JUNGLEFOWL DESIGN COMPENDIUM

TAN XUAN (A0154232R)

AR5807

ARCHITECTURAL DESIGN THESIS

THESIS SUPERVISOR: A/PROF. ONG KER-SHING

Contents

The premise of this thesis proposition calls for the close examination of a non-human agent, in hope that the consideration of the needs and behaviour of an additional protagonist might provide cues to anchor an alternative design process.

Choosing a single species to study was more about ensuring a sufficient level of rigour in the research, rather than have the design outcomes restricted to one particular avian species. An ideal design compendium for non-humans would survey multiple actors in a connected ecosytem. General principles relating to designing for non-human species have been consulted to mitigate this bias.

I have chosen to study the Red Junglefowl, as it is an endemic animal species of Singapore, heavily affected by shrinking secondary rainforests. This comes as unfortunate collateral to a constant tabula rasa that has come to characterise our island-state.

General / Contextual

ABOUT | ANATOMICAL LABELLING | GEOGRAPHY

Intrinsic Characteristics

NAVIGATIONAL APPENDAGES

Behavioural Study

ACTIVITY | PROXIMITY FIELD STUDY | AEROBIC PERFORMANCE

Extrinsic (Environmental)

PHYSICAL SPATIAL DOMAIN | SURFACE MATERIALITY STUDY | NUTRITION

Summary of Junglefowl Needs

MINDMAP

Landscape Ecology Principles

IN LANDSCAPE ARCHITECTURE AND LAND-USE PLANNING

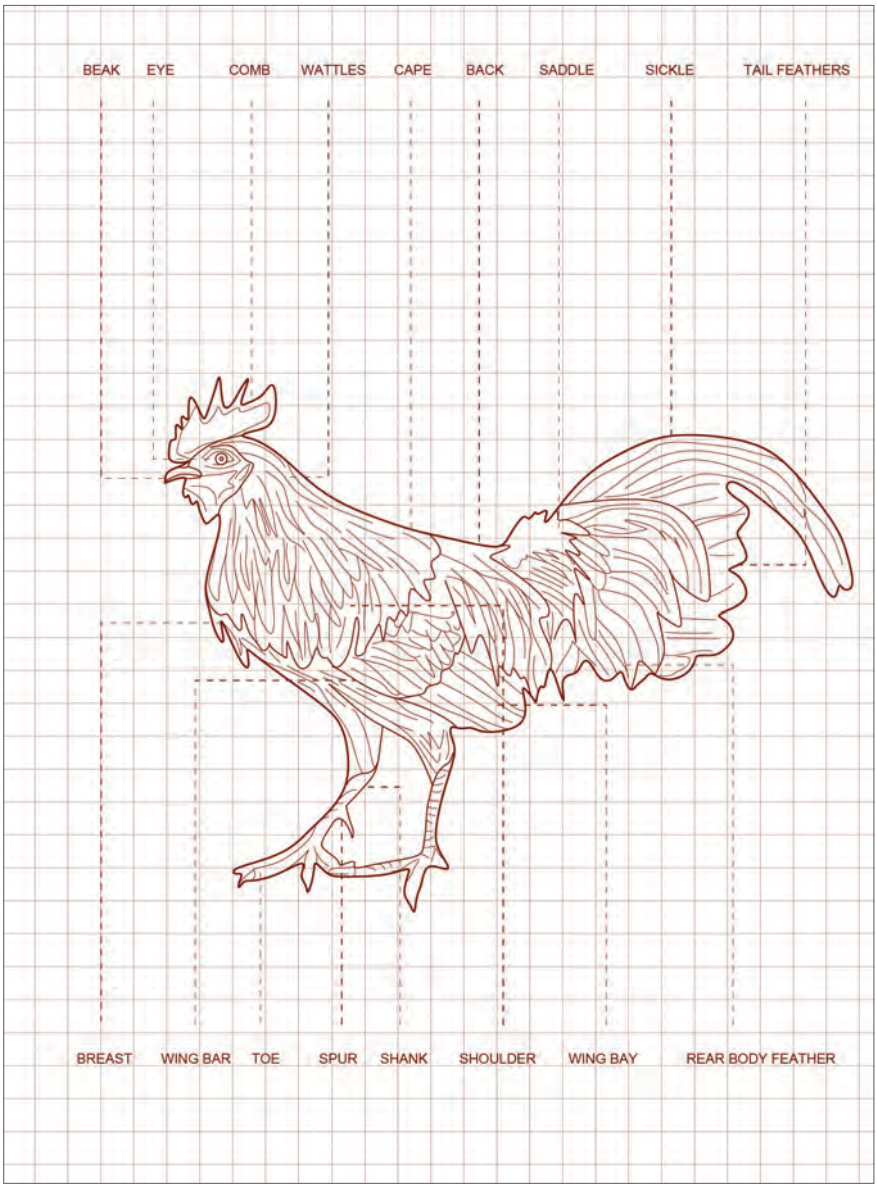
From top left, clockwise: Green Junglefowl *Gallus varius* Coq de Java (male), La Fayette's Junglefowl *Gallus lafayetti* Coq de La Fayette (male), Sonnerat's Junglefowl *Gallus sonnerati* Coq de Sonnerat (male), Cheer Pheasant *Catreus wallichi* Faisan de Wallich (male), Cochin-chinese Red Junglefowl *Gallus gallus gallus* Coq bankiva (male)

- Delacour, J & Harrison, JC, 1977. T*he Pheasants of the World*, Spur Publications, Salt Lake City.

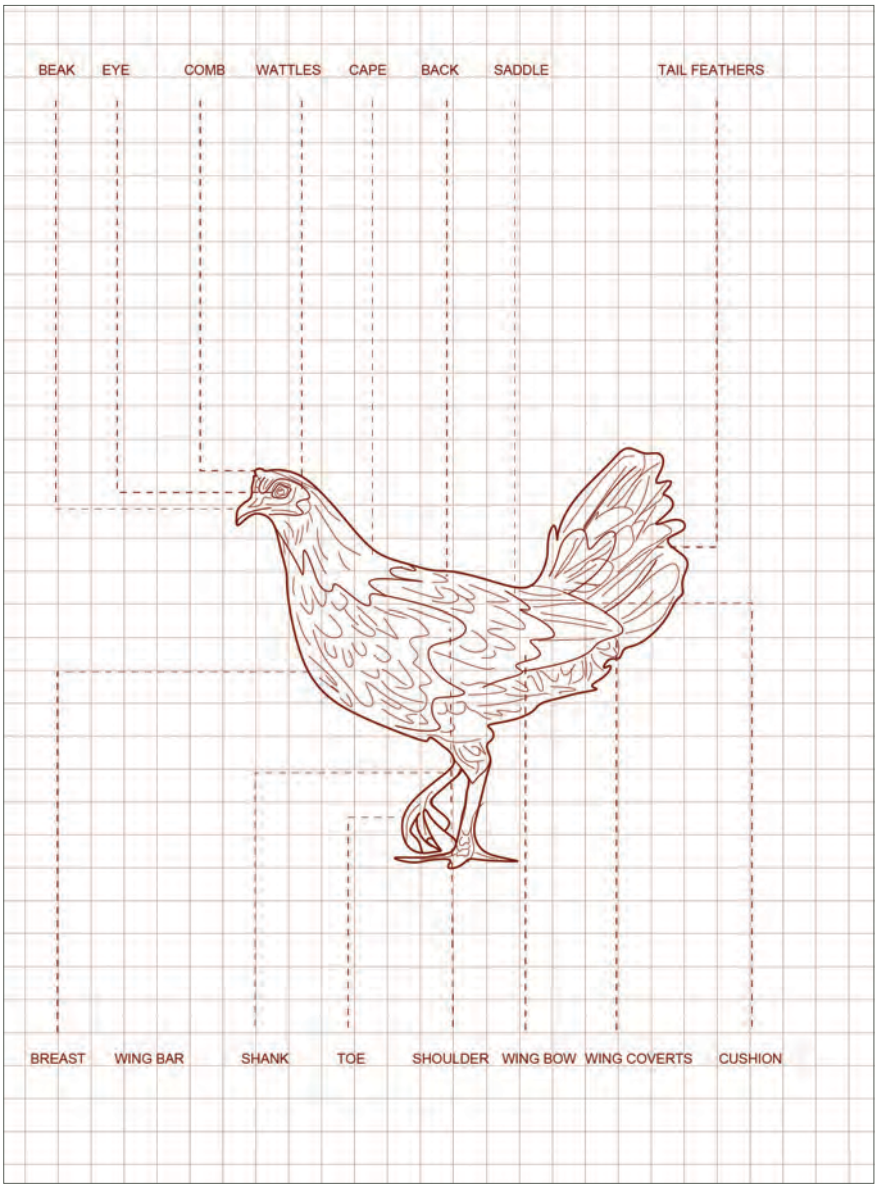
In this first segment, I introduce the red Junglefowl accompanied with basic anatomical information; its geographic distribution in the region; its particular territorial boundary of my site in question - the Rochester Park Colonial Estate - as well as some photographs.

These fowl are a compelling species to base this thesis upon because multiple populations of junglefowl have now re-settled into sites of close proximity to human settlements, yet are not fully understood or afforded proper consideration by residential communities.

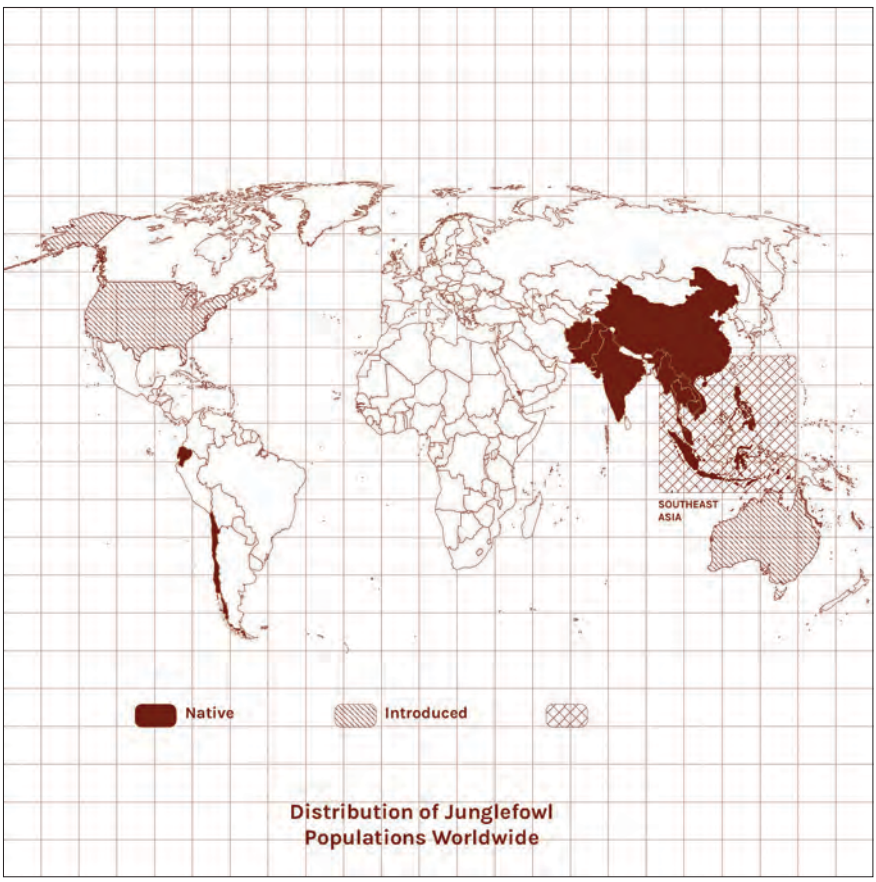
Despite what this thesis sets out to do, it is important to preface and recognise that this study is limited by time, scope and most importantly, the unfortunate inability to free itself from my anthropocentric gaze in its entirety. The research begins and ends with one human's imagination of what it *could* be inside a fowl's mind, approximating its behaviour, needs and requirements for a healthy quality of life.



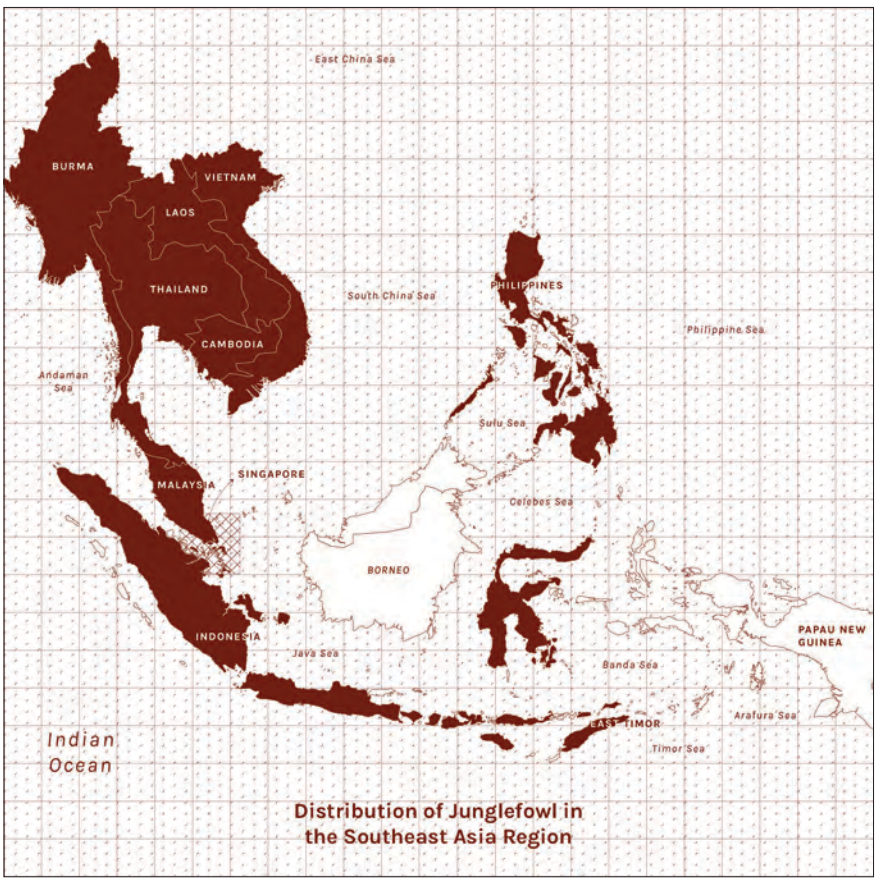
External anatomy: Male junglefowl



External anatomy: Female junglefowl

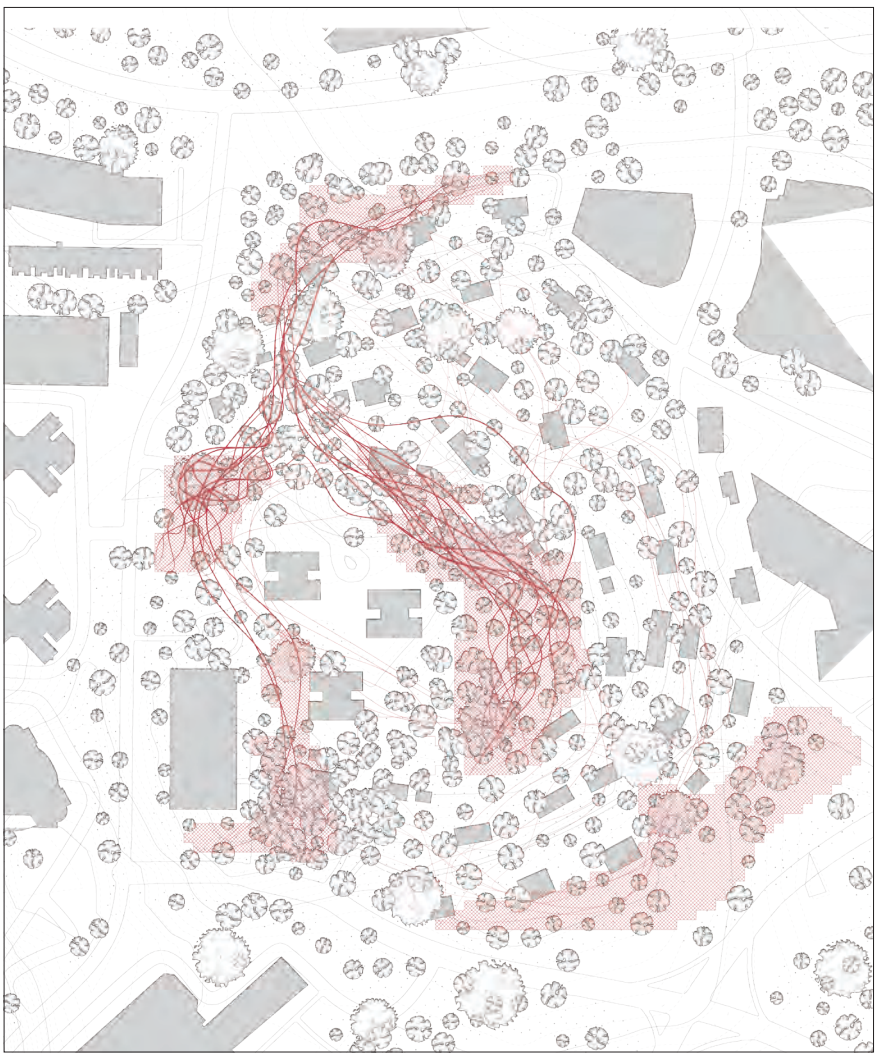


One of the main domesticated animals carried by the early Austronesian people from Southeast Asia in their voyages to Oceania, the red junglefowl can be found from the western Himalayas to southern China, and roaming throughout Southeast Asia.



In certain instances, this species was selected for introduction into certain countries owing to their good tasting meat, ability to withstand hunting pressure and the fact that they pose little risk to agricultural crops and native species.

In Singapore, wild populations have been recorded in Pulau Ubin since the 1980s. In the 1990s, junglefowls were spotted on the mainland – at Poyan Reservoir, Loyang and Changi.



A reminder of Singapore's colonial past, the Rochester Park Colonial Estate is now home to a population of red junglefowl. Depicted is the fowls' territorial foraging pattern.

An avian species, the junglefowl navigates the physical world quite differently from humans. In this chapter I illustrate the key appendages the fowl operates with.

General / Contextual

ABOUT | ANATOMICAL LABELLING | GEOGRAPHY

Intrinsic Characteristics

NAVIGATIONAL APPENDAGES

Behavioural Study

ACTIVITY | PROXIMITY FIELD STUDY | AEROBIC PERFORMANCE

Extrinsic (Environmental)

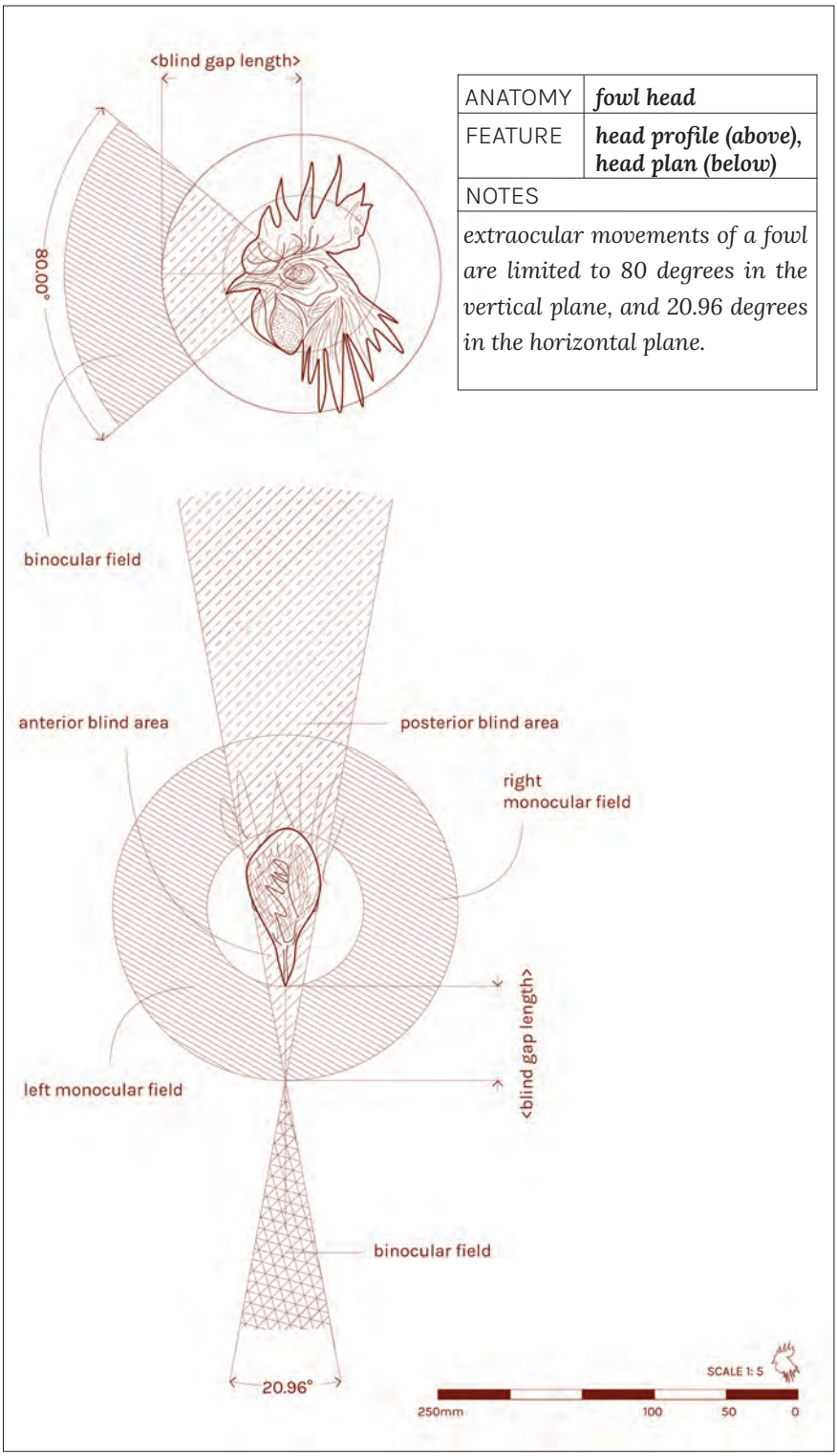
PHYSICAL SPATIAL DOMAIN | SURFACE MATERIALITY STUDY | NUTRITION

Summary of Junglefowl Needs

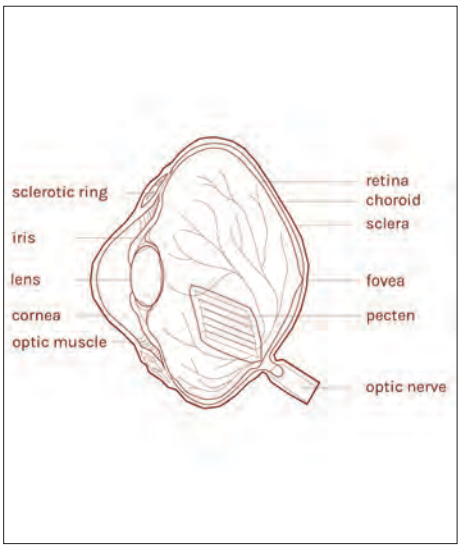
MINDMAP

Landscape Ecology Principles

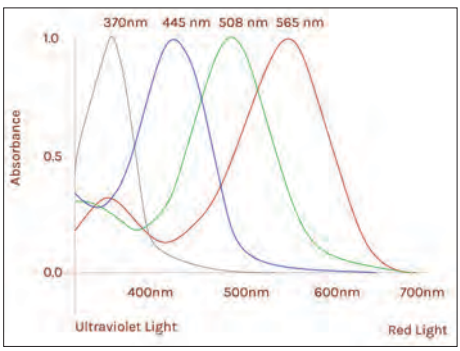
IN LANDSCAPE ARCHITECTURE AND LAND-USE PLANNING



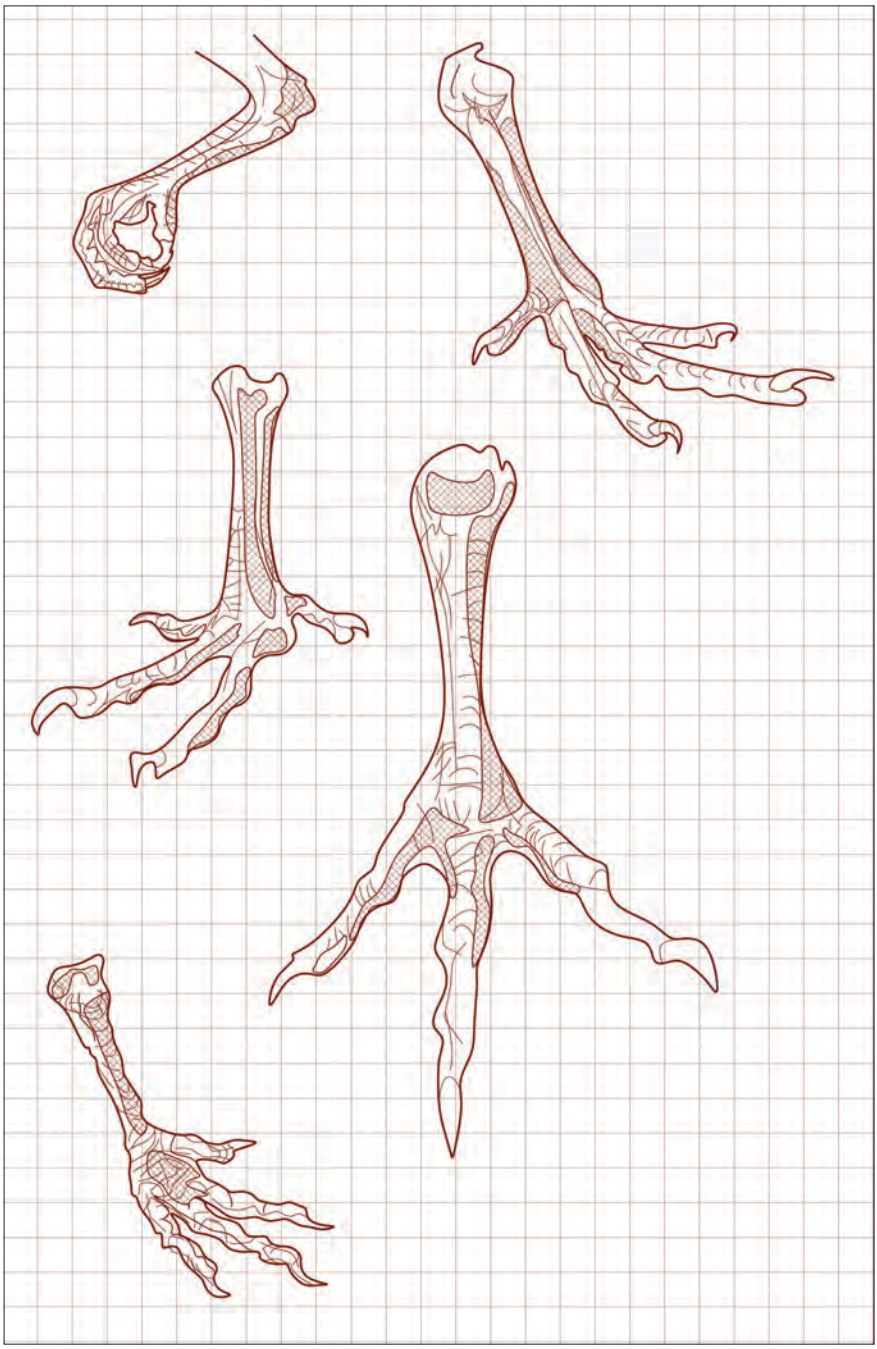
ANATOMY	***fowl head***
FEATURE	***head profile (above), head plan (below)***
NOTES	
extraocular movements of a fowl are limited to 80 degrees in the vertical plane, and 20.96 degrees in the horizontal plane.	



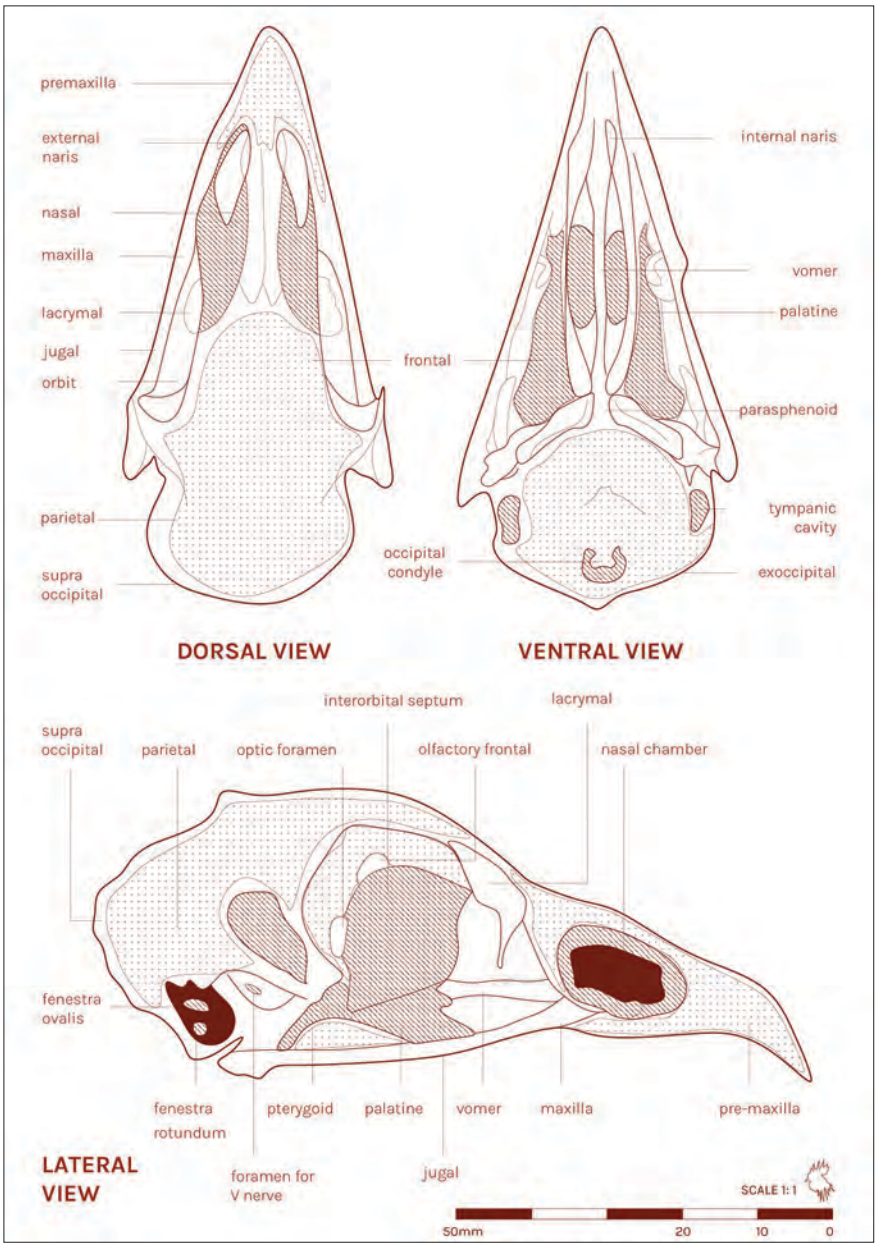
ANATOMY	***fowl eye***
FEATURE	***pecten oculi***
NOTES	
the pecten is a comb-like structure of blood vessels belonging to the choroid in the eye of the bird. it is a non-sensory, pigmented structure that projects into the vitreous body from the point where the optic nerve enters the eyeball. *the pecten both nourishes the retina and controls the pH of the vitreous body.*	



ANATOMY	***fowl eye***
FEATURE	***tetrachromacy***
NOTES	
junglefowl have tetra-chromatic vision (humans are only tri-chromatic). this means that they are sensitive to 4 wavelengths, including UV light. their conception of colour is radically different from ours as a result.	



Sketch study of junglefowl's claw



One of the theories attempting to explain how birds can navigate over great distances has to do with utilising the Earth's magnetic fields. While red junglefowl are non-migratory, they still possess these residual organs for magnetoreception. Like other birds, these structures are found in the upper beak area and could be responsible for how junglefowl remember and navigate complex terrain.

These next set of drawings illustrate the junglefowl navigating its environment. The main activities of the junglefowl are represented at scale with particular attention paid to its behaviour while under threat.

General / Contextual

ABOUT | ANATOMICAL LABELLING | GEOGRAPHY

Intrinsic Characteristics

NAVIGATIONAL APPENDAGES

Behavioural Study

ACTIVITY | PROXIMITY FIELD STUDY | AEROBIC PERFORMANCE

Extrinsic (Environmental)

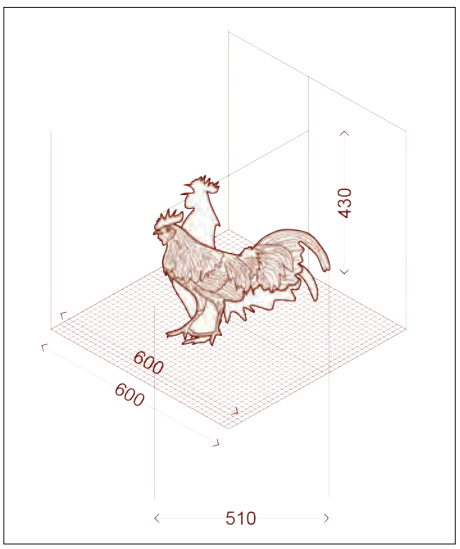
PHYSICAL SPATIAL DOMAIN | SURFACE MATERIALITY STUDY | NUTRITION

Summary of Junglefowl Needs

MINDMAP

Landscape Ecology Principles

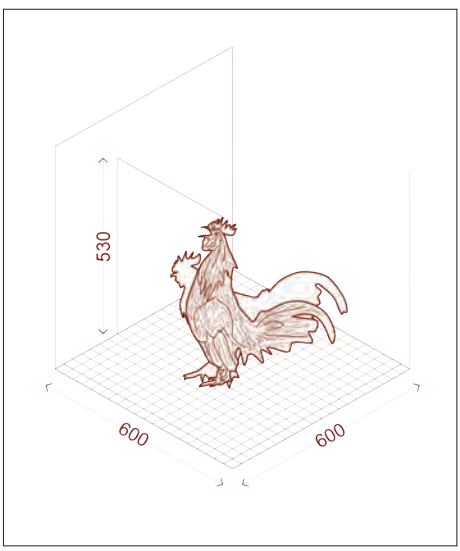
IN LANDSCAPE ARCHITECTURE AND LAND-USE PLANNING



ACTIVITY	***basic anatomical***
GENDER	***male***
AGE	***adult***

NOTES

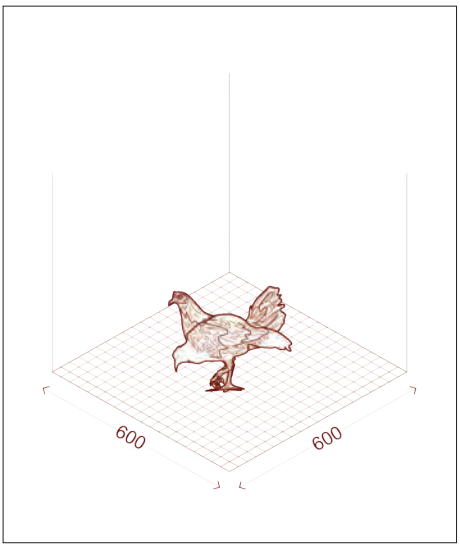
male junglefowl (approximately 1.5kg) are significantly larger than females (1kg).



ACTIVITY	***basic anatomical***
GENDER	***male***
AGE	***adult***

NOTES

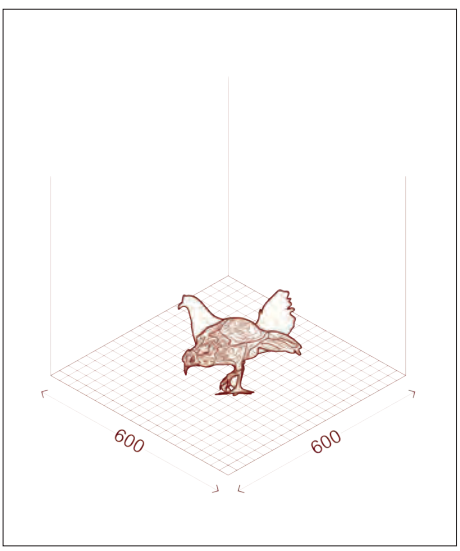
male junglefowl have brightly coloured decorative feathers that are long and arching. the tail can grow up to 28cm, with 14 tail feathers in total.



ACTIVITY	***basic anatomical***
GENDER	***female***
AGE	***adult***

NOTES

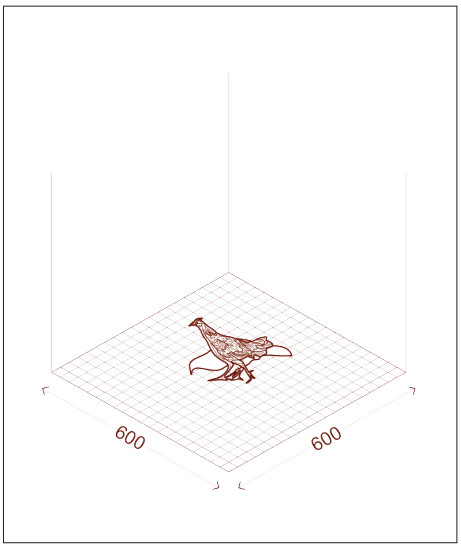
the female junglefowl's plumage is cryptic and well adapted to camouflage.



ACTIVITY	***basic anatomical***
GENDER	***female***
AGE	***adult***

NOTES

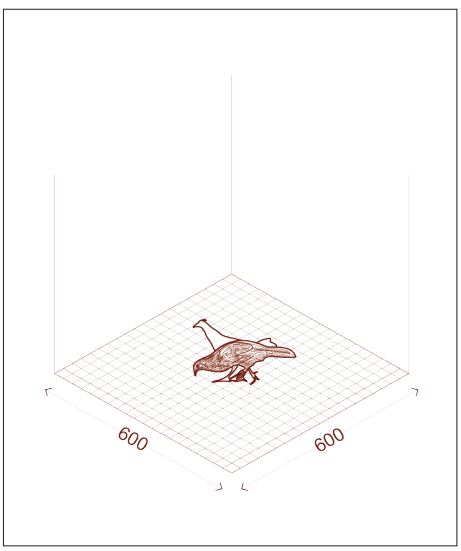
female junglefowl have small combs and wattles compared to males.



ACTIVITY	***basic anatomical***
GENDER	***male***
AGE	***teen***

NOTES

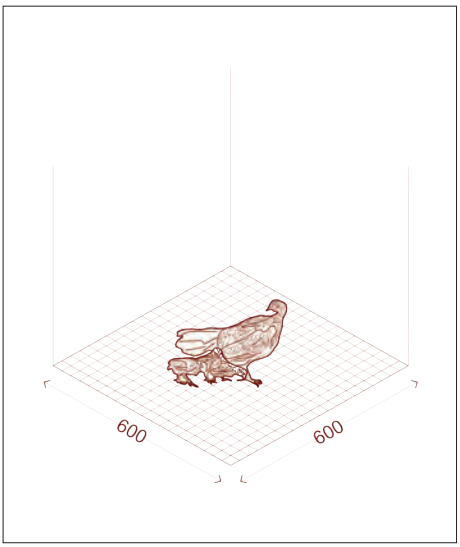
fowl develop feathers all over their body by 4 weeks, and grow their adult wings by 8 weeks.



ACTIVITY	***basic anatomical***
GENDER	***male***
AGE	***teen***

NOTES

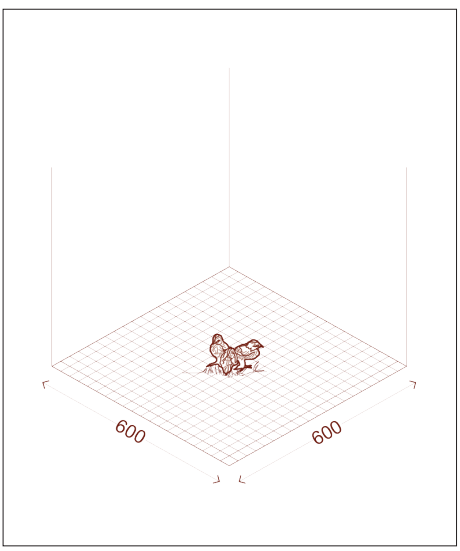
after 12 weeks with their mother, fowl leave their flock to form new groups.



ACTIVITY	***basic anatomical***
GENDER	***male***
AGE	***chick***

NOTES

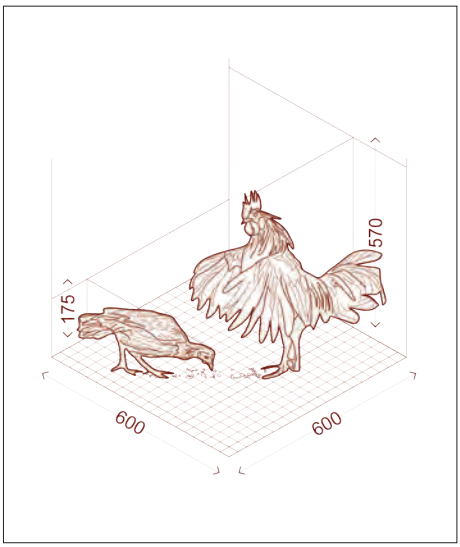
during the breeding period, the hen lays 4-7 eggs which hatch in 21 days. chicks fledge in 4-5 weeks.



ACTIVITY	***basic anatomical***
GENDER	***male***
AGE	***chick***

NOTES

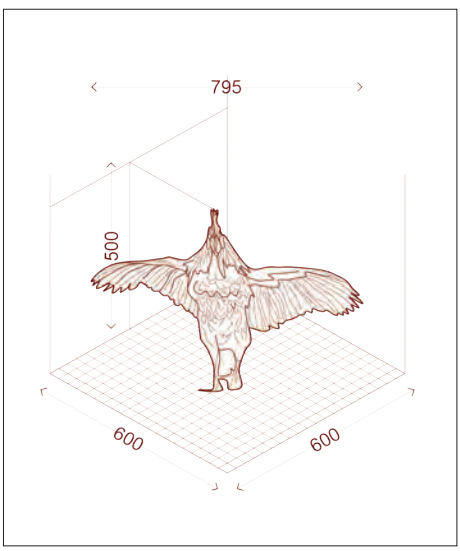
chicks have small yellow beaks, a white and black stripe running from their beaks to their tails, and a grey plumage.



ACTIVITY	***mating display***
GENDER	***male***
AGE	***adult***

NOTES

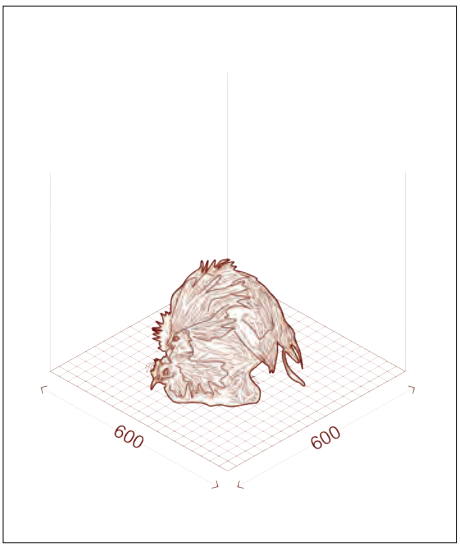
the male's 'tidbitting' involves coaxing, eye-catching bobbing and cluck-like calls. he repeatedly picks up and drops a food item with his beak in front of the hen. the display ends when the hen takes the food item.



ACTIVITY	***mating display***
GENDER	***male***
AGE	***adult***

NOTES

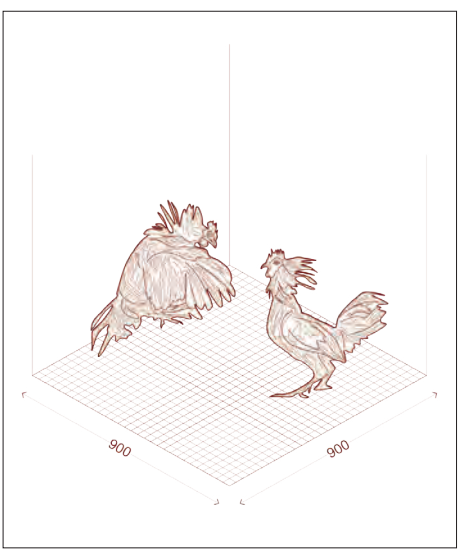
-



ACTIVITY	***mating mount***
GENDER	***male***
AGE	***adult***

NOTES

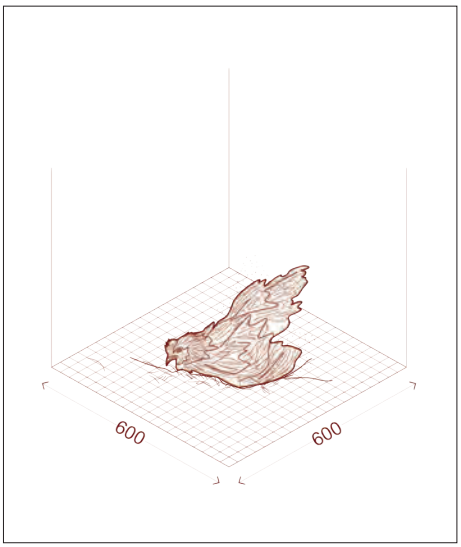
the male fowl treads, while the female fowl crouches down.



ACTIVITY	***challenge between male fowl***
GENDER	***male***
AGE	***adult***

NOTES

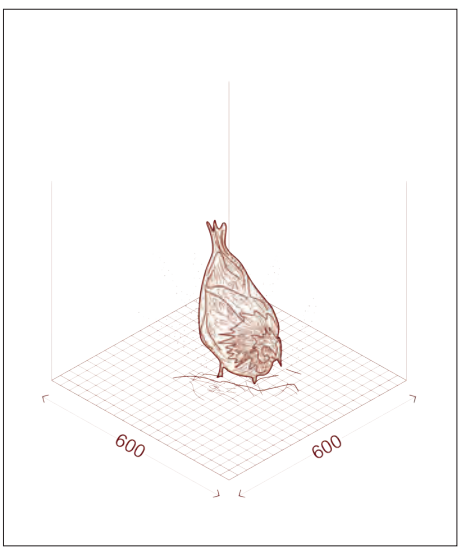
-



SUBJECT	***dust bathing***
GENDER	***male***
AGE	***adult***

NOTES

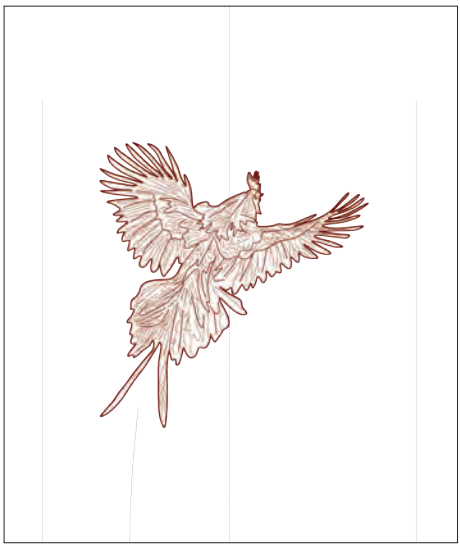
the dust bathing sequence starts with the fowl scratching and bill-raking in the dust. it then erects its feathers and squats down.



SUBJECT	***dust bathing***
GENDER	***male***
AGE	***adult***

NOTES

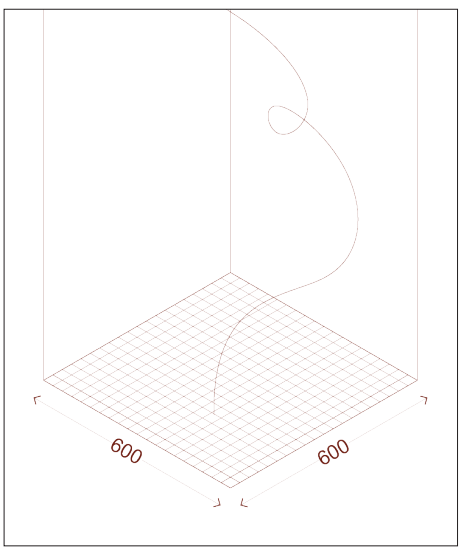
(cont.) a vigorous phase comprising of vertical wing-shaking, head rubbing, bill-raking and scratching with one leg then ensues, with its feathers flattened against its body. after 20 minutes, the fowl stands and shakes the dust out of its plumage.

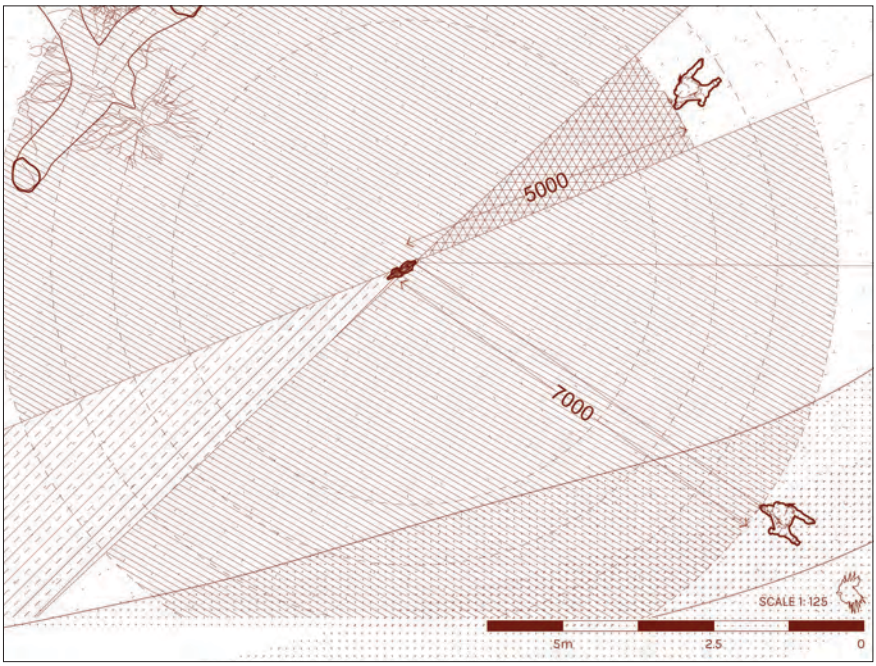


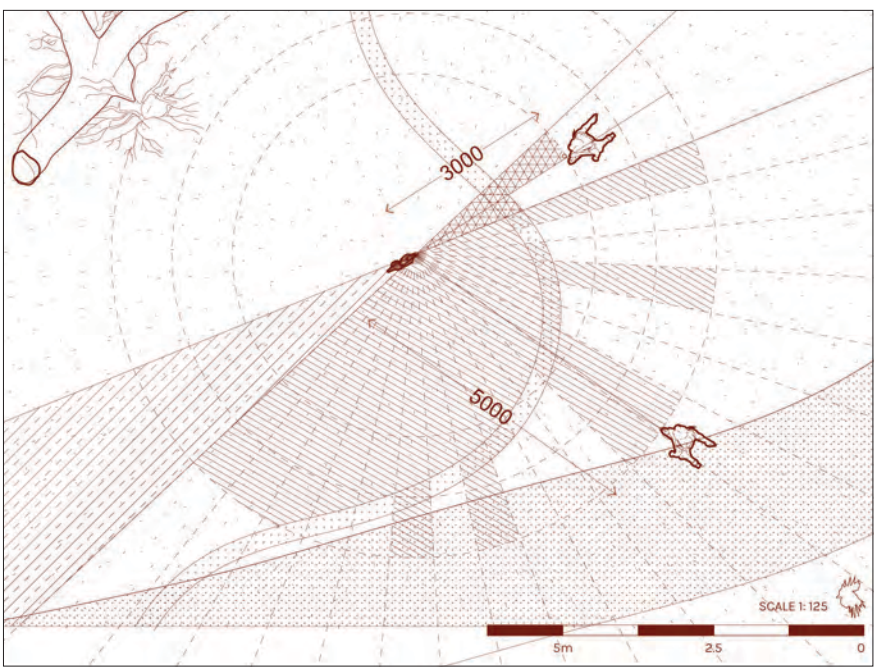
SUBJECT	***flight***
GENDER	***male***
AGE	***adult***

NOTES

fowl typically only fly to get into their roost spots at sunset. however they are capable of flight of up to 10m.

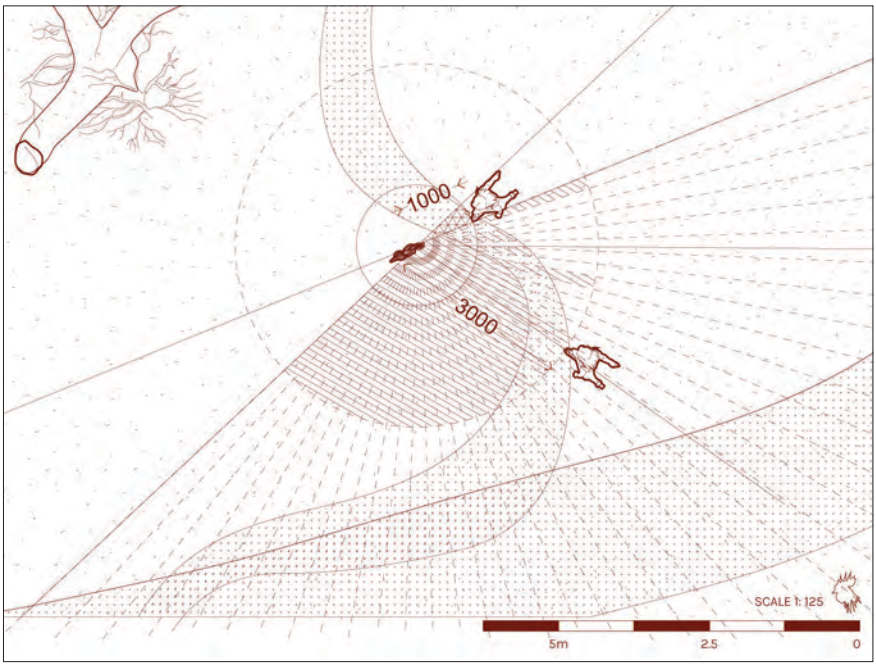


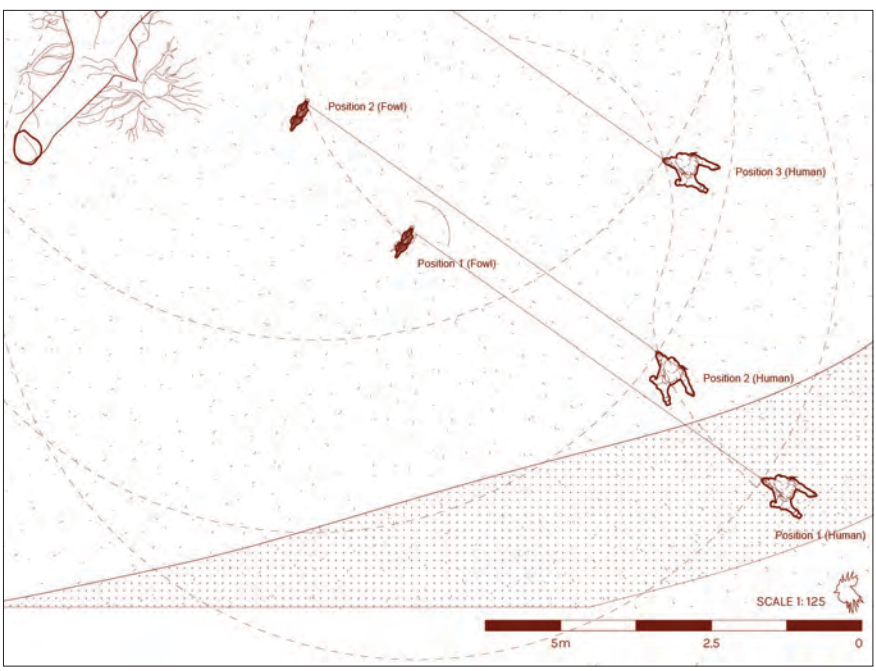

5000
7000
SCALE 1:125
5m
2.5
0


3000
5000
SCALE 1:125
5m
2.5
0

TYPE	***proximity study***
CONDITION	***open field, clear line of sight***
FOILAGE DENSITY	**0%**
MIN DISTANCE BEFORE ENTERING FOWL FLIGHT ZONE:	
HEAD-ON	**5000mm**
FROM SIDE	**7000mm**
NOTES -	

TYPE	***proximity study***
CONDITION	***open field, clear line of sight***
FOILAGE DENSITY	**50%**
MIN DISTANCE BEFORE ENTERING FOWL FLIGHT ZONE:	
HEAD-ON	**3000mm**
FROM SIDE	**5000mm**
NOTES -	


1000
3000
SCALE 1: 125
5m
2.5
0


Position 2 (Fowl)
Position 3 (Human)
Position 1 (Fowl)
Position 2 (Human)
Position 1 (Human)
SCALE 1: 125
5m
2.5
0

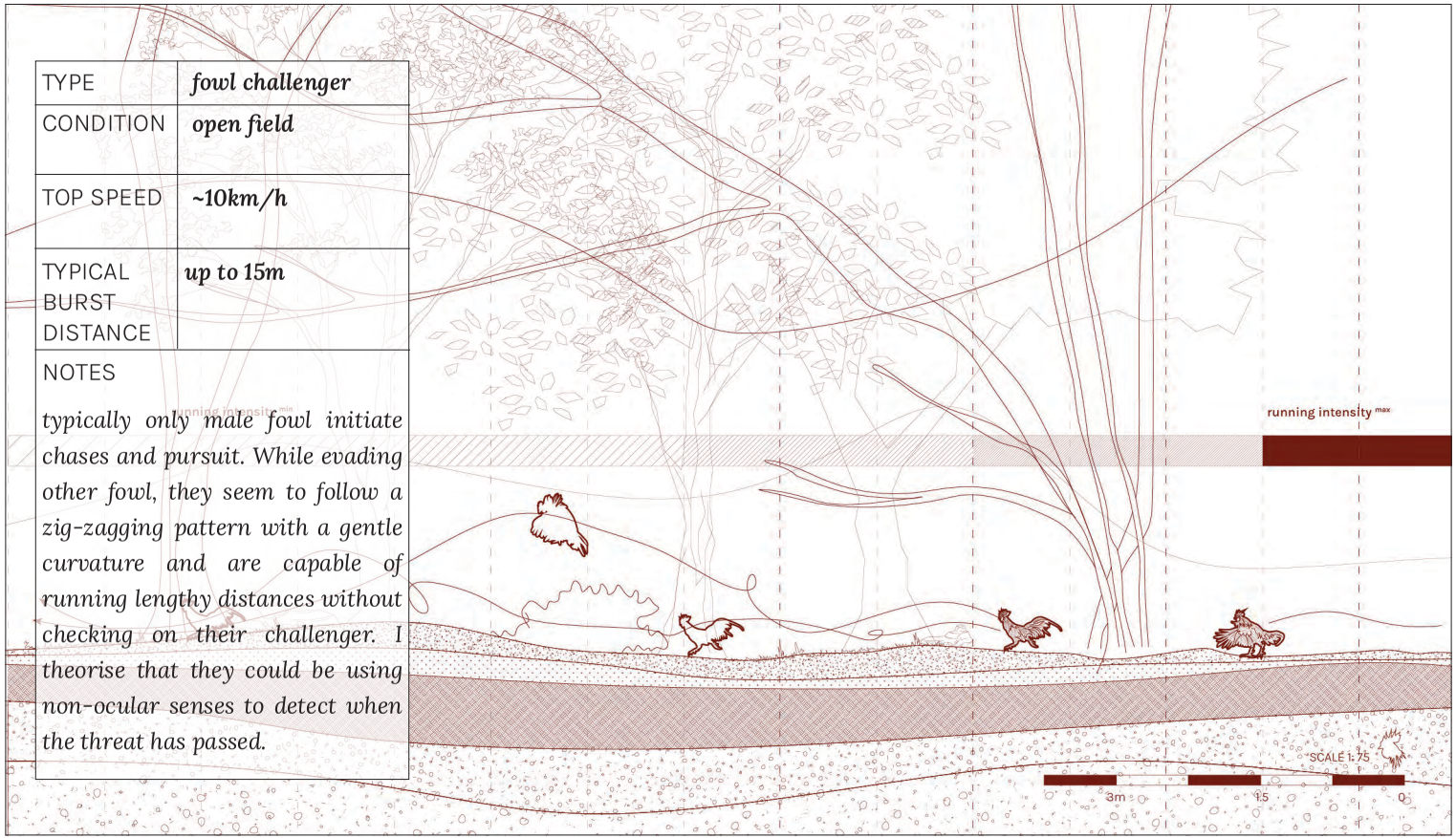
TYPE	***proximity study***
CONDITION	***open field, clear line of sight***
FOILAGE DENSITY	**>75%**
MIN DISTANCE BEFORE ENTERING FOWL FLIGHT ZONE:	
HEAD-ON	***1000mm***
FROM SIDE	***3000mm***
NOTES -	

TYPE	***proximity study***
CONDITION	***open field, clear line of sight***
FOILAGE DENSITY	-
MIN DISTANCE BEFORE ENTERING FOWL FLIGHT ZONE:	
HEAD-ON	***5000mm***
FROM SIDE	***7000mm***
NOTES *fowls move perpendicular to the direction the threat is approaching from so that it can continue focusing on its target with its left or right monocular vision while evading it.*	

TYPE	***fowl challenger***
CONDITION	***open field***
TOP SPEED	***~10km/h***
TYPICAL BURST DISTANCE	***up to 15m***

NOTES

typically only male fowl initiate chases and pursuit. While evading other fowl, they seem to follow a zig-zagging pattern with a gentle curvature and are capable of running lengthy distances without checking on their challenger. I theorise that they could be using non-ocular senses to detect when the threat has passed.

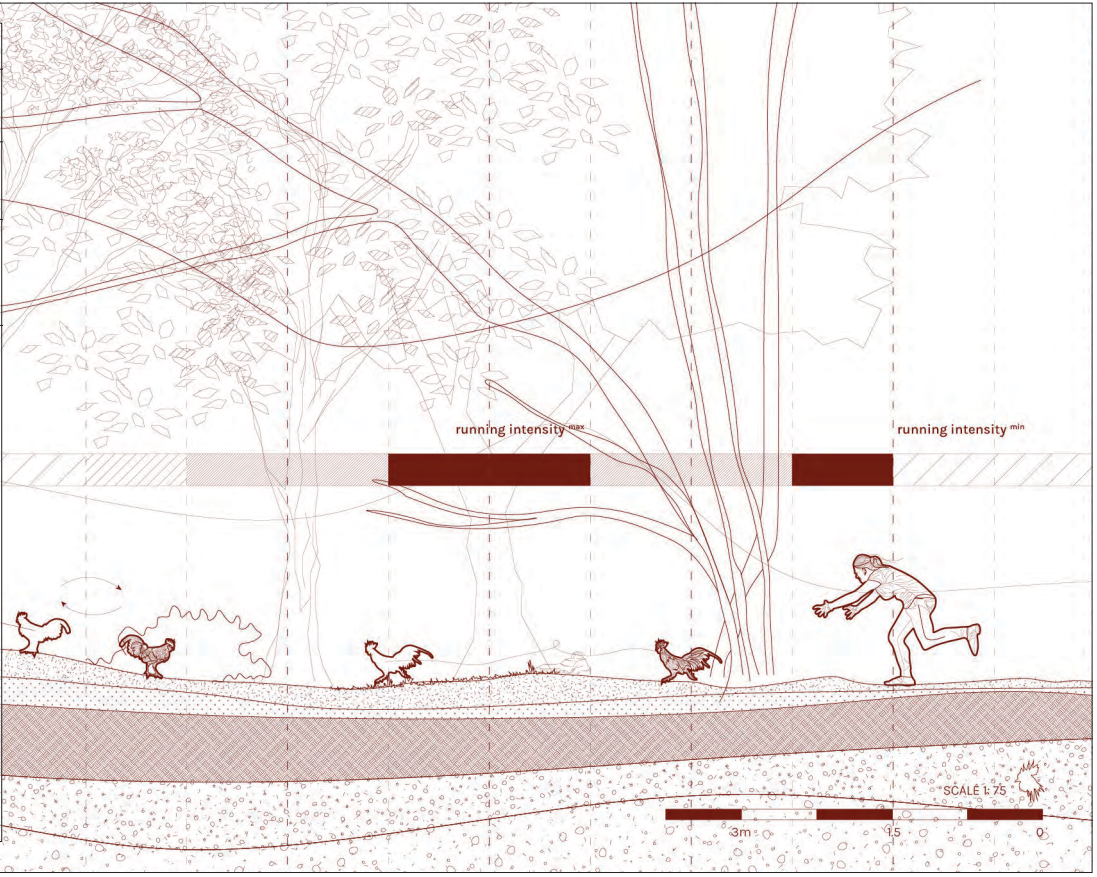


TYPE	***human challenger***
CONDITION	***open field***
TOP SPEED	**~10km/h**
TYPICAL BURST DISTANCE	***from 3 to 5 m***

NOTES

fowls seem to stop more periodically when chased by humans, turning back to check on their challenger.

I theorise that humans are not naturally attuned to the running patterns of fowls and therefore allows the fowl to evade more easily. A fowl seem to be more wary around humans, moving away once their flight zone has been intruded upon.



The physical domain that plays host to the junglefowl is of interest in this section. This study includes habitat morphology; surface materiality study as well as a brief understanding of what sustains the junglefowls diet.

General / Contextual

ABOUT | ANATOMICAL LABELLING | GEOGRAPHY

Intrinsic Characteristics

NAVIGATIONAL APPENDAGES

Behavioural Study

ACTIVITY | PROXIMITY FIELD STUDY | AEROBIC PERFORMANCE

Extrinsic (Environmental)

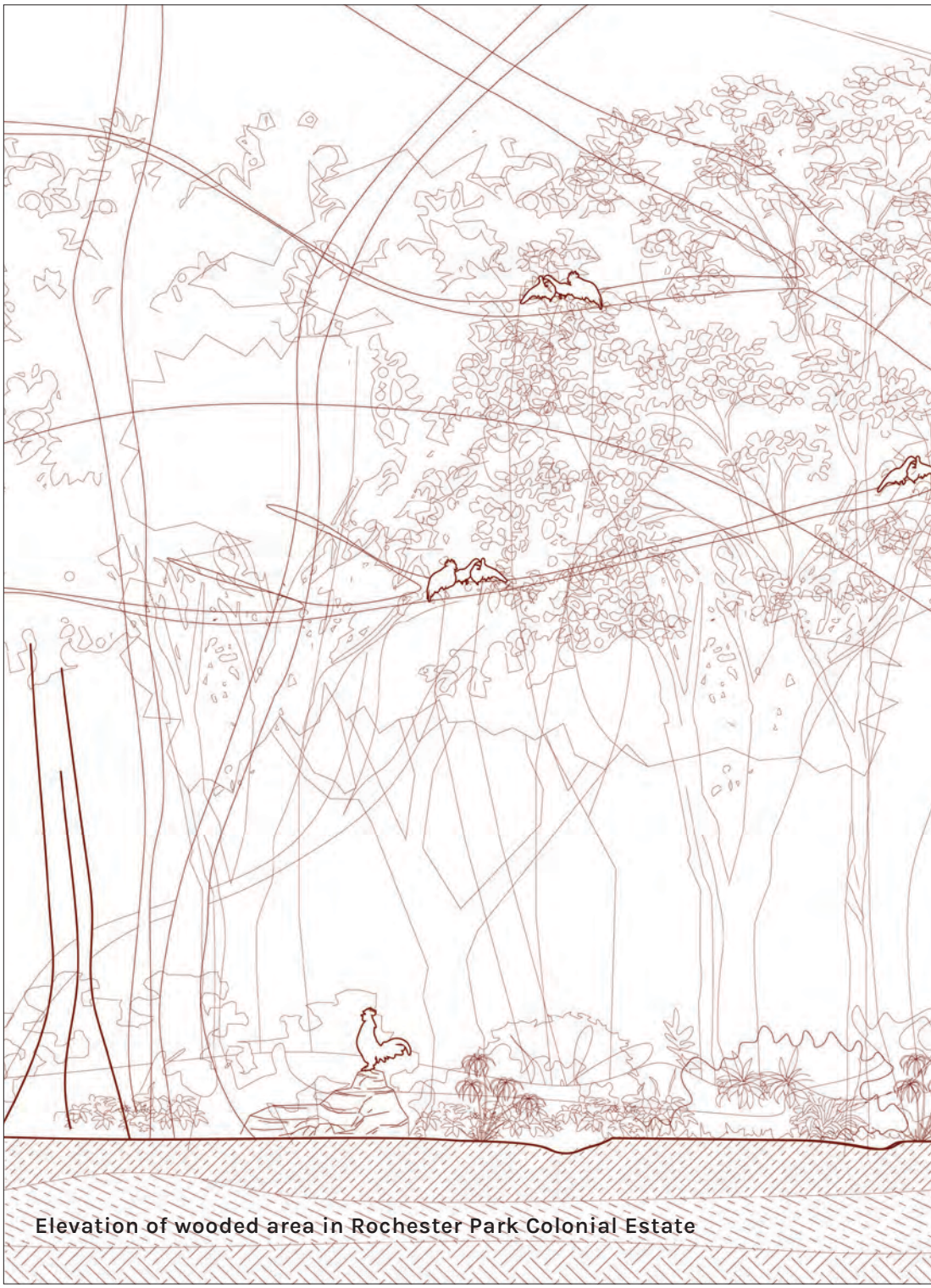
PHYSICAL SPATIAL DOMAIN | SURFACE MATERIALITY STUDY | NUTRITION

Summary of Junglefowl Needs

MINDMAP

Landscape Ecology Principles

IN LANDSCAPE ARCHITECTURE AND LAND-USE PLANNING



Elevation of wooded area in Rochester Park Colonial Estate

PLATE XXXII

Photograph by William Beebe

BURMESE HOME OF THE RED JUNGLEFOWL

(For detailed caption see page xxiii)

TYPICAL FORAGING CONDITION OF JUNGLEFOWL

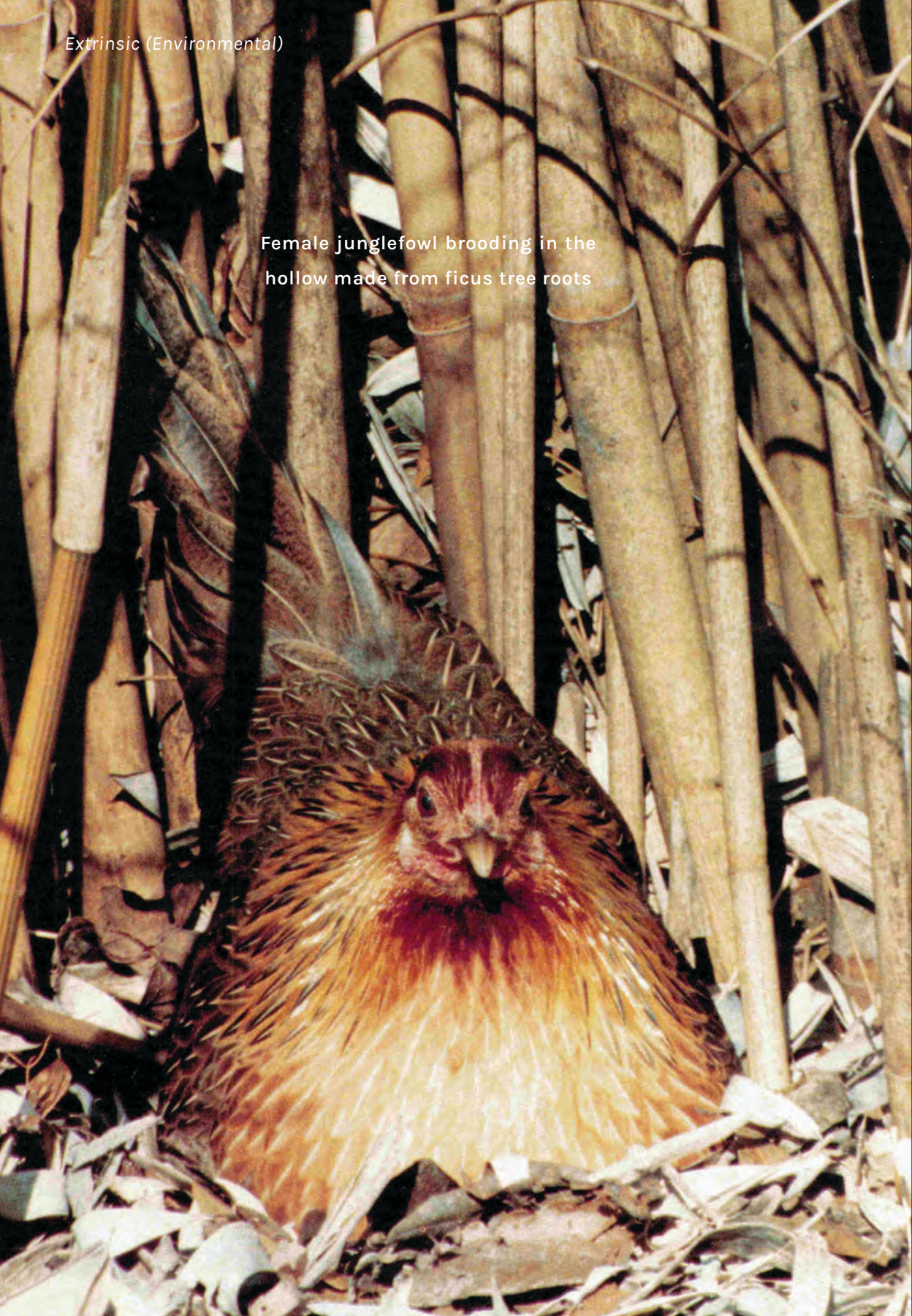
FROM PHEASANTS OF THE WORLD

- Delacour, J & Harrison, JC, 1977. *The Pheasants of the World*, Spur Publications, Salt Lake City.

Home of the Junglefowl in
Rochester Park Colonial Estate

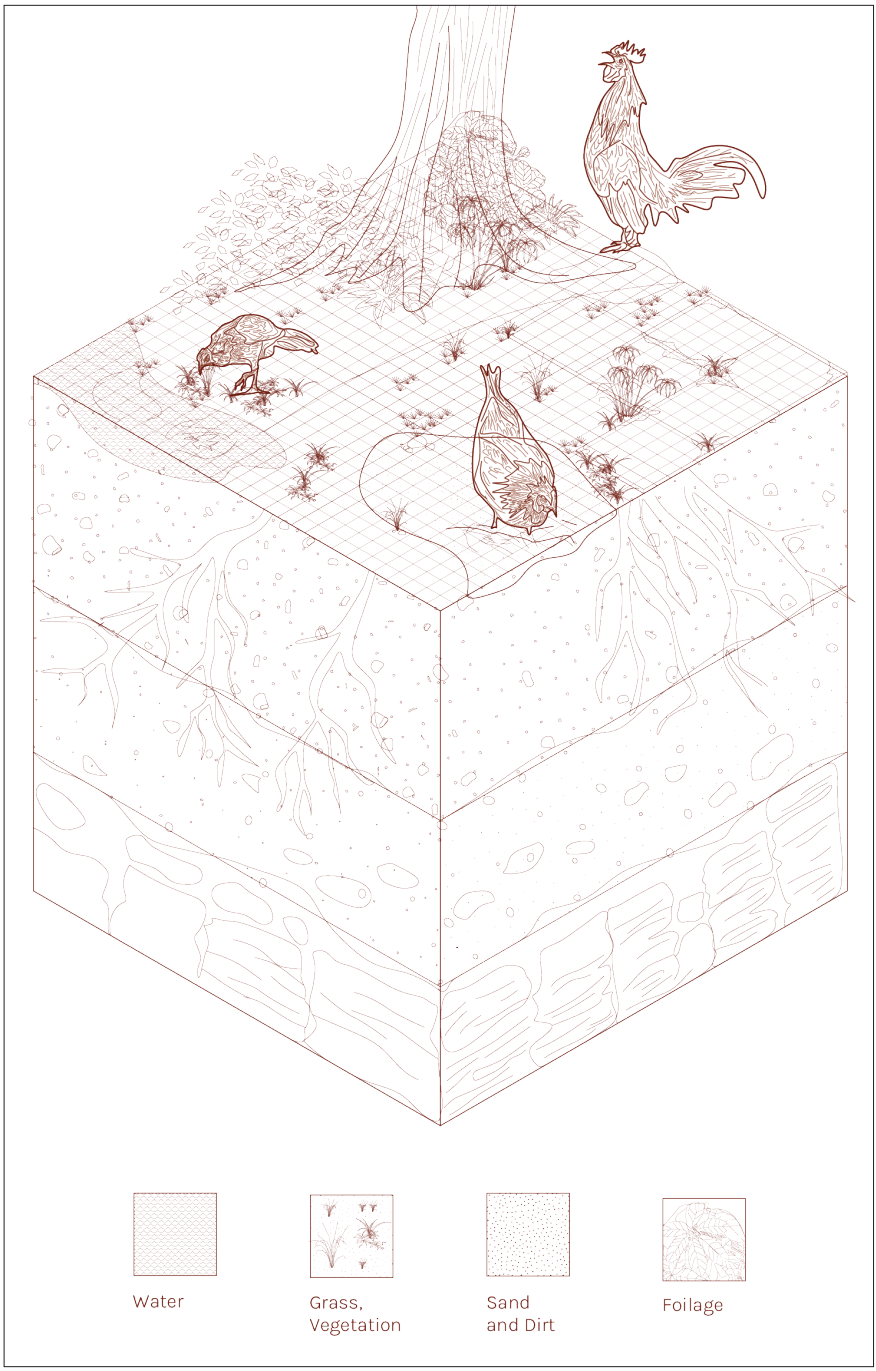
Junglefowl and shrubby undergrowth

Junglefowl under the cover of ficus trees



Female junglefowl brooding in the hollow made from ficus tree roots

A study of materials and surfaces that interface with the junglefowl


Water
Grass,
Vegetation
Sand
and Dirt
Foilage

Junglefowl are omnivorous creatures. Their staple diet comprises insects, namely termites and winged ants. They also rake the ground for invertebrates, roots, ripe fruit and seeds. In a continuous search for food, fowl need good ground-level cover to hide and feed in.

Due to a food shortage, some of the locals at the Rochester Park Colonial Estate have contributed to the feeding of the junglefowl to supplement their diet. Feed include grains, seeds and a healthy mix of mealworms.

Based on the preceeding findings, this mindmap illustrates what I believe are the needs of a junglefowl to thrive. This section is analogous to a client's brief of a typical architectural project.

General / Contextual

ABOUT | ANATOMICAL LABELLING | GEOGRAPHY

Intrinsic Characteristics

NAVIGATIONAL APPENDAGES

Behavioural Study

ACTIVITY | PROXIMITY FIELD STUDY | AEROBIC PERFORMANCE

Extrinsic (Environmental)

PHYSICAL SPATIAL DOMAIN | SURFACE MATERIALITY STUDY | NUTRITION

Summary of Junglefowl Needs

MINDMAP

Landscape Ecology Principles

IN LANDSCAPE ARCHITECTURE AND LAND-USE PLANNING

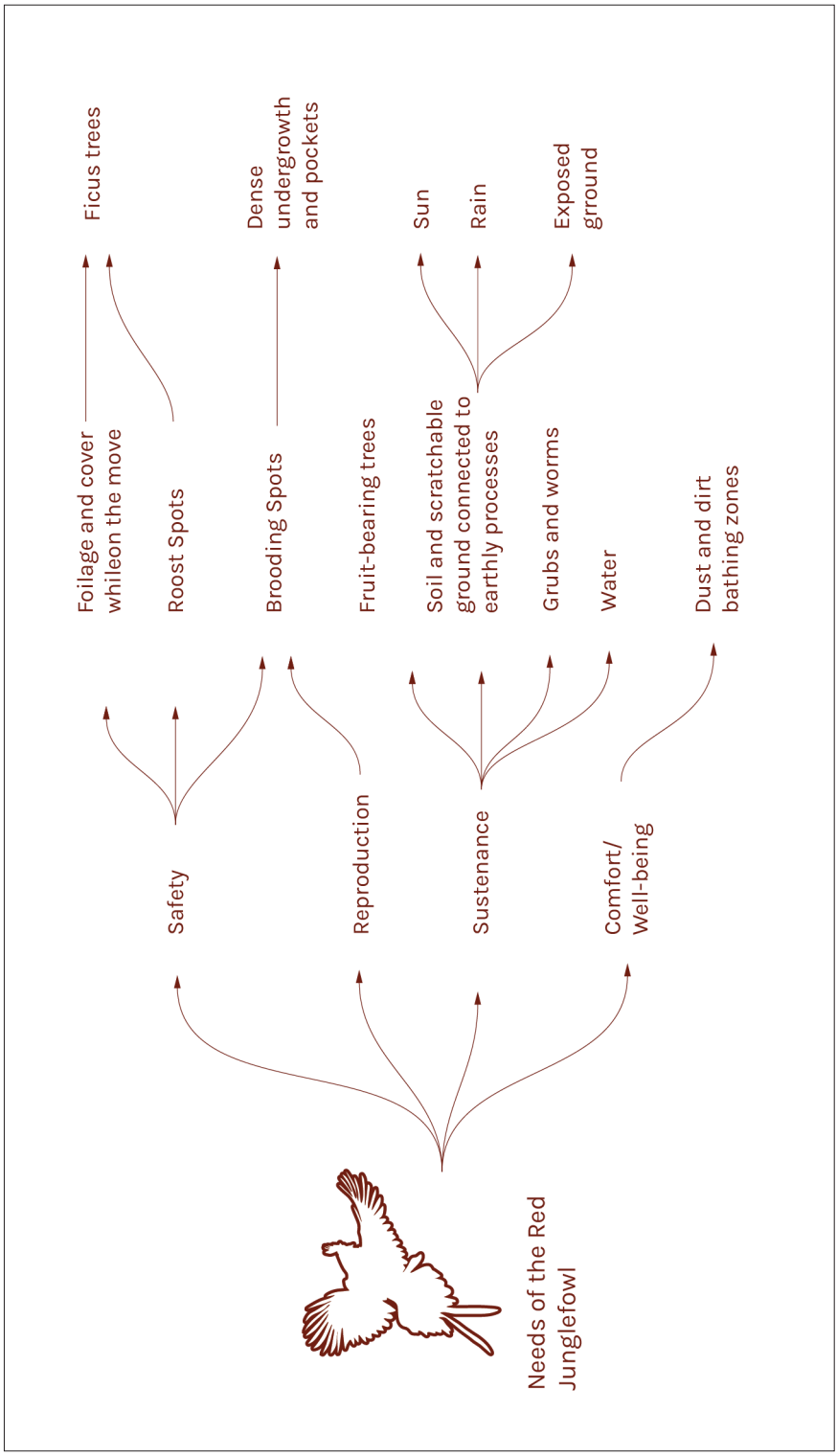
To supplement the research on the junglefowl, the other resource I referred to was Landscape Ecology Principles in Landscape Architecture and Land-Use Planning by Wenche E. Dramstad, James D. Olson and Richard T. T. Forman.

This resource has proven to be incredibly useful to guide my understanding about the key elements of any landscape - patch, corridor and matrix - which might help in designing for co-existing with nature. I have distilled some of the key principles as diagrams which have been instrumental in helping me consider ecological connections and processes more from the point-of-view of the animal other.

ILLUSTRATONS OF RED JUNGLEFOWL

FROM PHEASANTS OF THE WORLD

- Delacour, J & Harrison, JC, 1977. T*he Pheasants of the World,* Spur Publications, Salt Lake City.


Needs of the Red Junglefowl
Safety
Reproduction
Sustenance
Comfort/ Well-being
Foilage and cover whileon the move
Roost Spots
Brooding Spots
Fruit-bearing trees
Soil and scratchable ground connected to earthly processes
Grubs and worms
Water
Dust and dirt bathing zones
Ficus trees
Dense undergrowth and pockets
Sun
Rain
Exposed grround

General / Contextual

ABOUT | ANATOMICAL LABELLING | GEOGRAPHY

Intrinsic Characteristics

NAVIGATIONAL APPENDAGES

Behavioural Study

ACTIVITY | PROXIMITY FIELD STUDY | AEROBIC PERFORMANCE

Extrinsic (Environmental)

PHYSICAL SPATIAL DOMAIN | SURFACE MATERIALITY STUDY | NUTRITION

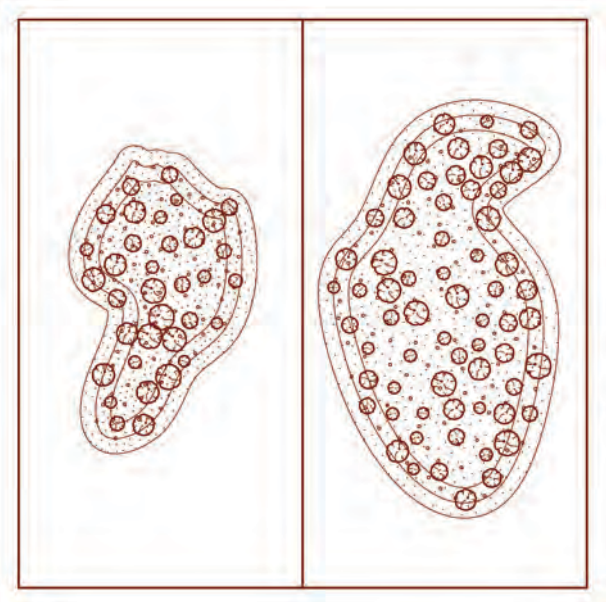
Summary of Junglefowl Needs

MINDMAP

Landscape Ecology Principles

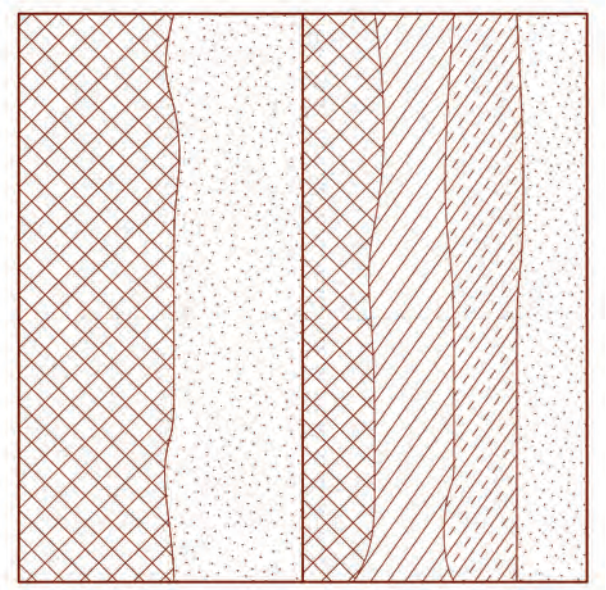
IN LANDSCAPE ARCHITECTURE AND LAND-USE PLANNING

- Dramstad, WE, Olsen JD & Forman RTT, 1996, *Landscape ecology principles in landscape architecture and land-use planning*, Harvard University Graduate School of Design, Cambridge.



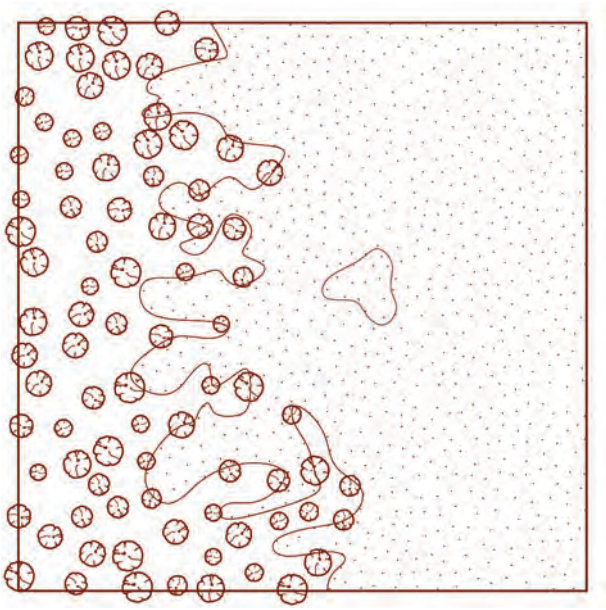
Patch Sizes

A large patch is likely to have more inhabitants present, therefore contain a greater number of species.



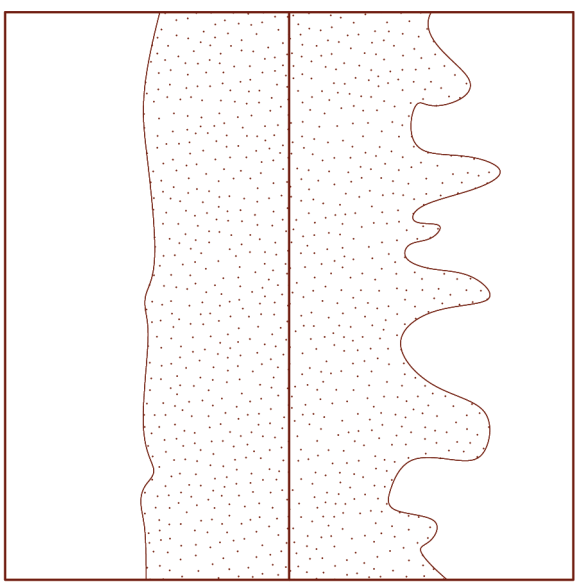
Edge Abruptness

Increased edge abruptness encourages movement along an edge. Less edge abruptness favours movement across an edge.



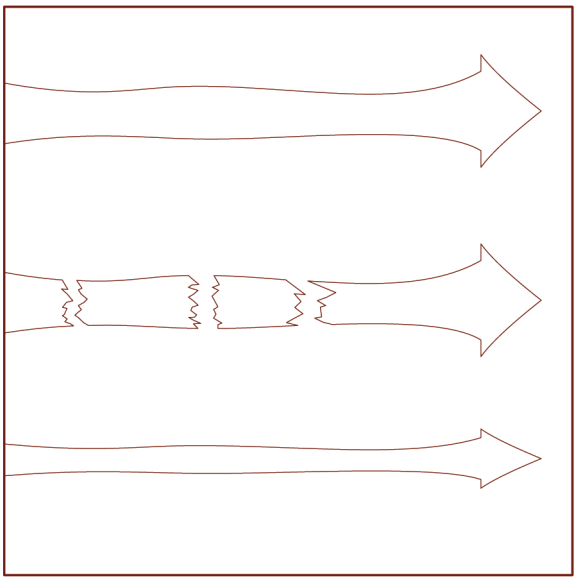
Coves and Lobes

Cove and lobes along an edge provide greater habitat diversity than along a straight edge, encouraging higher species diversity.



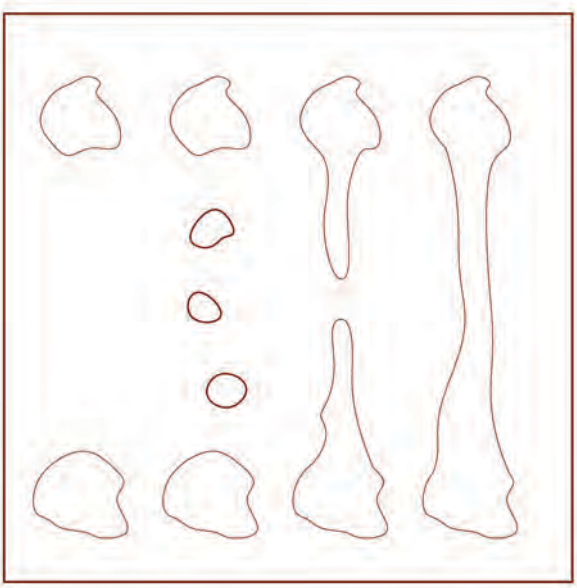
Straight and Curved

A straight boundary tends to have more species movement along it, whereas a covoluted boundary is more likely to have movement across it.



Corridors

In the face of continued habitat loss, landscape ecologists stress the need for providing landscape connectivity through movement corridors and stepping-stones.

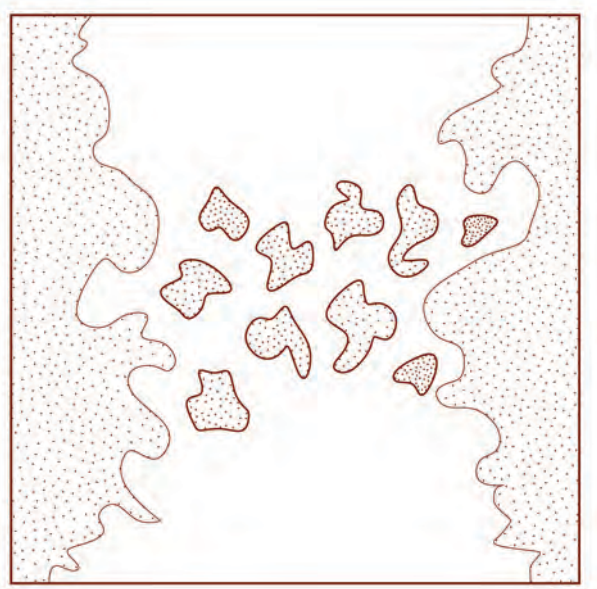


Stepping Stone Connectivity

A row of stepping stones (small patches) is intermediate in connectivity between a corridor and no corridor.

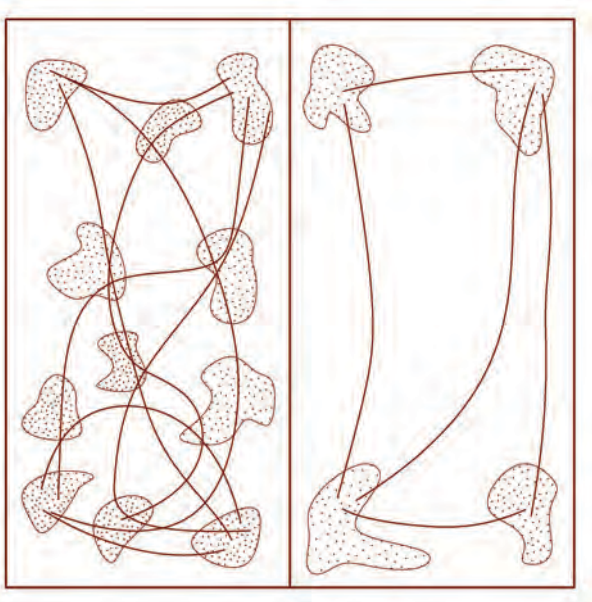
Stepping Stone Placement

For highly visual-oriented species, effective distance for movement between stepping stones is determined by the ability to see each successive stepping stone.



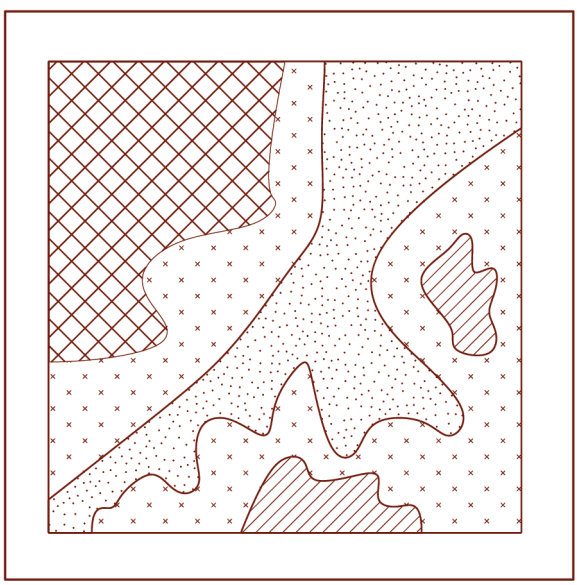
Cluster of Stepping Stones

The optimal spatial arrangement of a cluster of stepping stones between large patches provides alternate or redundant routes while maintaining an overall linear-oriented array.



Animal Perception of Scale of Fragmentation

A finely fragmented habitat is normally perceived as continuous by most species. A coarsely fragmented one is discontinuous to all species, except the most wide-ranging animals.



Grain of Mosaics

A coarse-grained landscape containing fine-grained areas is optimal to provide for large-patch ecological benefits, multi-habitat species including humans, and a breadth of environmental resources and conditions.