

## ECOLOGY II

## TERRESTRIAL VEGETATION:

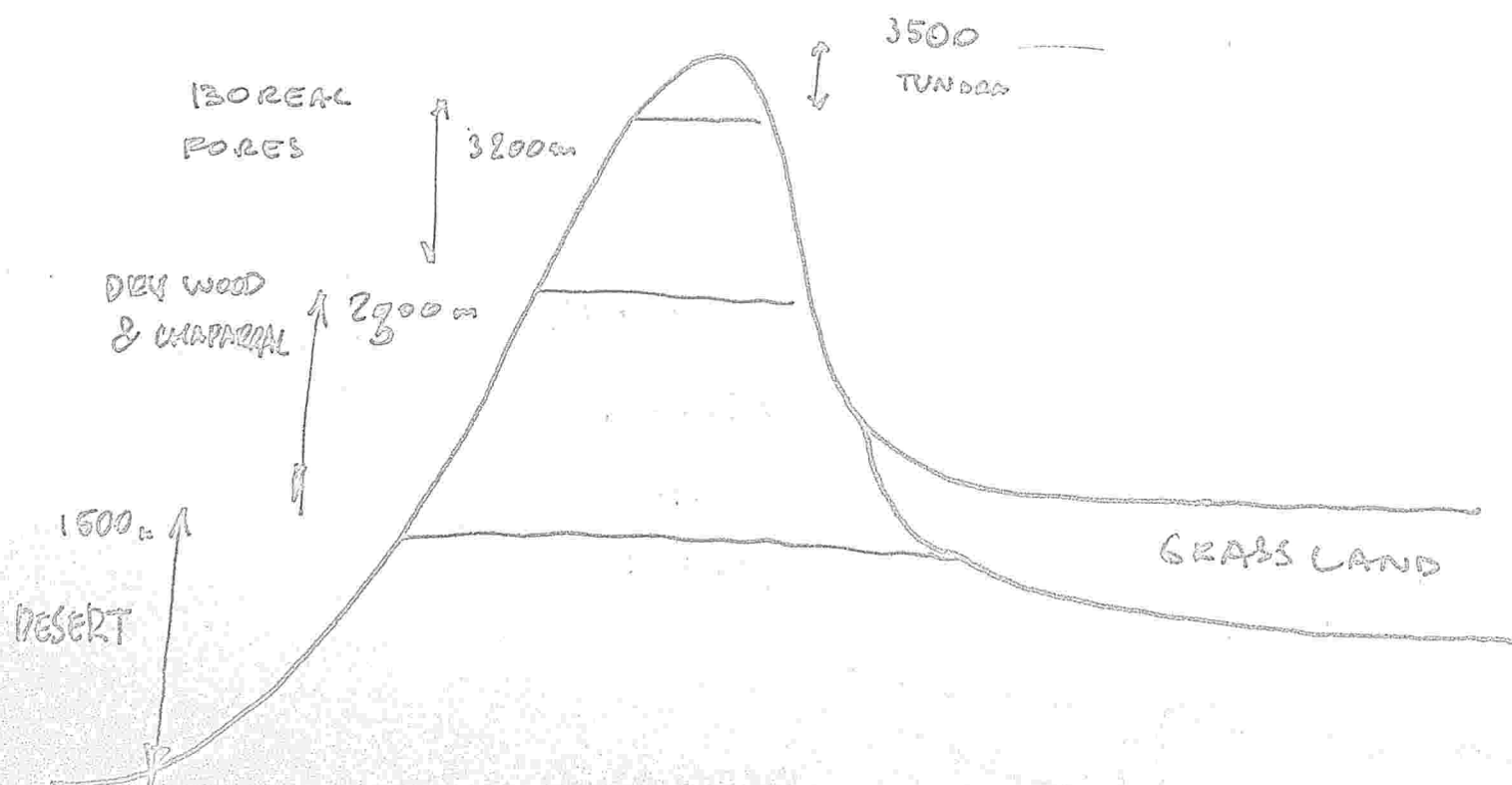
GROWTH  $\uparrow$  WITH MOISTURE  
TEMPERATURE  $\downarrow$  DETERMINE BIOMES

## THERMAL INERTIA

TEMPERATURES VARY MORE IN THE  
NORTHERN HEMISPHERE DUE TO  
THE LESSER INFLUENCE OF WATER  
AS A HEAT SINK.

MARITIME BREEZES REDUCE THE  
INCIDENCE OF LATE FROSTS.

THE DRIEST DESERTS OCCUR  
INLAND OF COLD-WATER  
UPWELLINGS



## CORE IDEAS

- RANGES OF TOLERANCE  
LIMIT DISTRIBUTION

- OPTIMAL CONDITIONS  
ARE NECESSARY  
FOR OPTIMAL  
DEVELOPMENT

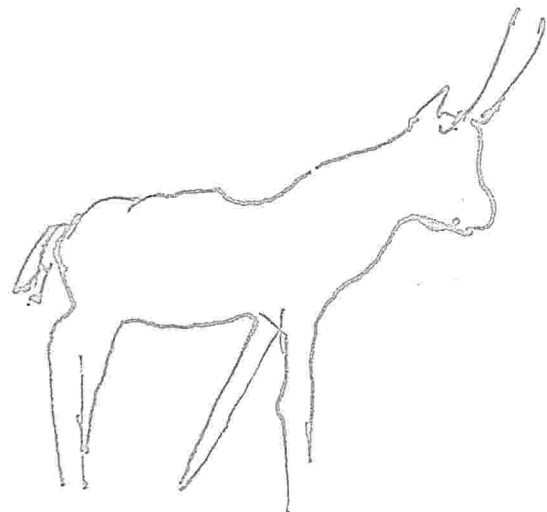
## TWO TYPES OF RANGE:

RANGES OF TOLERANCE  
&  
GEOGRAPHIC RANGE

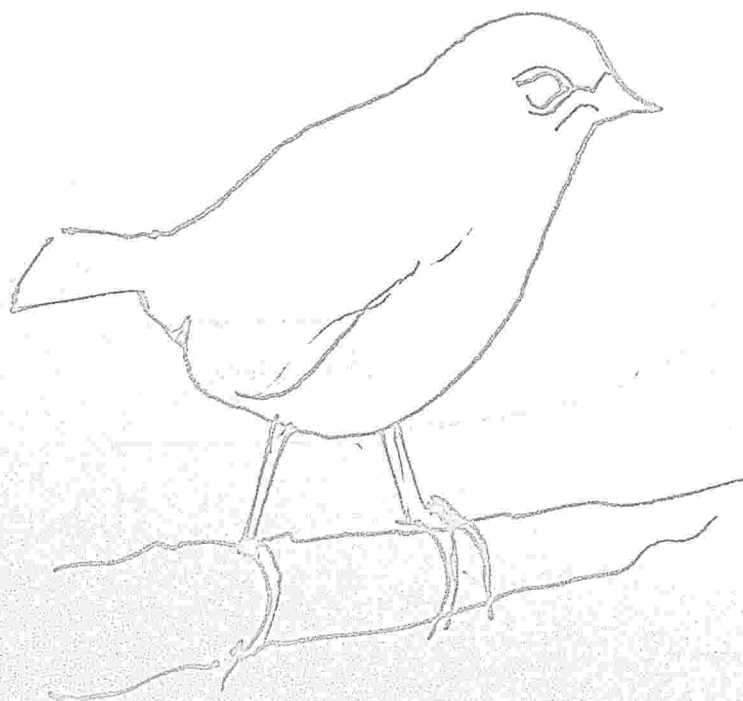
- OFTEN GEOGRAPHIC  
RANGES CORRESPOND  
TO BIOMES,  
BUT SOMETIMES NOT.

- FACTORS INCLUDE:

- SPECIFIC HABITATS  
EG. PRONGHORN
- FRIENDS/ENEMIES



FAST, BUT NOT AGILE

KIRKLAND'S WARBLER

EXTREME  
HABITAT  
SELECTION

COGNITIVE  
LIMITATION?

TRANSLAPPING DIOME!

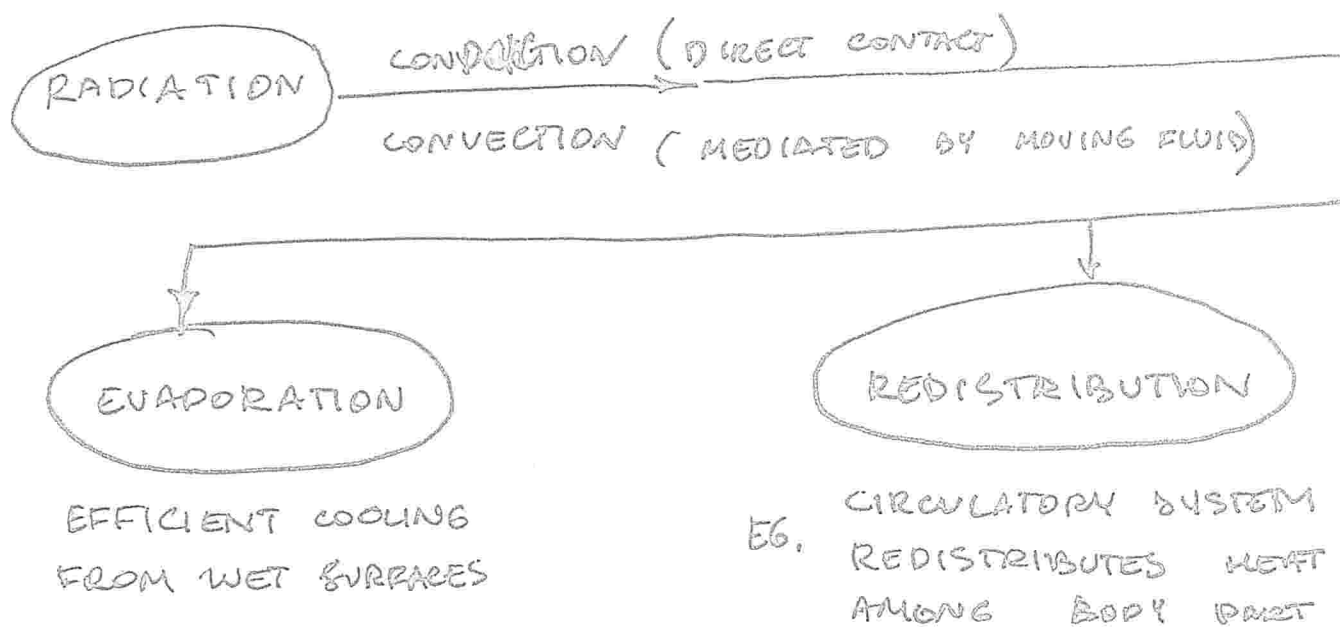
BROAD TEMPERATURE TOLERANCE,

BROAD HABITAT RANGE

• TIGERS

• COYOTES (EXTIRPATION OF WOLVES?)

HEAT BALANCE



SIZE MATTERS TO HEAT BALANCE

→ SURFACE AREA DETERMINES THE EQUILIBRATION RATE

→ VOLUME PROVIDES THE INERTIA

$$S = 4\pi R^2, \quad V = \frac{4\pi R^3}{3}$$

$$\Rightarrow \frac{V}{S} = \frac{R}{3} \quad \Rightarrow \quad \text{FOR } \oplus \quad SA:V = \frac{3}{R}$$

BERGMANN'S RULE: HOMEOTHERMS TEND TO BE LARGER AT HIGHER LATITUDES (COLDER).

EXAMPLE: TROPICAL BEARS  $\xrightarrow{\uparrow}$  POLAR BEARS

SHAPE MATTERS

WHY NOT BE A SPHERE?

PARTICULAR SHAPES ARE REQUIRED FOR FUNCTION

WHO HAS THE HIGHEST SA:V?

UPRY SOPELEA GLIDING SAKS BORNED

WHO HAS THE MINIMUM SA:V?

PIKA, OCHOTONA PRINCEPS: ALPINE TUNDRA RABBIT

ALLEN'S RULE: APPENDAGES ARE REDUCED IN COLD CLIMATES.



LEPUS AMERICANS

LEPUS CALIFORNICUS

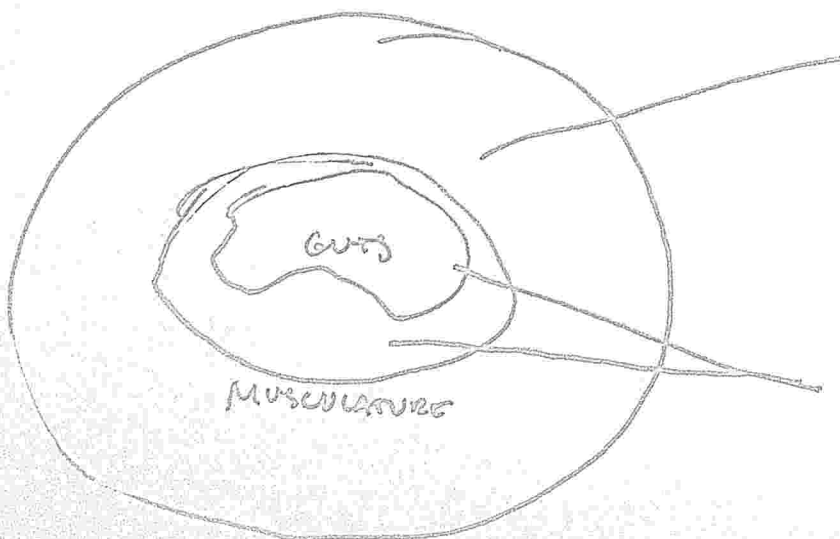
INSULATION IS EVEN MORE IMPORTANT THAN SIZE / SHAPE



EVIDENCE  
SUGGESTS  
THAT  
LATE DINOSAURS HAVE  
HAD FEATHERS

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CROSS-SECTION OF A SEAL



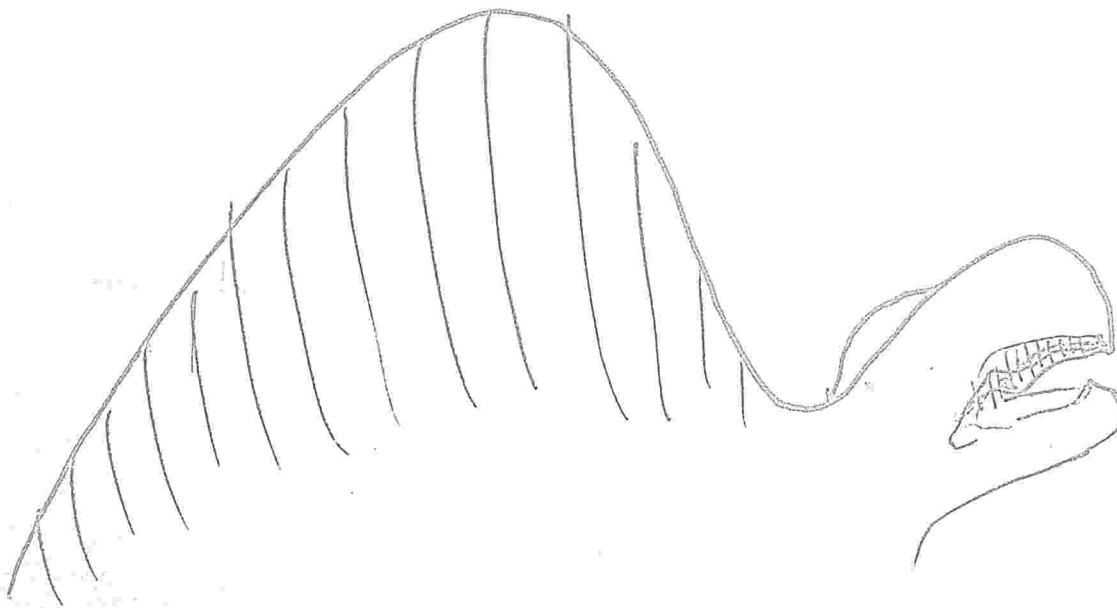
BLUBBER

58%

42%



BACK RABBITS  
DUMP HEAT  
THROUGH EARS

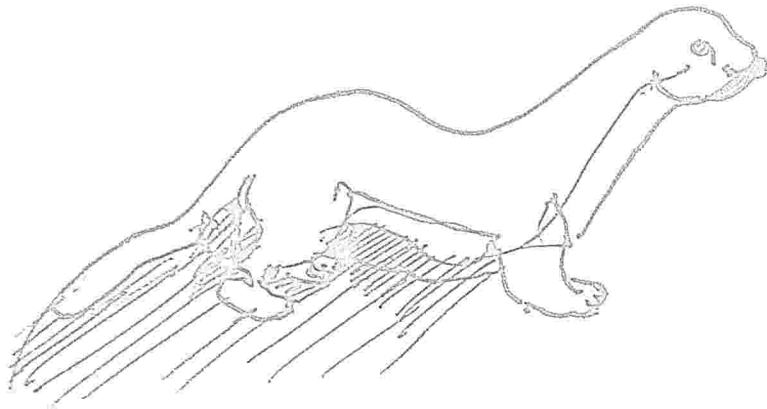


DIMETROPON

WHY ARE WEASELS LONG AND SKINNY?

ERMIWE = WEASEL IN WINTER

ACTIVE ALL YEAR, WHITE CAMOUFLAGE



CURLS INTO A FLAT DISK,  
WHICH IS AN ADVANTAGE

TYPICAL WEASEL PREY:

POCKET GOPHER,  
THOMOMUS TALPOIDES

LONG AND THIN BECAUSE  
THE PREY LIVE IN THE NARROW TUNNELS

SKINNY WEASEL IN COLD CLIMATES  
IS AN EXAMPLE OF A TAPROPE.



CIRCULATION TO LIMBS  
COUNTER CURRENT  
CONSERVES HEAT

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ARTERIES AND VEINS SHOULD:

- BE SEPARATED IN APPENDAGES  
DESIGNED TO SWAP HEAT
  - BE APPRESSED IN APPENDAGES  
TO CONSERVE HEAT
- 

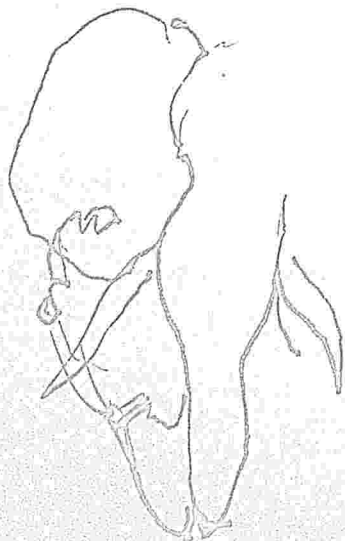
COUNTERCURRENT FLOW MAINTAINS GRADIENT,  
SO HEAT IS FLOWING FROM OUTGOING  
BLOOD TO INCOMING BLOOD.

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CONVECTION ENHANCED BY EVAPORATION



CONVECTION ENHANCED BY EVAPORATION



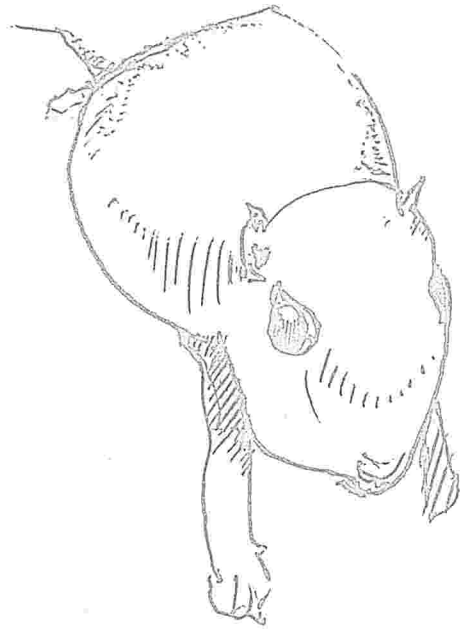
- KANGAROO MAMAS  
LICK THEIR LIMBS
  - KOALAS LIE ON  
THE COOLEST PARTS  
OF THE TREE.
- 

FEED ON DIFFERENT  
TREES THAN FOR WHICH  
THEY COOL OFF



# DEALING WITH EXTREME WATER STRESS

KANGAROO RAT



## ANATOMY:

- ERECT POSTURE
- BIPEDAL
- LESS HEAT GAIN FROM THE GROUND

## PHYSIOLOGY

- SUPER-EFFICIENT KIDNEYS
- METABOLIC WATER EFFICIENCY

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LIPID BREAKDOWN  
PRODUCES WATER

## BEHAVIOUR:

- NOCTURNAL
- EAT SEEDS UNDERGROUND,  
WHICH RECAPTURE WATER  
VAPOUR FROM EXHALATION

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## EVASIONS

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### METHODS:

- ENTERING A DORMANT STAGE ( SEEDS, CISTS, EGGS, PUPAE, TORPOR )
- HIBERNATE
- NEST OR DEN IN A PROTECTED MICROHABITAT
- STORE FOOD
- MIGRATE TO Milder CLIMATE,

MASTERS OF EVASION: GARTER SNAKE, MUSKRAT, CHIPMUNK

PIKAS DRIES HAY - ON WHICH THEY FEED  
DURING THE WINTERS

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PLANTS DO NOT HAVE THE SAME RANGE  
OF BEHAVIOURS AS ANIMALS DO.

PLANTS ARE AUTOTROPHIC AND RUM ON  
NET PHOTOSYNTHESIS.

ANATOMY & PHYSIOLOGY REFLECT CONSTRAINTS

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PHOTOSYNTHETIC STRUCTURES ARE USUALLY LEAVES

BUT SA:V ↑

PLANTS WITH LARGE LEAVES COMBAT  
OVERHEATING BY

• GROWING IN SHADY HABITATS

• COOL BY EVAPORATION BY OPENING STOMATA