° angle. The distance from the base of tree should equal that of the height of the tree, minus the persons height holding the book.



conclusions: The bush land had about 5 layers in its canopy whilst the pine forest had roughly 2 layers. From this we can conclude that pine trees are what is called a **MONOCULTURE** - because the pines dominated all vegetation with little sunlight coming through.



The bushland is what is called a **COMMUNITY** - with various layers, and it allows sunlight through for undergrowth vegetation.

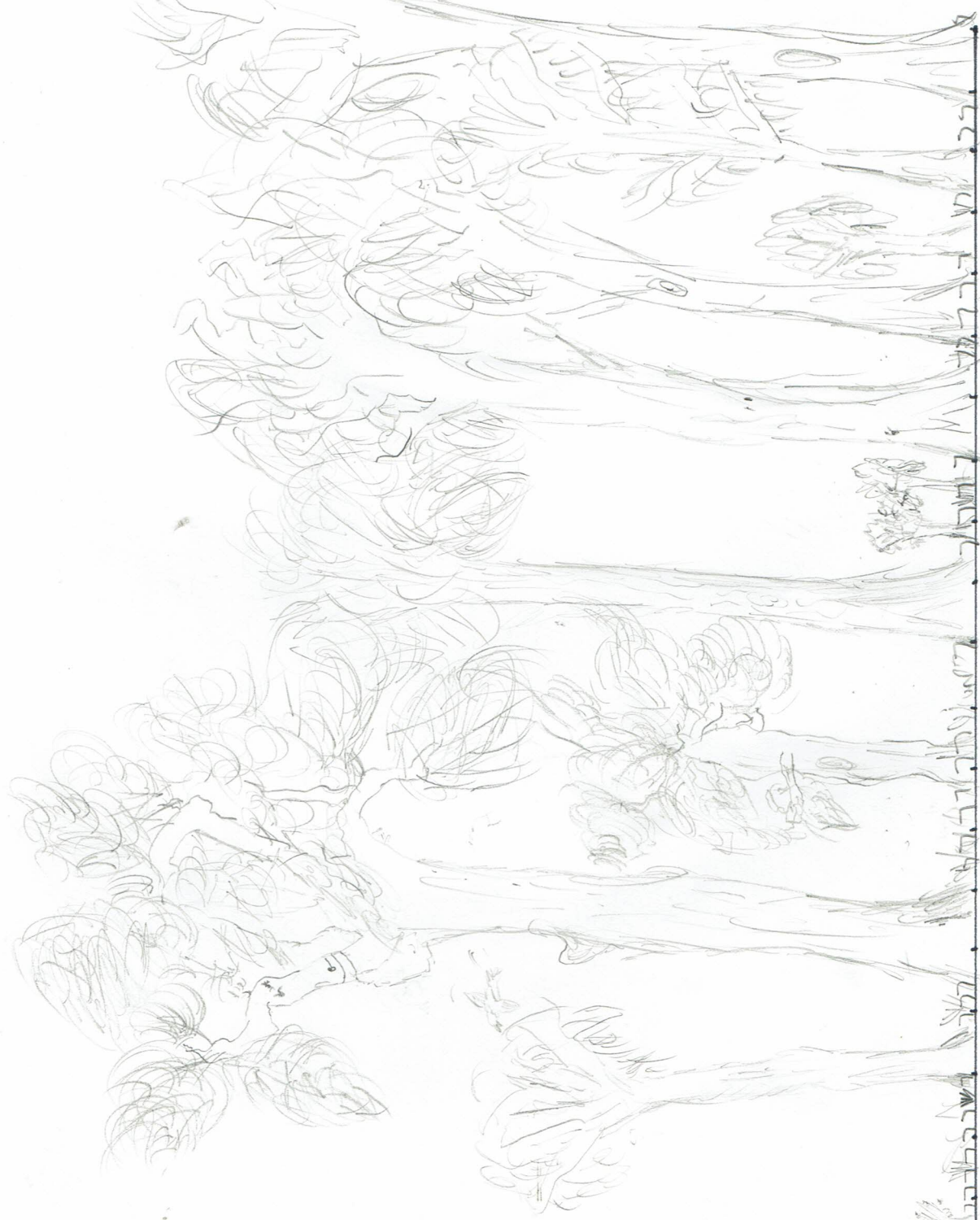


Profile of Native bushland.

KEY:

- W - Wattle = 100 per Ha.
- T - Tussocks.
- B - Bracken.
- H - Hickory = 100 per Ha.
- BB - Brown Barrel = 500 per Ha.
- SS - Snow Gum = 100 per Ha.
- SB - Stringy bark = 100 per Ha.

8
6
24
22
10
6
4
2
0
8
6
4
2



TOTAL AREA OF PROFILE

= $20m \times 5m \text{ deep}$
= $100m^2$.

eg. 5 Brown Barrel per 100m²
= 500 per Ha.

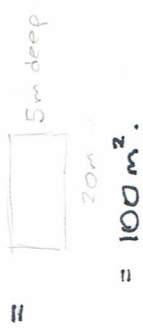
W1 B2 T3 S5.4 SB6 T9 SB11 H12 H13 BB14 SB16 H17 H18 SB20

Profile of introduced Radiata Pine.

KEY:

- W - Wattle = 100 per Ha.
- T - Tussock
- B - Bracken = 58000 per Ha.
- BP - Baby Radiata Pines.
- P - Radiata Pines = 500 per Ha.
- H - Hickory = 200 per Ha.

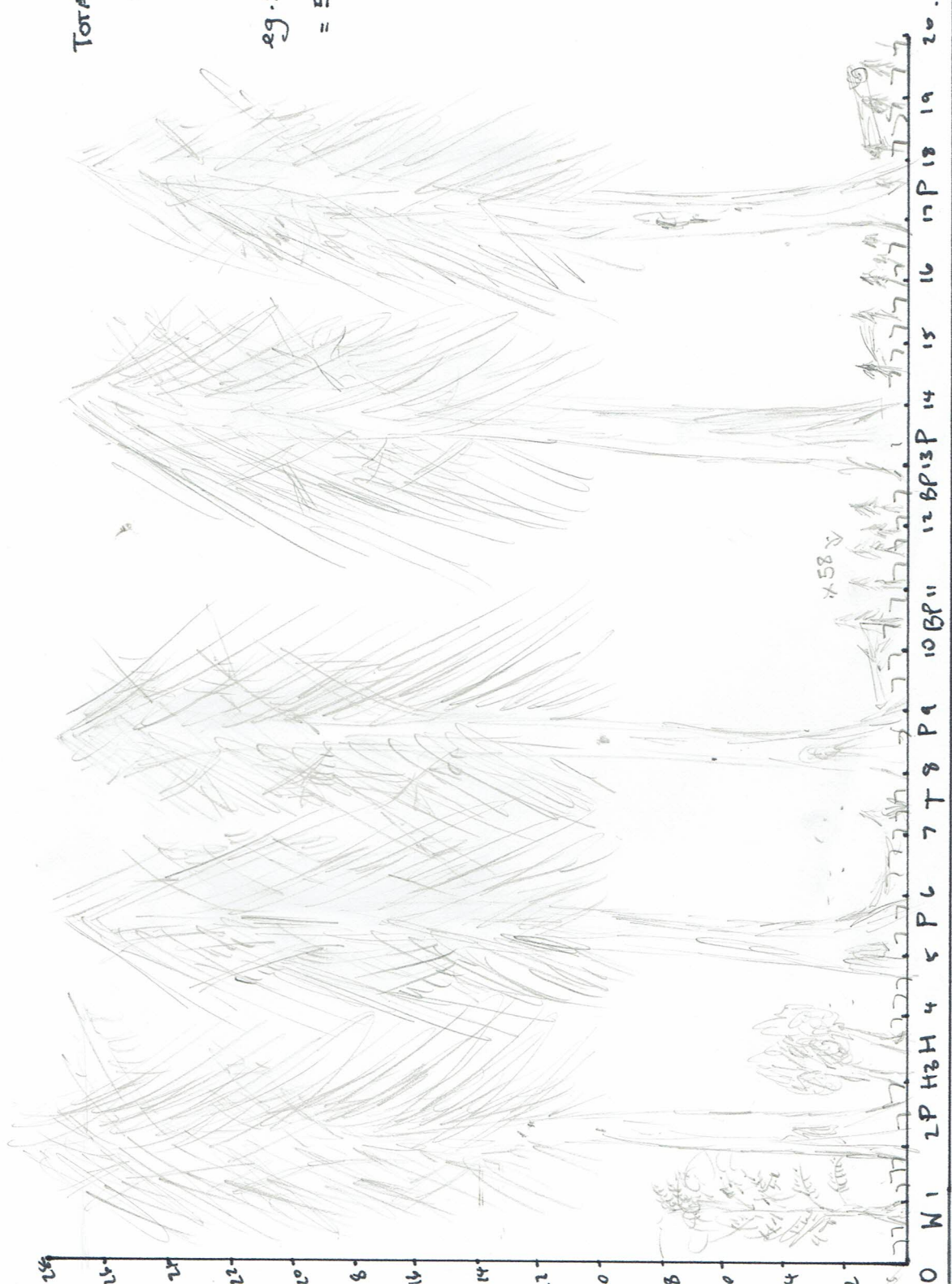
TOTAL AREA OF PROFILE .



= $100 m^2$.

eg. 5 Radiata Pine per $100 m^2$.

= 500 per Ha.



pH Testing: Test 1 - inaccurate.




Method: I took 2 samples of soil from the pine forest and 4 samples of soil from bushland. Weighed out 12g accurately - shook vigorously with distilled water, left over night. Next day I filtered the water, recorded the amount of humus/ clay & tested with a piece of indicator paper. The above are the results. These all have a greenish tinge indicating a pH of about 6-7.

Test 2 - accurate.

I was not happy with the inaccuracy so I tried another test.

Method:

I placed a small sample of each soil into the holes on the pH  tray, added a few drops of universal indicator, then white Barium Sulfate (BaSO₄) powder and got more accurate results & colour changes. SAMPLE

Results:	BUSH: A	B	C	D
Humus (mm)	3mm	8mm	2mm	2mm
Clay (mm)	5mm	-	2mm	4mm.
pH:	6.5.	4.5-5	7	6.5-7.

(A) Description: light/humus soil. (B) merone/rich soil (C) rich/dark/clayey (D) rich/dark/clayey.

PINE: A
Humus (mm): 1mm
clay (mm): 2mm

B
: -
: 5mm

Average pH: BUSH: 6.125
PINE: 6.5.
ie slightly acidic.

pH:


I always presumed pine trees had acidic soil, but in this case my hypothesis was to expect the pine soil to be acidic and the bush soil to be near neutral. I was mistaken and found the results interesting.

Conclusion:

Both the pine and bush have similar pH.
 i.e. slightly acidic - 6-6.5 pH.
 The bush soil also had more humus.

∴ pH is not a factor in determining the differences in vegetation (in this case).

Expanding Quadrat:

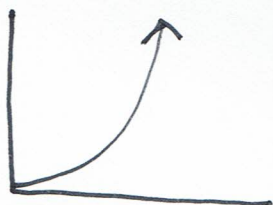
Method: use a $\frac{1}{2}m^2$ quadrat  and count the no. of species in $\frac{1}{4}m^2$, then $\frac{1}{2}m^2$, then $1m^2$ and keep doubling and so on. Each new area you count any new species found.

Theory: when graphed these are called a "species area curve". Different graphs indicate different conclusions.

ie.



This indicates a slow / flat graph means: the number of species is low and not very diverse.



This indicates a short / sharp graph means: many species, very diverse. when the line (slope starts to flatten it means no more new species are being found. To be accurate you should keep increasing area until no new species are found.

Conclusion: **Bush**: - sharp steep line (42+ species) the line is not flattening so there is definitely more species than 42.
 ie. very diverse.

NATIVE BUSHLAND VEGETATION

Grasses.

bush vine.

Tussock.

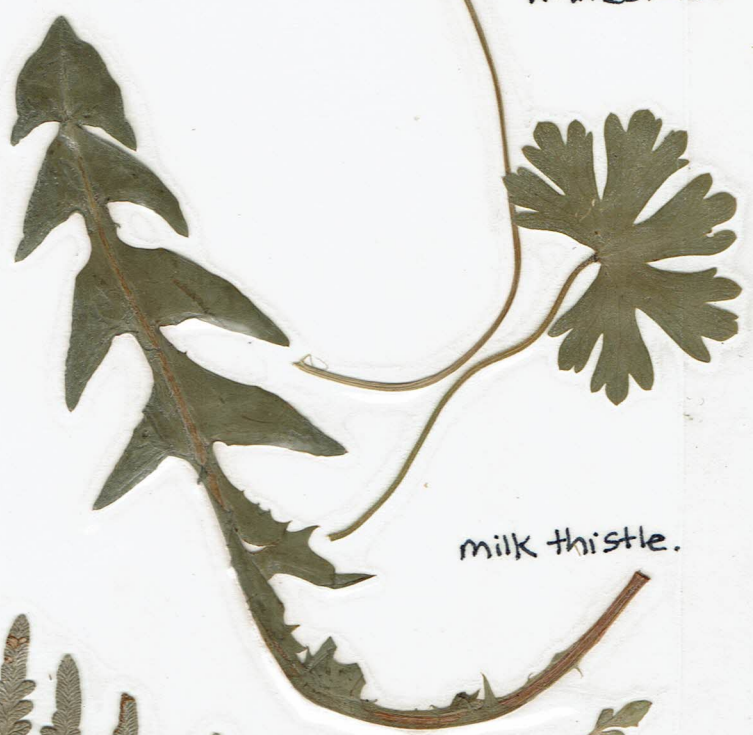




Stinging nettle.



White clover



milk thistle.



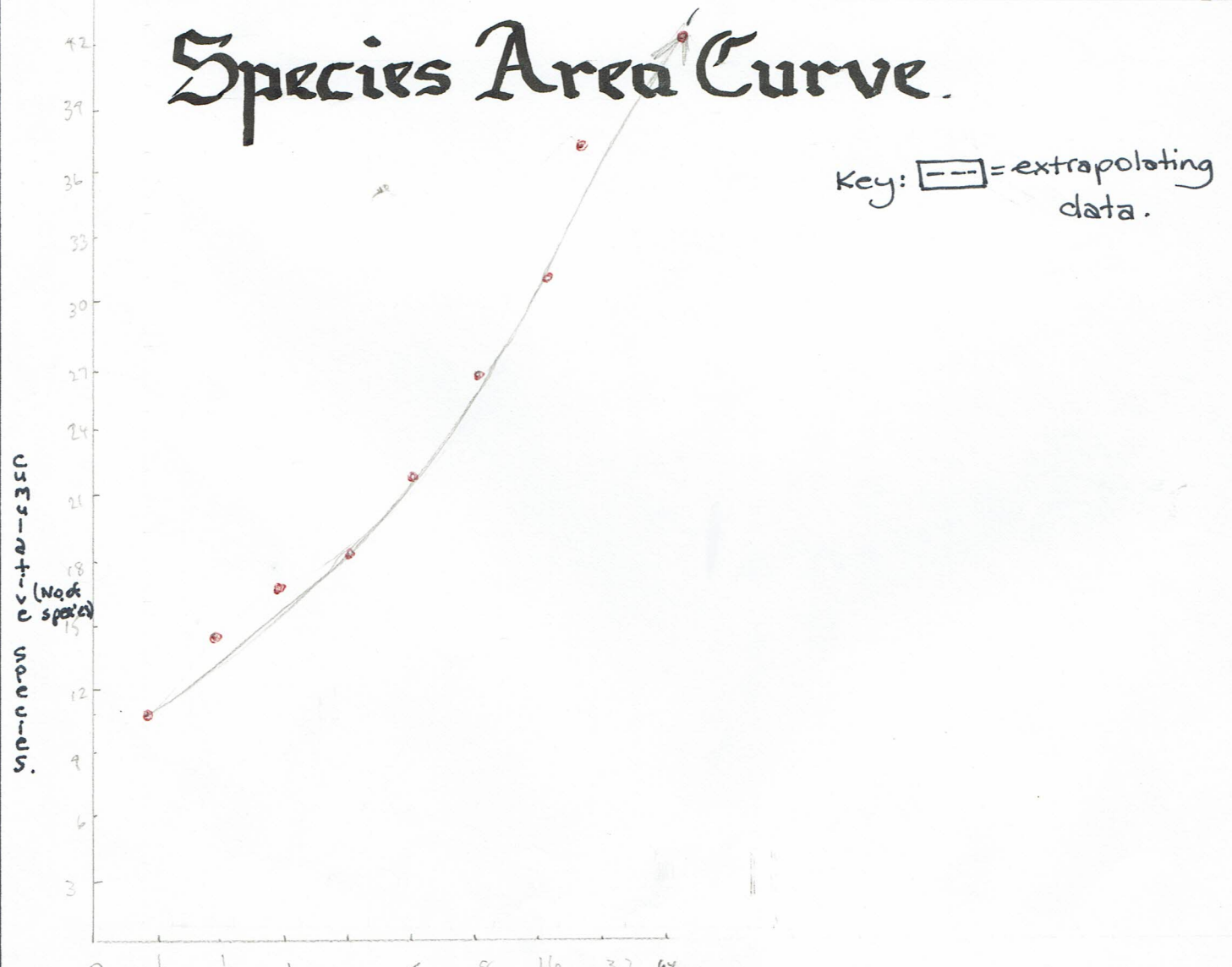
Bracken.



Expanding Quadrat - bush.

Area.	Number of species.	Cumulative species.
$\frac{1}{4}$ metre ²	11	11
$\frac{1}{2}$ m ²	3	14
1 m ²	3	17
2 m ²	1	18
4 m ²	3	21
8 m ²	6	27
16 m ²	5	32
32 m ²	6	38
64 m ²	4	42

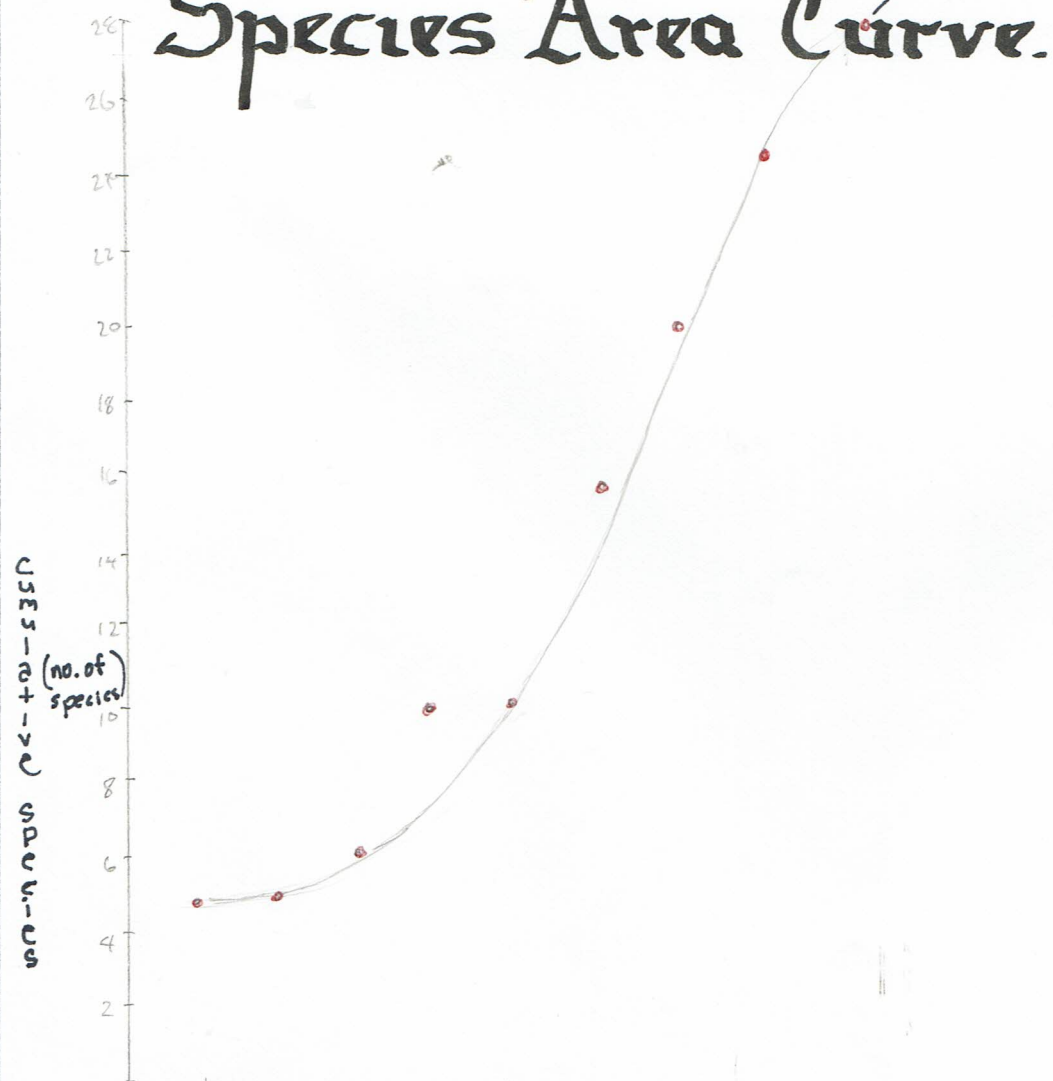
Species Area Curve.



Expanding Quadrat - pine

Area	Number of species	Cumulative Species.
$\frac{1}{4}$ metre ² .	5	5
$\frac{1}{2}$ m ²	0	5
1 m ²	1	6
2 m ²	4	10
4 m ²	0	10
8 m ²	6	16
16 m ²	4	20
32 m ²	5	25
64 m ²	3	28.

Species Area Curve.



Percentage/Type of vegetation-bush.

①

	herbs/grasses	leaf litter	mosses	fungi/leichen	rock/soil	skats.
①	83.5%	16%	-	-	-	.5%
②	75%	25%	-	-	-	-
③	74%	19%	-	4%	2%	1%
④	74%	24%	-	-	1%	1%
⑤	28.5%	66%	-	.5%	1%	4%
⑥	85%	14%	-	1%	-	-
⑦	8%	83%	8%	.5%	-	.5%
⑧	76%	24%	-	-	-	-
⑨	72%	28%	-	-	-	-
⑩	82%	16%	-	-	-	2%

Average =

65.8% 31.5% .8% .6% .4% .9%

②

(see pie graph for comparison.)

	herbs/grasses	leaf litter	mosses	fungi/leichen	rock/soil	skats.
①	72%	26%	-	-	-	2%
②	73%	27%	-	-	-	-
③	82%	16%	2%	-	-	-
④	63%	22%	15%	-	-	-
⑤	22%	73%	-	5%	-	-
⑥	89%	10%	-	-	-	1%
⑦	80%	20%	-	-	-	-
⑧	87.5%	12%	-	-	-	.5%
⑨	77.5%	22%	-	-	-	.5%
⑩	93.5%	6%	-	-	-	.5%

Average =

QUADRANT TESTS.

QUADRANT TESTS.

Percentage/Type of vegetation-pine.

②

Pinelitter (Dead pine needles)

	herbs/grasses	leaf litter	mosses	fungi/leichen	rock/soil	skats.
①	12%	75.5%	-	1%	11%	.5%
②	10%	84.5%	-	.5%	5%	-
③	12%	62%	-	4%	22%	-
④	17%	64%	-	-	19%	-
⑤	98.5%	-	-	.5%	1%	-
⑥	11%	88.5%	-	.5%	-	-
⑦	3%	86%	-	-	11%	-
⑧	6%	74.5%	-	.5%	19%	-
⑨	0%	95.5%	.5%	-	4%	-
⑩	13%	84%	1%	-	-	2%

Average =

18.25% 71.45% .15% .7% 9.2% .25%

④

Pinelitter (Dead pine needles)

	herbs/grasses	leaf litter	mosses	fungi/leichen	rock/soil	skats.
①	14%	85%	-	-	-	1%
②	13%	86.5%	-	.5%	-	-
③	52%	46%	-	-	2%	-
④	2%	96%	-	-	2%	-
⑤	0%	97%	-	-	3%	-
⑥	0%	8%	40%	2%	50%	-
⑦	11%	89%	-	-	-	-
⑧	20%	-	78.5%	.5%	1%	-
⑨	90%	8.5%	-	-	-	1.5%
⑩	15%	-	80.5%	.5%	4%	-

Average =



PHOTO: Pine forest floor. Note: pine litter, soil exposed and the vegetation is primarily weeds eg. blackberry.

(17)

% / Type of vegetation:



Method: Using $\frac{1}{2} \text{ m}^2$ quadrat - each square represents 11.1%.

* estimate % in each square - add up total of 9 squares. = total %.

* divide vegetation into 6 basic groups - record data.

Conclusions:

* The pie graph is self explanatory.

pine: * primarily has dead pine needles as the forest floor.

* rocks/soil exposed.

* little vegetation / herbs / grasses.

* many weeds. *what's a weed - unwanted, exotic?*

* less skats is less wildlife.

bush: * primarily herbs / grasses / dense vegetation, excellent ground cover.

* good layer of humus / leaf litter.

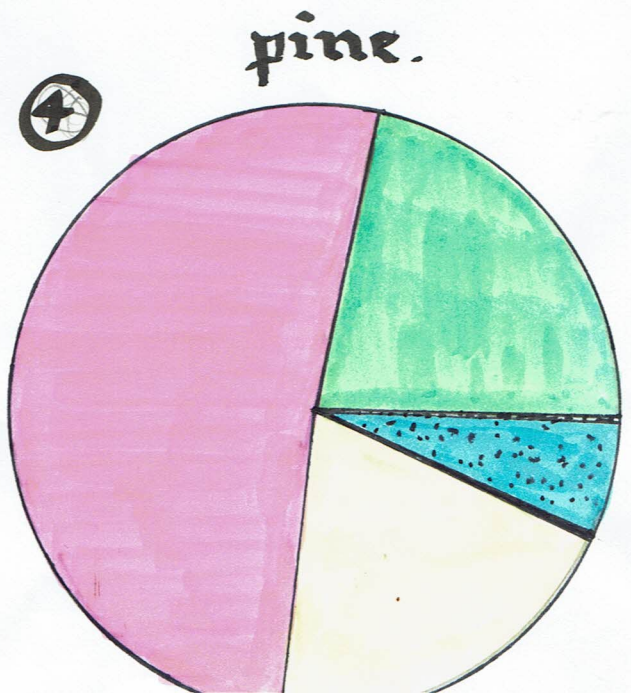
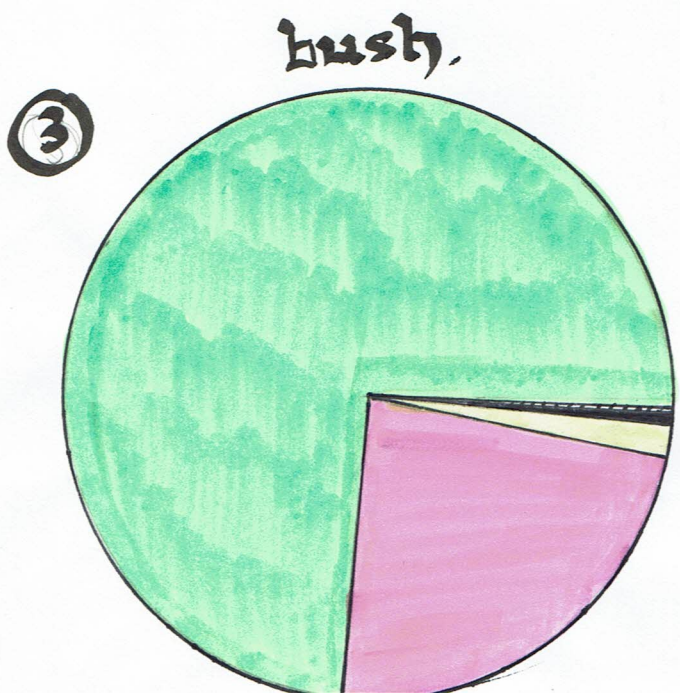
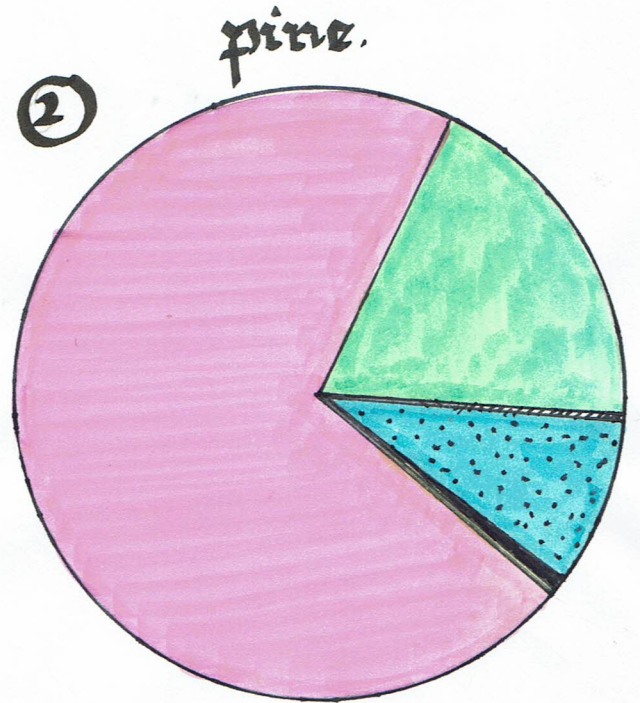
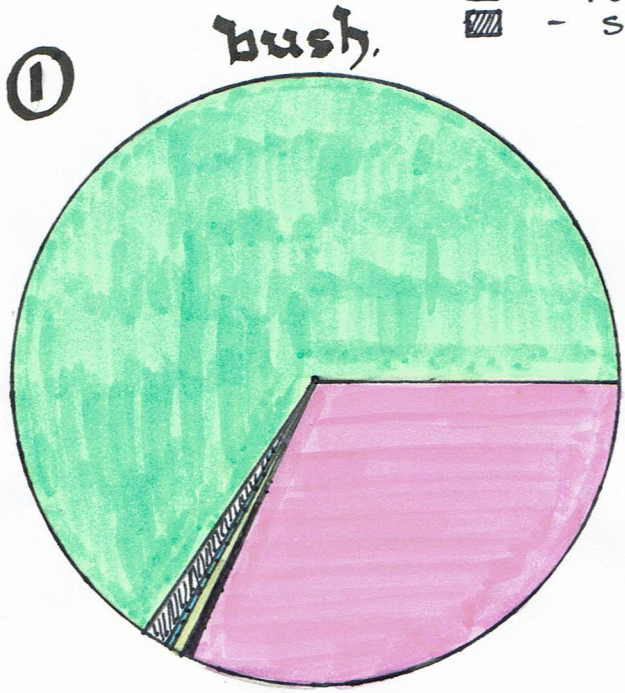
* very little soil / rocks exposed.

* Plenty of skats is wildlife thrives.



Comparison of bush/pine vegetation.

- KEY:
- herbs/grasses.
 - leaf litter (bush) - pineneedle/leaf litter (pine).
 - mosses
 - fungi/leichen
 - rock/soil
 - skats.



INTRODUCED PINE VEGETATION.

Black Berry.



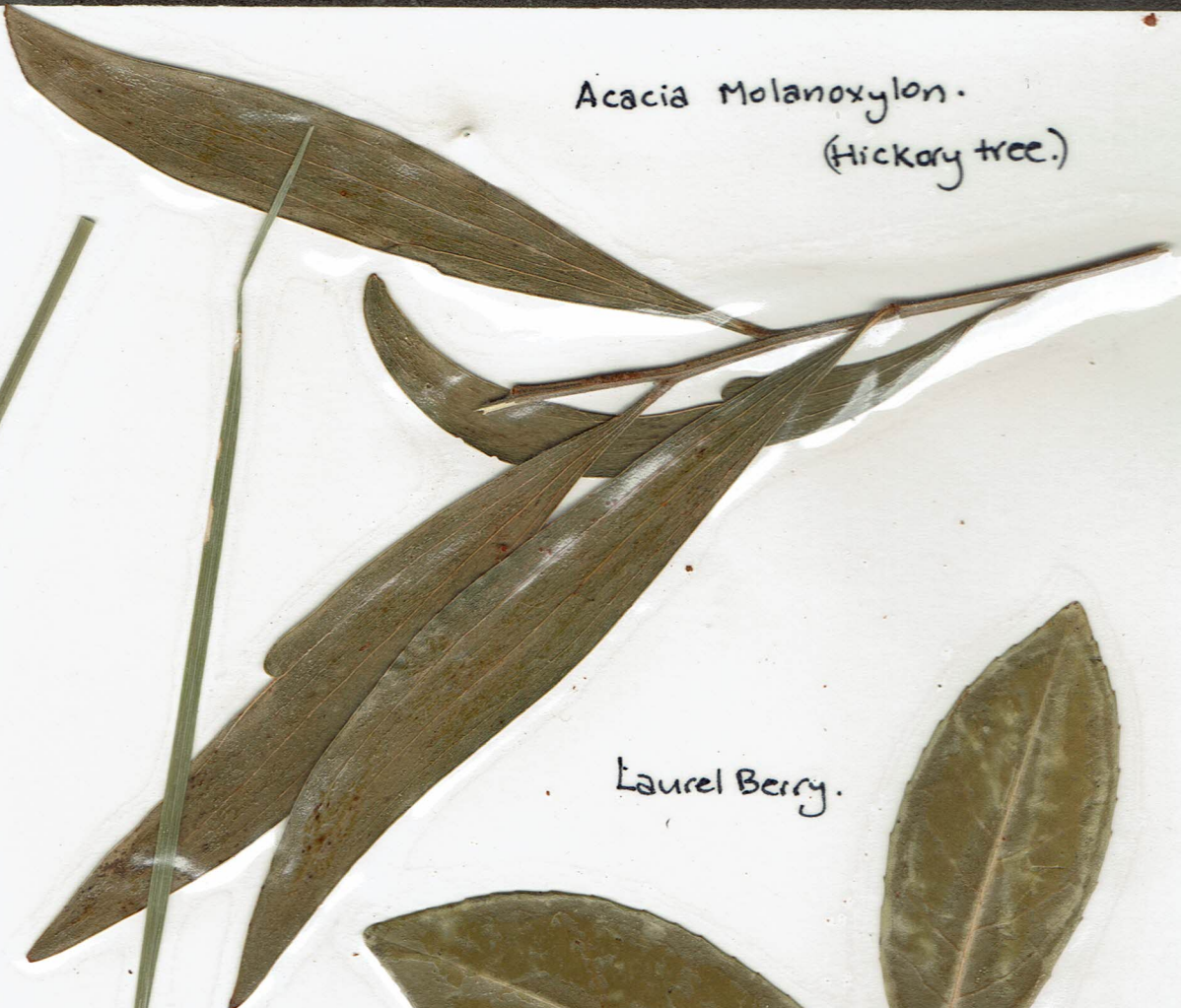
Hardinburgia
Violacea.

Acacia Delbata
(silver wattle).

Greenhood
Bush Orchid.



Acacia Molanoxylon.
(Hickory tree.)



Laurel Berry.



grasses.



Radiata Pinc.



Eucalyptus
pauciflora.



Main Species Table:

Bush:

MAINTREE TYPES:

- Brown Barrel - *Eucalyptus fastigata*.
- Ribbon Gum - *Viminalis*.
- Mountain Gum - *E. dolympteana*.
- Snow Gum - *E. pauciflora*.
- wattle - *acacia melanoxylon*.
- acacia dealbata*.
- Hickory - *falcioformis*.
- Bracken - *Pteridium ^{ox} esculentum*.
- Tussock grass - *Poa labillardieri*.
- Perennial herbs - *senecio gunni*
- Native Geranium - *geranium granitocola*.
- Native violet
- spider orchid.
- greenhooded orchid.
- Ladies slipper.
- * Cryptic orchid. - *chiloglottis palachila*.
- * (rare species - this small area of bushland is the only place in N.S.W where this type of orchid is found.
- dozens of different types of grasses.
- bushvine.
- stinging nettles
- milk thistle
- white clover
- broad leaf weeds
- purple vine - *Hardinburgia violacea*.
- black berries

WILDLIFE:

Quoted: Mr Goldney "56 known birds in bush area, 17 different types of mammals - some of reptiles, amphibians and a large

Pine:

MAINTREE TYPES:

- introduced *Pinus Radiata* (from California)
- spindly - *A. decurrens*.
- Eucalyptus viminalis*.
- self-sown pines
- acacias, Hickory
- P. esculentum*.
- Blackberry - *Rubus vulgaris*.
- Poa labillardieri*
- Holcus lantus*.
- *Onopordon acanthium*
- Mimulus moschatius*.
- *Geranium solanderi*
- annual herbs - *Wahlenbergia communis*
- geranium homeanum*
- sow thistle - *sonchus asper*
- veronica plebeia*.
- Gnaphalium umbricola*.
- Epilobium billardierianum*
- various laurelberry tree saplings.
- scotts thistle
- stinging nettle
- many weeds.

Pinus species name:

Pinus

MAIN TREE TYPES:

MAIN TREE TYPES:



Vertical text on the right side of the page, including handwritten notes and possibly a checklist. Legible words include: "Kipbon", "Mountain", "Snow", "Wattle", "thicket", "Black", "Tussock", "Native", "Native", "spider", "green", "Larix sibirica", "Cryptic orchid - chloropellis parvula - saw-throat - saw-claw sedge", "umbrella", "tree", "grass", "milk", "prod", "grass", "prod", "white".

Conclusion:

From the results of my project I can now satisfactorily answer my question "What is the difference between the vegetation in Native Bushland and introduced radiata pine plantations?"

I can now make the following conclusions:

- ① * Bushland - the vegetation occurs in about 5-6 layers underneath the canopy. (COMMUNITY).
- * pineland - the vegetation is primarily dominated by pines radiata thus making only about 2 layers of vegetation (MONOCULTURE), they take most of the sunlight & dominate.
- ② * bushland - the vegetation is more diverse than in the pine forests. (Dr Goldney's calculations ≈ 100 species)
my research 42+ species.
- * pineland: vegetation less diverse. (28+ species).
- ③ * bushland - % and type of vegetation
 - primarily herbs/grasses/excellent dense ground cover.
 - good layer of humus/leafy plants.
 - very little soil/rocks exposed.
 - plenty of skats - indicating wildlife thrives.
- * pineland - primarily dead pine needles dominate forest floor.
 - Rocks/soil frequently exposed.
 - little vegetation/herbs/grasses.
 - many weeds - spindly, hardy weeds.
 - less skat than bushland - less wildlife.

From observations: the bush seems a 'softer' environment with a soft ground covering of leafy herbs/grasses, whilst in the pine it seems 'survival of the fittest' plays a major role when examining the hardy, spindly, tough weeds that grow. Numerous finds of mosses, fungi and lichen indicate a stale, moist forest floor, also indicating not a lot of sunlight hits the forest floor for vegetation to grow that needs moisture and darkness.

In the pine you also find where there are gaps of sunlight through the canopy vegetation thrives in those particular spots.

CONCLUSIONS AS TO WHY THERE ARE DIFFERENCES IN VEGETATION:

- * comparison of both helps narrow down the solution
- ✓ - similar aspect
- ✓ - similar pH of soils
- ✓ - similar environment i.e. rainfall / weather
- ✓ - similar height of top canopy.

Yet?? the only factors that were different were;

- X - % percentage of sunlight hitting forest floor.
- X - Number and types of vegetation.
- X - human interactions - especially in pine i.e. logging / thinning - weed spraying.

CONCLUSIONS FOR DIFFERENCES IN VEGETATION:

- PINE - (MONOCULTURE)
- ① LACK OF LIGHT
 - a) initially when canopy closes up (before thinning) (native plants die).
 - b) when canopy opens up (after thinning) - (weeds invade).
 - ② TOO MUCH COMPETITION
 - for nutrients } pines dominate area
 - water } and resources.
 - ③ HUMAN INTERACTIONS
 - State Forest destroys / burns vegetation when they thin & log.
 - poisoning - aerial spray kills - weeds - acacias - blackberries
 - ④ FLORISTICALLY
 - PINE - is very simple - dominated by one species (+28 and many weeds).
 - BUSH - very complexed dominated by many species ≈ 100.
 - ⑤ STRUCTURALLY
 - PINE - simple - 2 layers.
 - BUSH - complexed - 5-6 layers.
 - ⑥
 - PINE - ≈ 40 yr cycle. no chance to recycle.

In conclusion my S.G.P was very successful, despite the fact that my fire area was logged half way through my project. I found a new area and battled on. I encountered many difficulties; the Sunny Corner bleak winter inhibited my progress to a certain degree, but thank goodness for my mountain bike.

I feel my investigations have many prospects for future studies, after all, it's all inter-related; I could then investigate how the wildlife is affected by the vegetation.

I can honestly say I enjoyed doing my S.G.P, because I did it by myself and all my statistics were my own primary research, rather than pages and pages quoted from books, apart from that I took a picnic lunch with me every outing and made a day of it!!



over this way is a logged pine forest.

(30)

PHOTO: opening to bushland.



→ wombat hole!



Ranger Welker
with her handy
video camera.

BIBLIOGRAPHY:

- * Geography research projects - Heather Bindon
Heather Williams
- * Dr Goldney (C.S.U) - notes, extract from book.
- interview -
- * Steve Woodhall (Park Ranger) - photocopy of
acacia identification processes, also
'Eucalyptus' in Sunny Corner District.
- * Native Plants of the upper Blue Mountains.
- Margaret Baker.
- * General Knowledge of area.
- * Mr Dunden (Biology teacher) - various plant
identification books.
- * 10mm video tape from C.S.U on mammals in
Sunny corner. (Dr Goldney) - mentioned vegetation
in brief, got location from here.



ACKNOWLEDGEMENTS:

Special thanks must go to all these people.

* Dr Goldney - lecturer (C.S.U)
(studies wildlife in area).

* Ranger Steve Woodhall
- (helped with some plant species
identification).

* Mr Durdon (Biology teacher at Scots school
- for getting me started.

* Eric Walker - (my camera crew) for helping
me make a "home" video to show
class. = 30 mins.

* My Dad for paying \$185 to get the
camera fixed that I broke, and finding
me one to borrow for my project.

* And finally Sarah Jolly who kept me
company when doing my project on the
mountain bikes.

