

TALES FROM THE

URBAN JUNGLE



UNIVERSITY OF HELSINKI

IAN MACGREGOR-FORS

- URBANIZATION
 - BIODIVERSITY RESPONSES
 - UNDERSTANDING CITIES
CONSIDERING BIODIVERSITY

THE

ANTHROPOCENE



BIG KILLERS

Overexploitation and agriculture are the most prevalent threats facing the 8,688 threatened or near-threatened species from comprehensively assessed species groups on the IUCN Red List.

OVER-EXPLOITATION



More than 80% of species analysed are harmed by more than one sub-class threat.



LOGGING



HUNTING



FISHING



GATHERING PLANTS

AGRICULTURAL ACTIVITY



CROP FARMING



LIVESTOCK FARMING



TIMBER PLANTATIONS



AQUACULTURE

URBAN DEVELOPMENT



HOUSING



TOURISM AND RECREATION



INDUSTRIAL

INVASION AND DISEASE



INVASIVE SPECIES



PROBLEMATIC NATIVE SPECIES



INTRODUCED GENETIC MATERIAL

POLLUTION



AGRICULTURE



DOMESTIC WASTE



INDUSTRIAL



AIRBORNE

SYSTEM MODIFICATION



FIRE



DAMS



OTHER

CLIMATE CHANGE



STORMS AND FLOODING



HABITAT MODIFICATION



EXTREME TEMPERATURES



DROUGHT

The **Sumatran rhinoceros** (*Dicerorhinus sumatrensis*) and **Western gorilla** (*Gorilla gorilla*) are being harmed by overexploitation; Africa's **cheetah** (*Acinonyx jubatus*) and Asia's **hairy-nosed otter** (*Lutra sumatrana*) are being imperilled by agricultural activity.

The **common hippopotamus** (*Hippopotamus amphibius*) and **leatherback turtle** (*Dermochelys coriacea*) are being affected by droughts and high temperatures.

BIG KILLERS

Overexploitation and agriculture are the most prevalent threats facing the 8,688 threatened or near-threatened species from comprehensively assessed species groups on the IUCN Red List.

OVER-EXPLOITATION



More than 80% of species analysed are harmed by more than one sub-class threat.



LOGGING



HUNTING

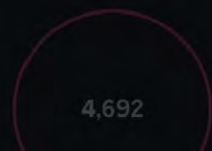


FISHING

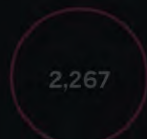


GATHERING PLANTS

AGRICULTURAL ACTIVITY



CROP FARMING



LIVESTOCK FARMING



TIMBER PLANTATIONS



AQUACULTURE

URBAN DEVELOPMENT



HOUSING



TOURISM AND RECREATION



INDUSTRIAL

INVASION AND DISEASE



INVASIVE SPECIES

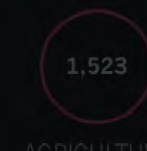
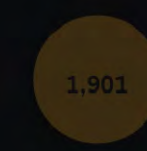


PROBLEMATIC NATIVE SPECIES



INTRODUCED GENETIC MATERIAL

POLLUTION



AGRICULTURE



DOMESTIC WASTE

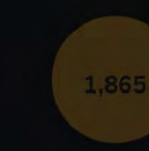


INDUSTRIAL



AIRBORNE

SYSTEM MODIFICATION



FIRE

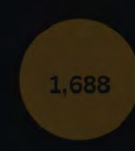


DAMS



OTHER

CLIMATE CHANGE



STORMS AND FLOODING



HABITAT MODIFICATION



EXTREME TEMPERATURES



DROUGHT

The **Sumatran rhinoceros** (*Dicerorhinus sumatrensis*) and **Western gorilla** (*Gorilla gorilla*) are being harmed by overexploitation; Africa's **cheetah** (*Acinonyx jubatus*) and Asia's **hairy-nosed otter** (*Lutra sumatrana*) are being imperilled by agricultural activity.

The **common hippopotamus** (*Hippopotamus amphibius*) and **leatherback turtle** (*Dermochelys coriacea*) are being affected by droughts and high temperatures.



NRTODAY.COM

OVER-EXPLOITATION

LOGGING



LEICA-GEOSYSTEMS.COM

AGRICULTURAL ACTIVITY

CROP FARMING



3CL703FE8D.SITE.INTERNAPCDN.NET

INVASION AND DISEASE

INVASIVE SPECIES

THE HOUSE SPARROW



INVASION AND DISEASE

INVASIVE SPECIES

THE HOUSE SPARROW

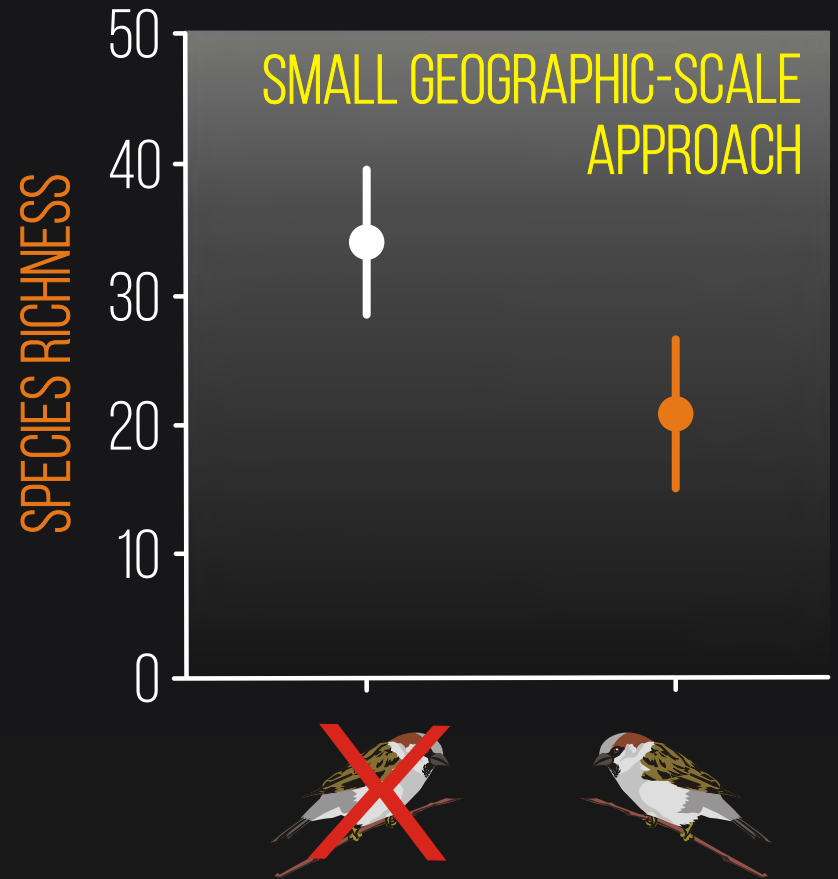


MY LAB'S 'BATTLE HORSE'

INVASION AND DISEASE

INVASIVE SPECIES

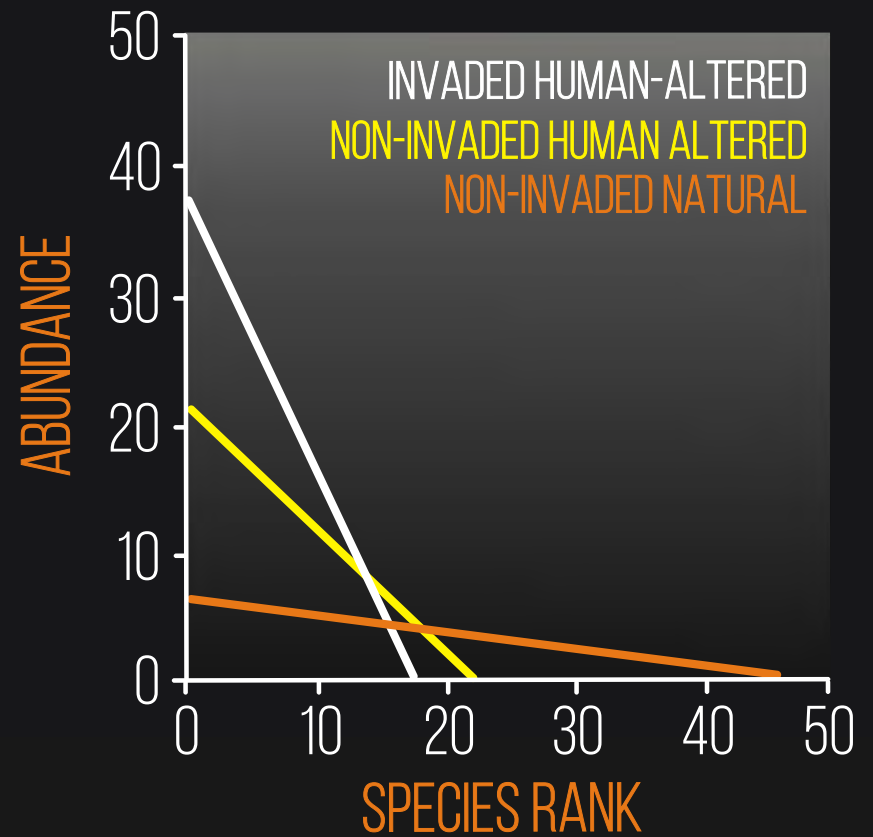
THE HOUSE SPARROW



INVASION AND DISEASE

INVASIVE SPECIES

THE HOUSE SPARROW



INVASION AND DISEASE

INVASIVE SPECIES

THE HOUSE SPARROW



~30%
NATIVE
SPECIES
LOSS

INVASION AND DISEASE

INVASIVE SPECIES

MACGREGOR-FORS ET AL (2010) BIOL INV, 12: 87-96

URBAN DEVELOPMENT HOUSING



URBAN DEVELOPMENT HOUSING

BIG KILLERS

OVER-
EXPLOITATION

6,241
SPECIES
AFFECTED

AGRICULTURAL
ACTIVITY

5,407

URBAN

'METABOLISM'



URBAN

'METABOLISM'



ENERGY



FOOD



WATER



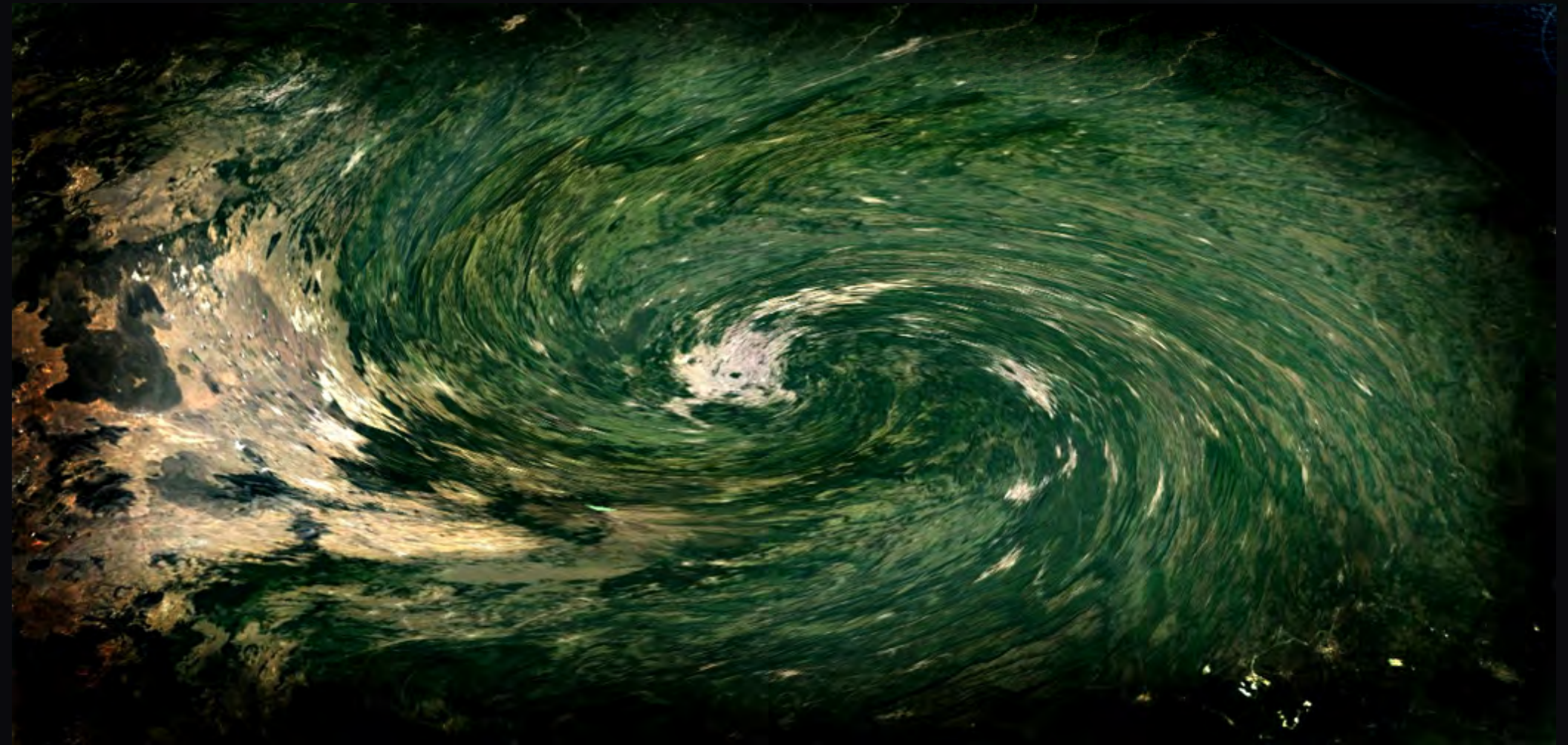
GOODS



URBAN

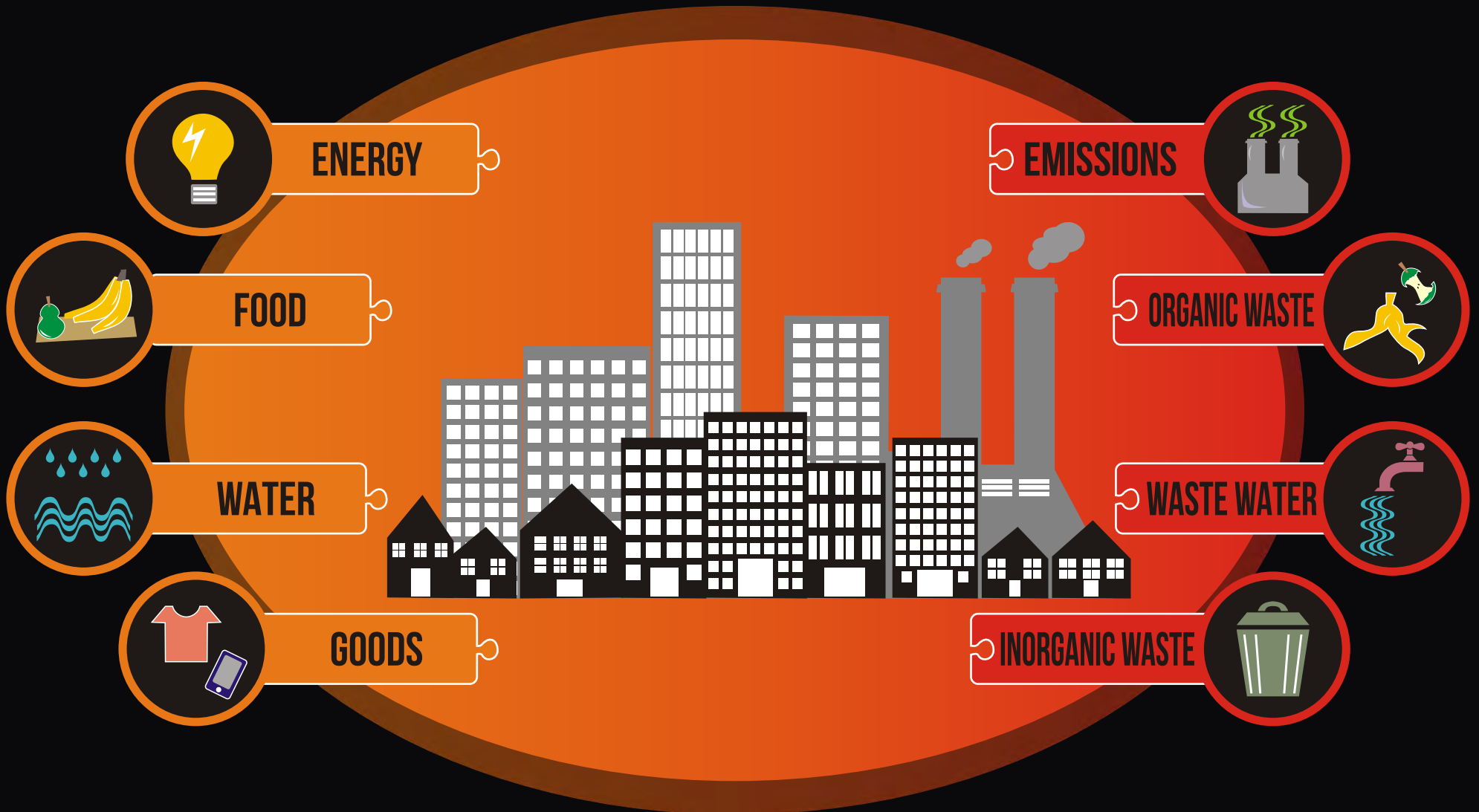
'METABOLISM'

BLACK HOLES



URBAN

'METABOLISM'

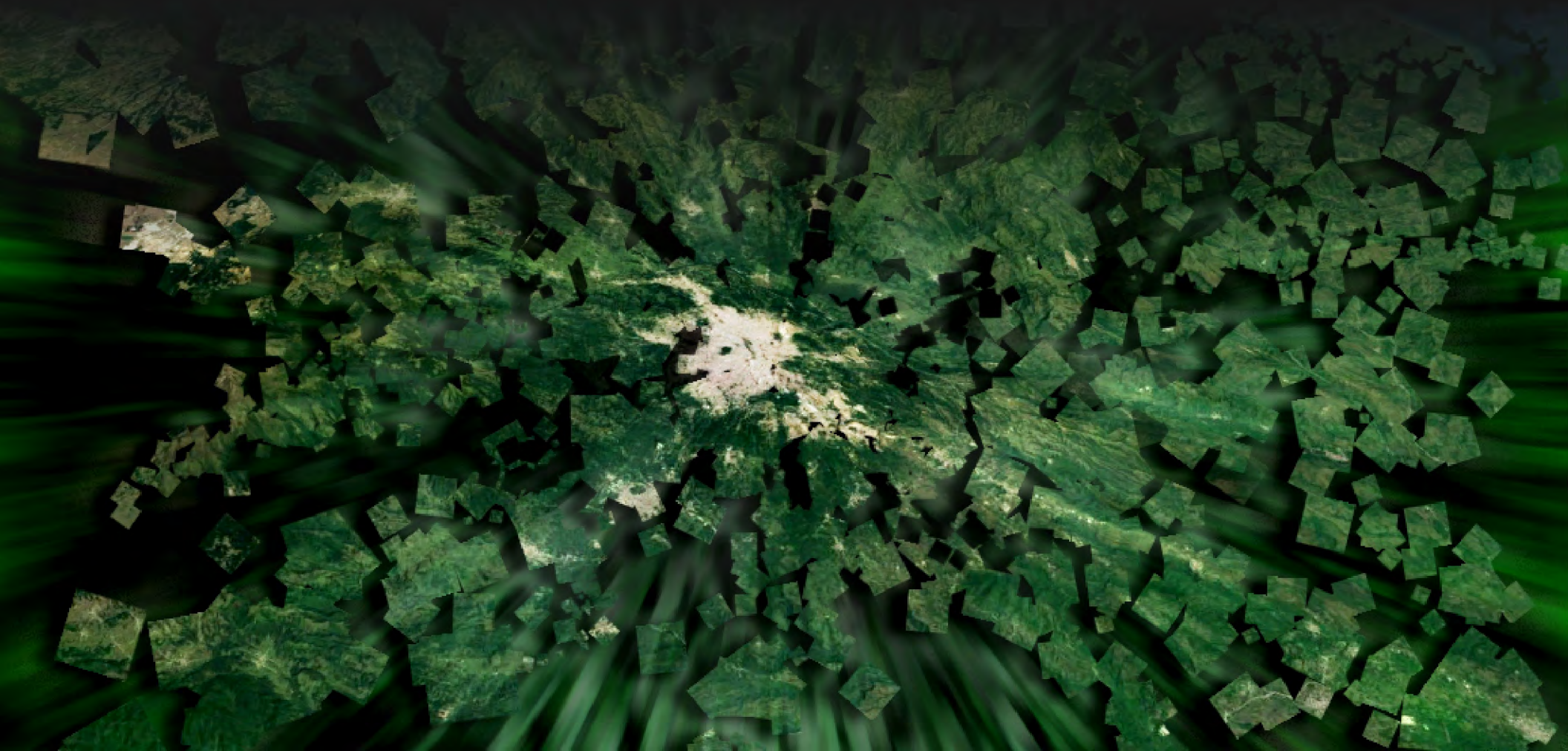


URBAN

'METABOLISM'

UNBALANCED

METABOLISM



BIRD RESPONSES

The title 'BIRD RESPONSES' is centered in the top left of a dark grey rectangular area. To the right of this area, two horizontal orange lines extend across the top of the slide. The upper line is thicker and tapers to the right, while the lower line is thinner and remains constant in width.

BIRD RESPONSES

TO URBANIZATION

BLAIR (1996) ECOL APPL, 6: 506-519

FISCHER ET AL (2015) CONS BIOL, 29: 1246-1248



**APPLICABLE
TO OTHER
SYSTEMS**

BIRD RESPONSES

TO URBANIZATION

FISCHER ET AL (2015) CONS BIOL , 29: 1246-1248

AVOIDERS



BIRD RESPONSES

TO URBANIZATION

FISCHER ET AL (2015) CONS BIOL , 29: 1246-1248

UTILIZERS



BIRD RESPONSES

TO URBANIZATION

FISCHER ET AL (2015) CONS BIOL , 29: 1246-1248

DWELLERS



CASE STUDIES

LANDSCAPE-SCALE

WEST-CENTRAL MEXICO ○ ENTIRE WATERSHED

CHÁVEZ-ZICHINELLI ET AL (2013) CONDOR, 115:81-94



CORTICOSTERONE
IMMUNOGLOBULIN
RELATIONS



CASE STUDIES

LANDSCAPE-SCALE

WEST-CENTRAL MEXICO ○ ENTIRE WATERSHED

CHÁVEZ-ZICHINELLI ET AL (2013) CONDOR, 115:81-94

DWELLER OR UTILIZER?



CORTICOSTERONE
IMMUNOGLOBULIN
RELATIONS



CASE STUDIES

LANDSCAPE-SCALE

WEST-CENTRAL MEXICO ○ ENTIRE WATERSHED

CHÁVEZ-ZICHINELLI ET AL (2013) CONDOR, 115:81-94

DWELLER

NO EVIDENCE OF PHYSIOLOGICAL
LIMITATIONS



UTILIZER

~30% URBAN INDIVIDUALS
PHYSIOLOGICAL LIMITATIONS



CASE STUDIES

LANDSCAPE-SCALE

WEST-CENTRAL MEXICO ○ ENTIRE WATERSHED

CHÁVEZ-ZICHINELLI ET AL (2013) CONDOR, 115:81-94

DWELLER

NO EVIDENCE OF PHYSIOLOGICAL
LIMITATIONS



UTILIZER

~30% URBAN INDIVIDUALS
PHYSIOLOGICAL LIMITATIONS



BIRD RESPONSES

TO URBANIZATION

BLAIR (1996) ECOL APPL, 6: 506-519

EXPLOITERS



BIRD RESPONSES

TO URBANIZATION

REDRAWN FROM **GONZÁLEZ-LAGOS & QUESADA (2017)**
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)

BIRD RESPONSES

TO URBANIZATION

REDRAWN FROM **GONZÁLEZ-LAGOS & QUESADA (2017)**
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)

URBANIZATION



BIRD RESPONSES TO URBANIZATION

REDRAWN FROM **GONZÁLEZ-LAGOS & QUESADA (2017)**
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)

URBANIZATION

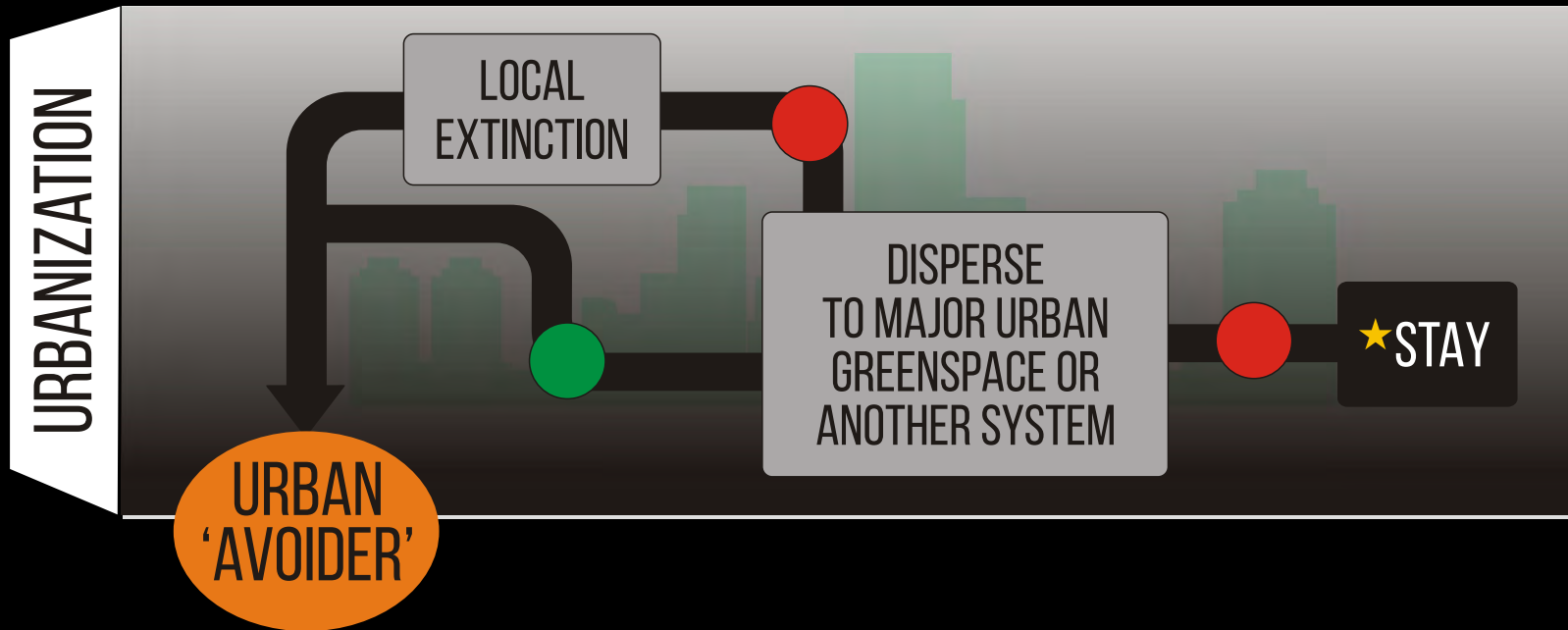
DISPERSE
TO MAJOR URBAN
GREENSPACE OR
ANOTHER SYSTEM

★ STAY



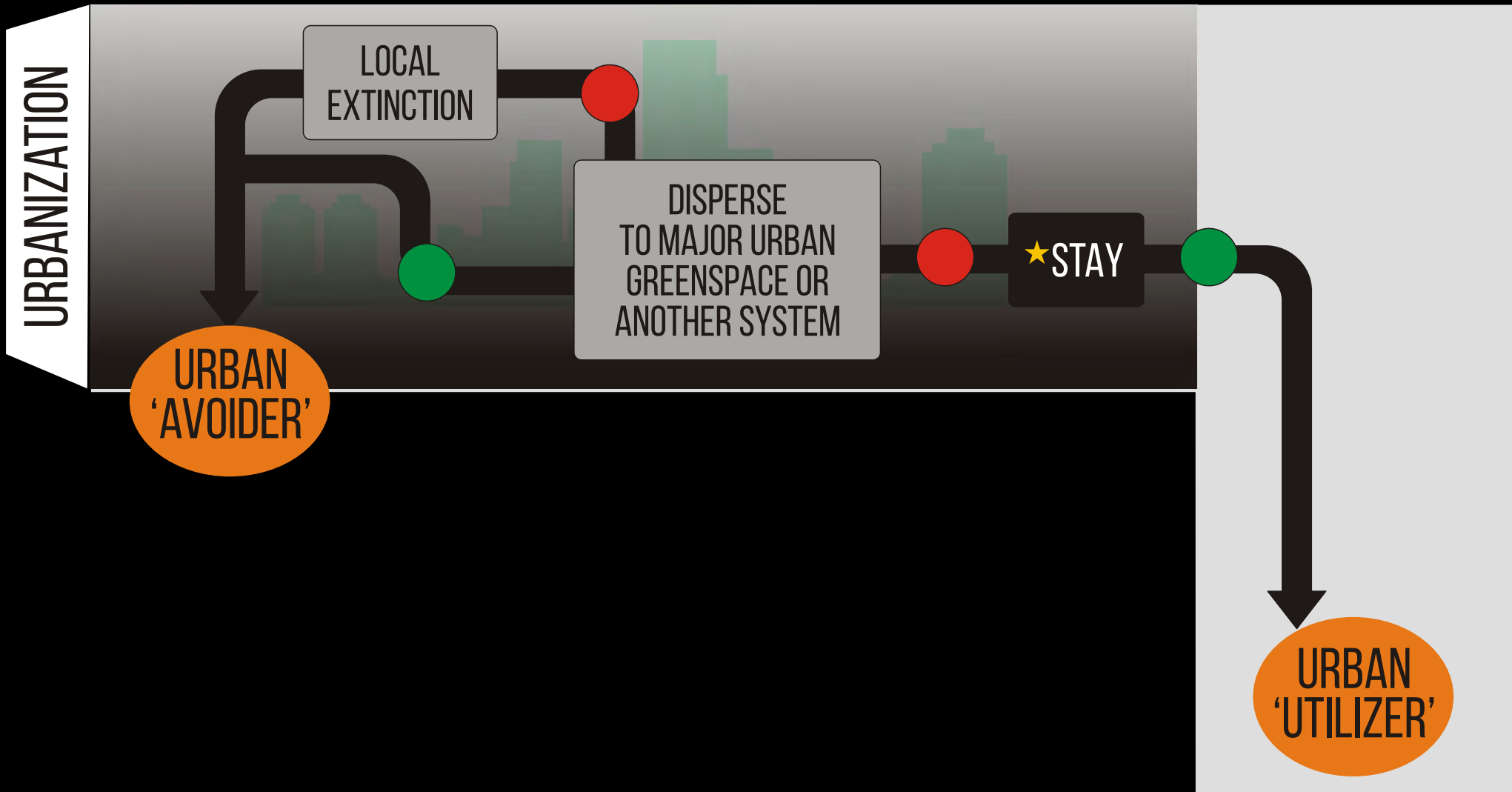
BIRD RESPONSES TO URBANIZATION

REDRAWN FROM **GONZÁLEZ-LAGOS & QUESADA (2017)**
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)



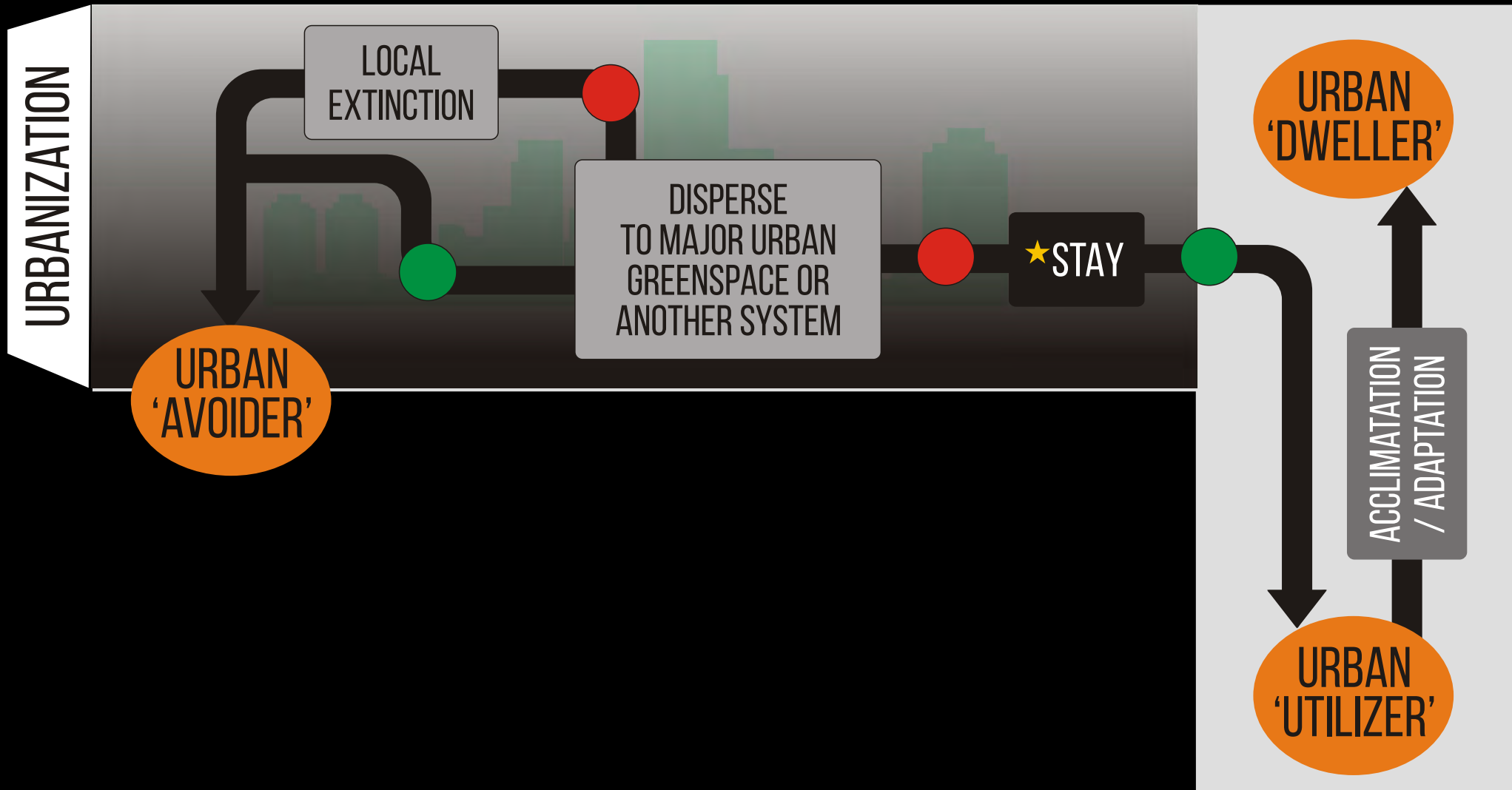
BIRD RESPONSES TO URBANIZATION

REDRAWN FROM GONZÁLEZ-LAGOS & QUESADA (2017)
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)



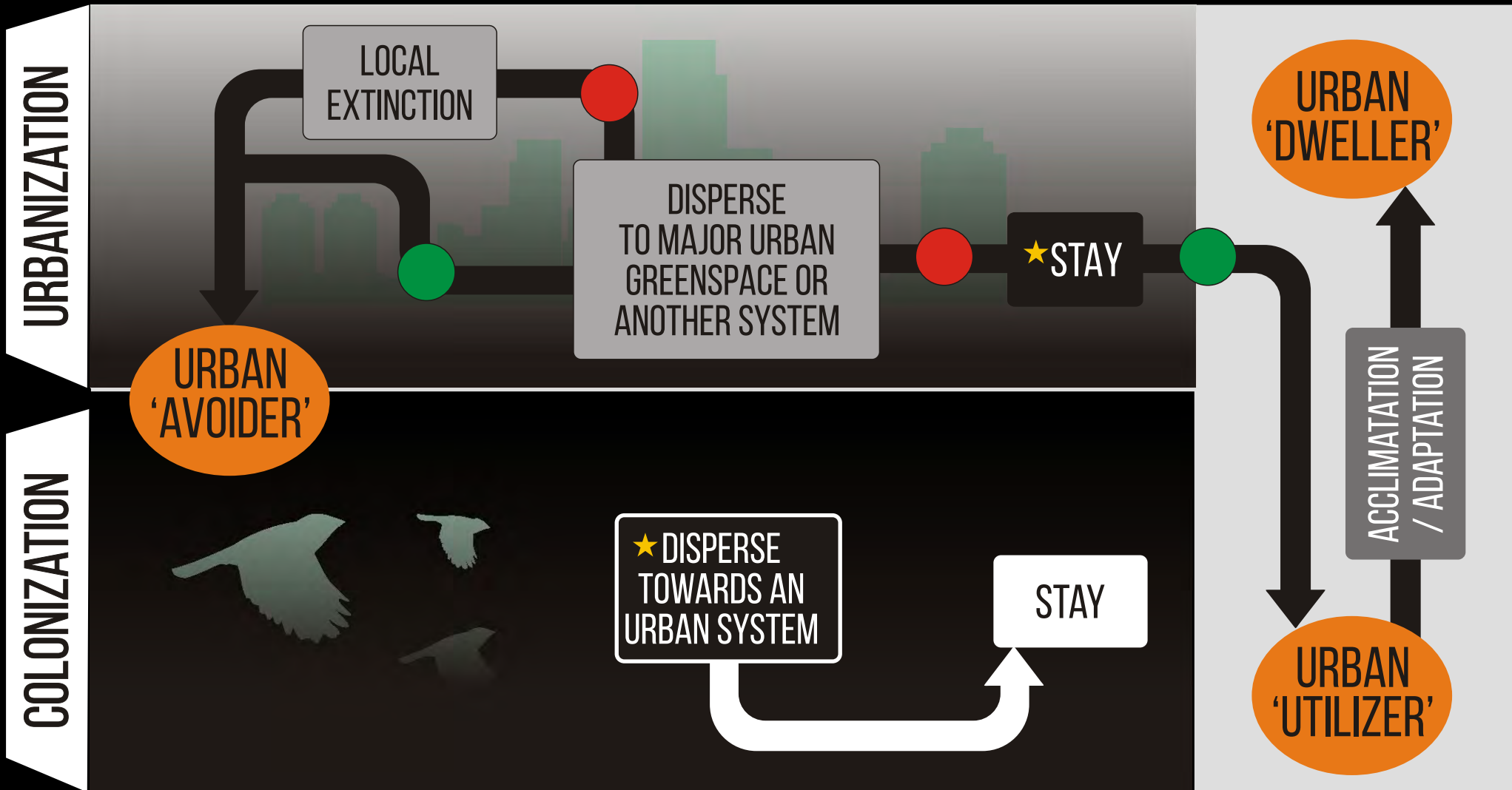
BIRD RESPONSES TO URBANIZATION

REDRAWN FROM GONZÁLEZ-LAGOS & QUESADA (2017)
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)



BIRD RESPONSES TO URBANIZATION

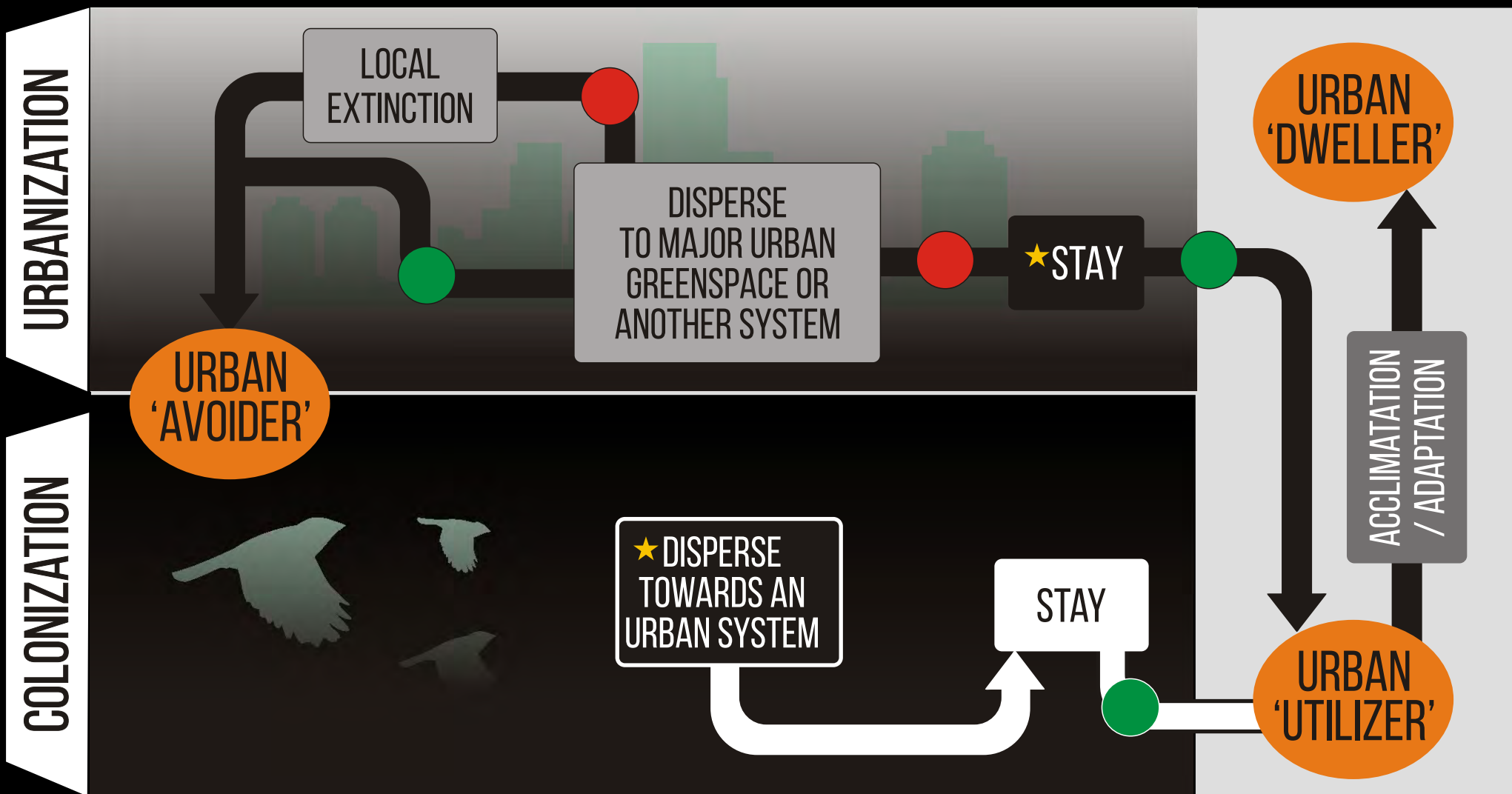
REDRAWN FROM GONZÁLEZ-LAGOS & QUESADA (2017)
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)



BIRD RESPONSES

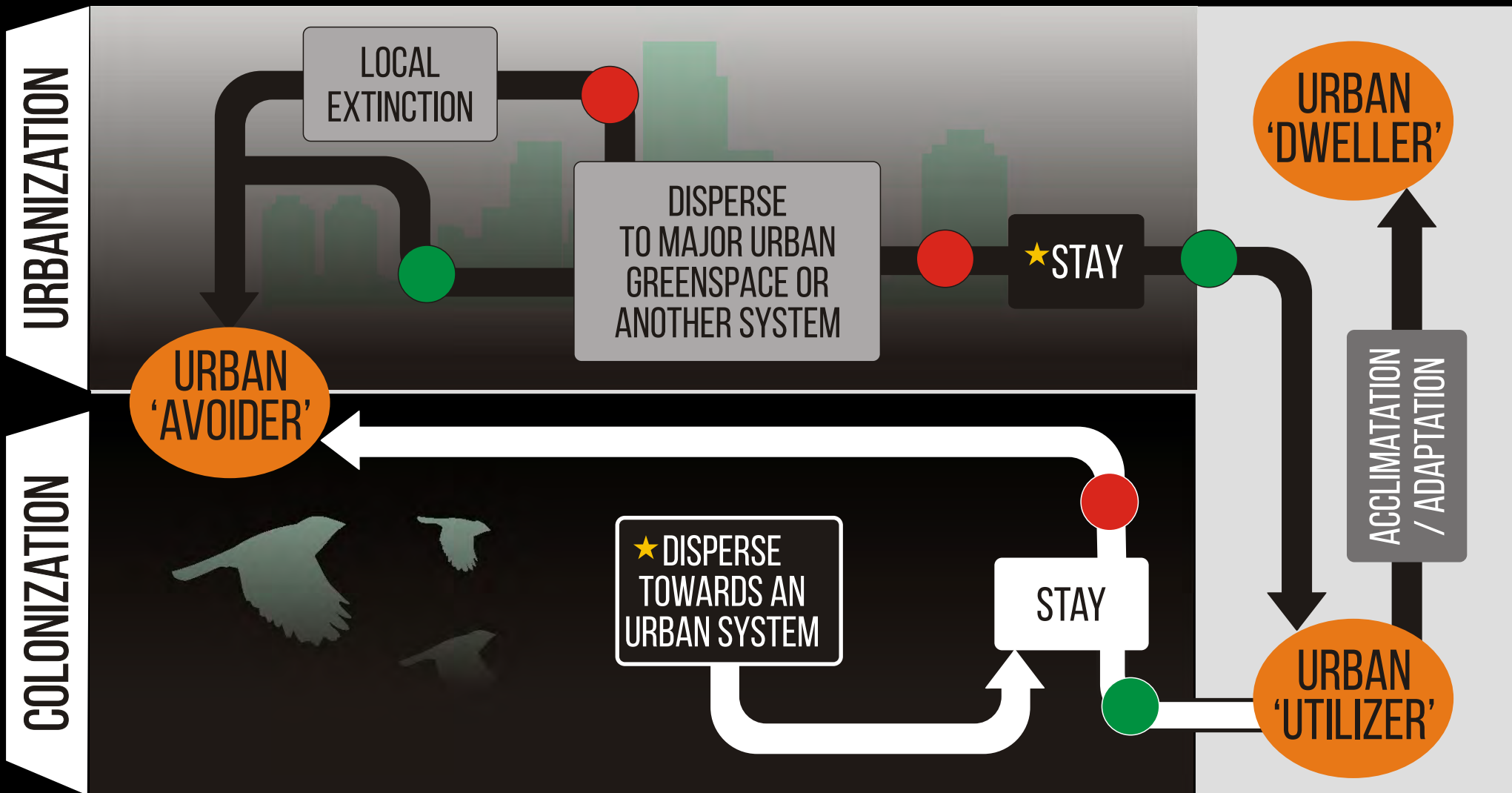
TO URBANIZATION

REDRAWN FROM **GONZÁLEZ-LAGOS & QUESADA (2017)**
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)



BIRD RESPONSES TO URBANIZATION

REDRAWN FROM GONZÁLEZ-LAGOS & QUESADA (2017)
AVIAN ECOLOGY IN LATIN AMERICAN CITYSCAPES (SPRINGER BOOK)

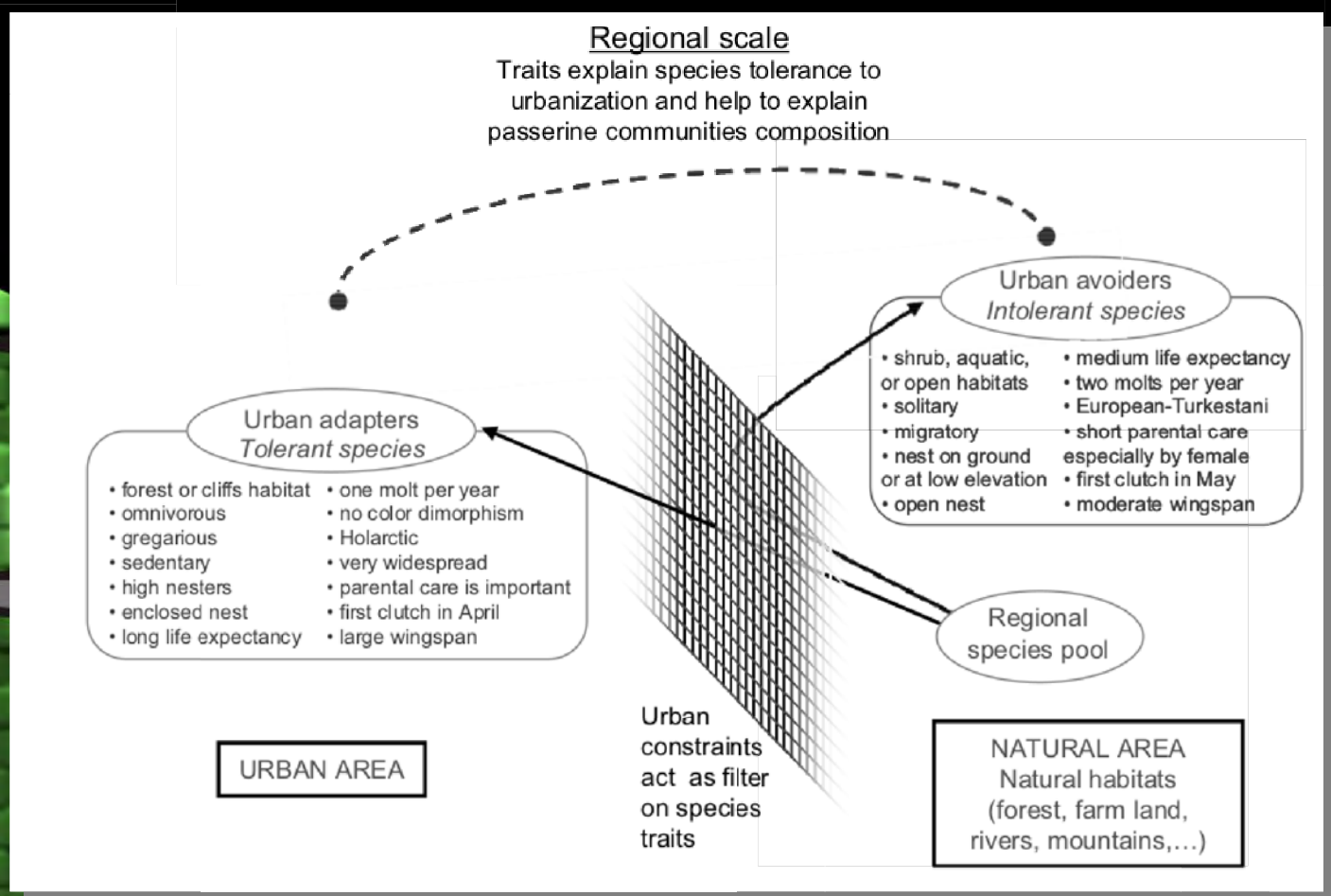


BIRD RESPONSES

TO URBANIZATION






BIRD RESPONSES TO URBANIZATION






COMMENTARY

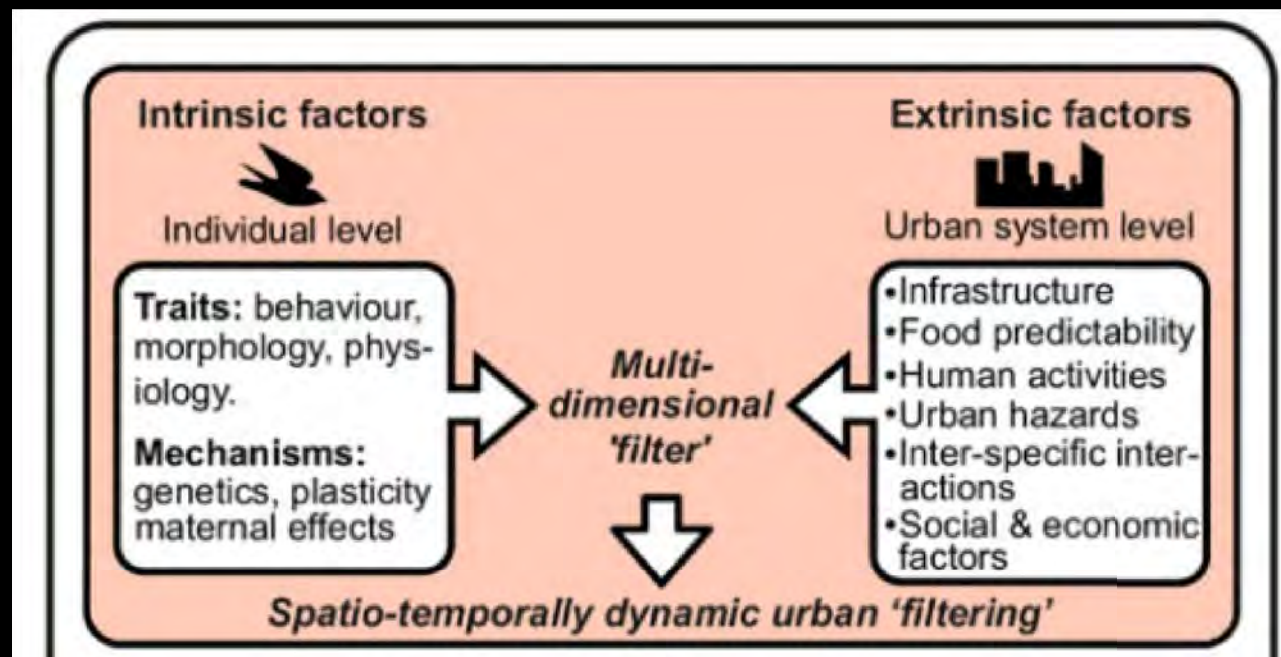
Keys to the city: an integrative conceptual framework on avian urban filtering

Ian MacGregor-Fors ^{1,*} Michelle García-Arroyo ¹ and Javier Quesada ²

COMMENTARY

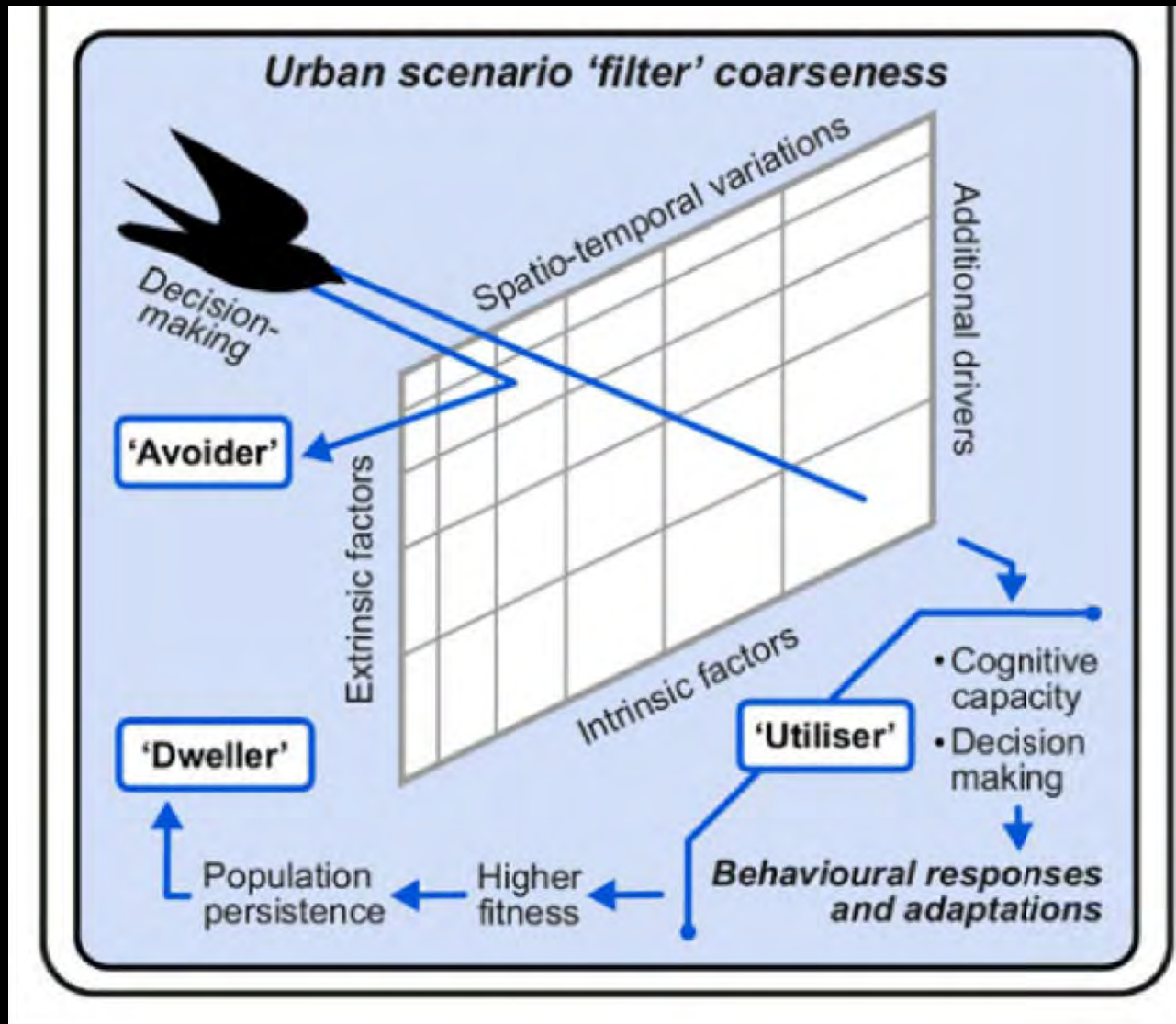
Keys to the city: an integrative conceptual framework on avian urban filtering

Ian MacGregor-Fors ^{1,*} Michelle García-Arroyo ¹ and Javier Quesada ²



BIRD RESPONSES

TO URBANIZATION



CASE STUDIES

The slide features a dark grey header bar at the top. The text 'CASE STUDIES' is centered in white. To the right of the text, there are two horizontal orange lines. The top line is thicker and extends across the width of the slide. The bottom line is thinner and also extends across the width. A vertical orange line segment is positioned to the right of the text, connecting the two horizontal lines.

SOME FIRST (VERY SIMPLE) APPROACHES

CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ WEST-CENTRAL MEXICO

MACGREGOR-FORS ET AL (2013) STUD AVIAN BIOL, 45: 33-48

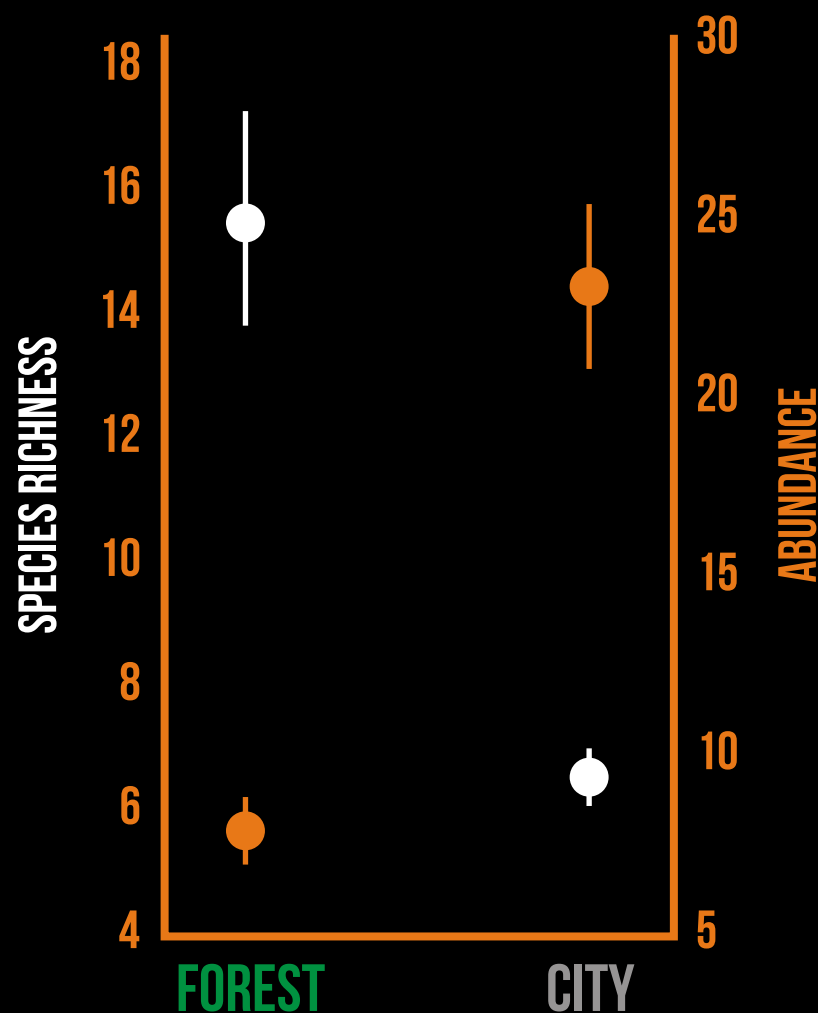


CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ WEST-CENTRAL MEXICO

MACGREGOR-FORS ET AL (2013) STUD AVIAN BIOL, 45: 33-48

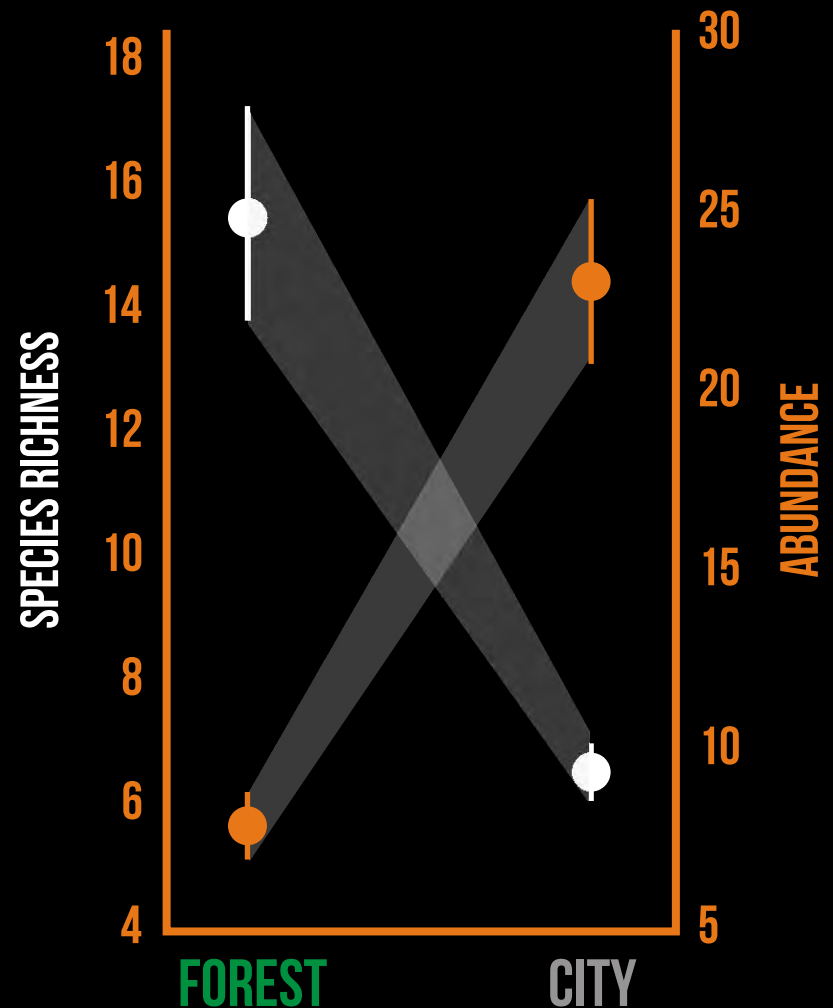


CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ WEST-CENTRAL MEXICO

MAGGREGOR-FORS ET AL (2013) STUD AVIAN BIOL, 45: 33-48



CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ WEST-CENTRAL MEXICO

MACGREGOR-FORS ET AL (2013) STUD AVIAN BIOL, 45: 33-48

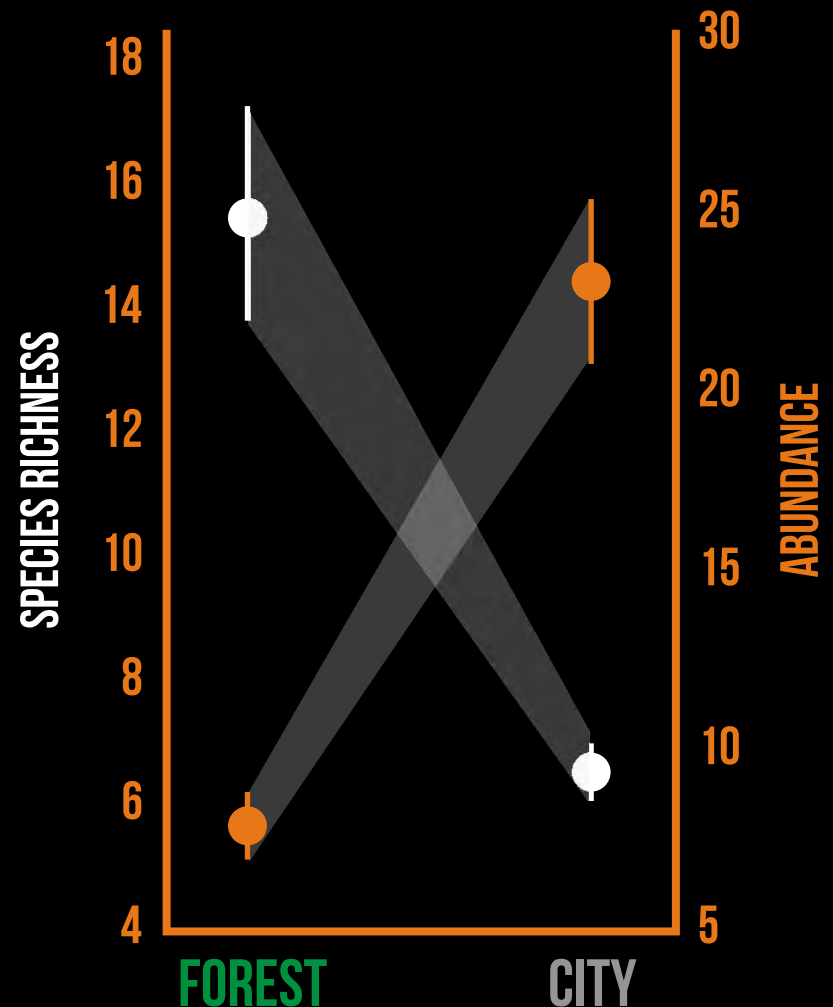


RICHNESS

○ TREE, HERB. COV. (+); CAR TRAFFIC (-)

ABUNDANCE

○ HERB HT., BUILD. HT. (+)

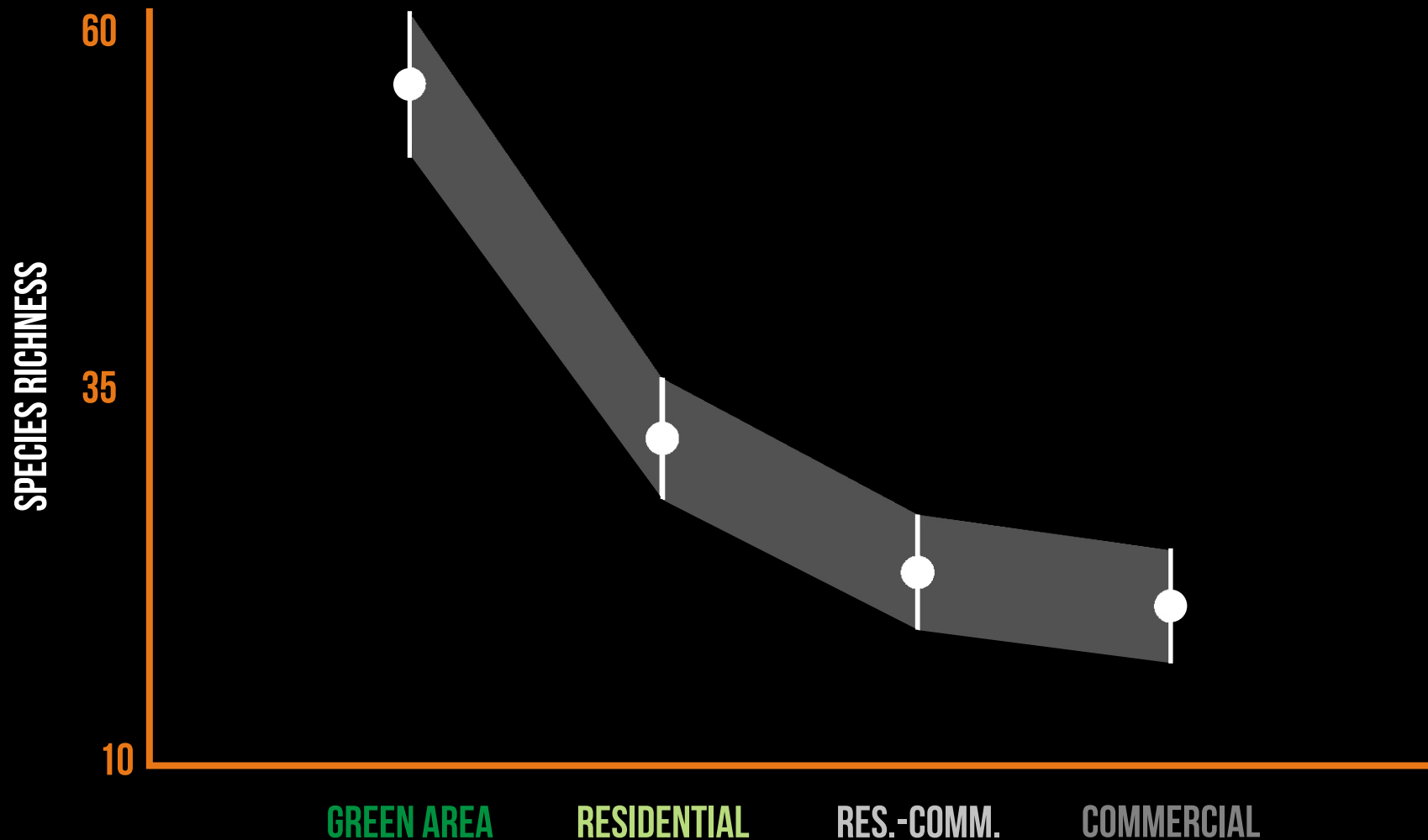


CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ CENTRAL MEXICO

ORTEGA-ÁLVAREZ & MACGREGOR-FORS (2009) LANDSC URBAN PLAN, 90: 189-195

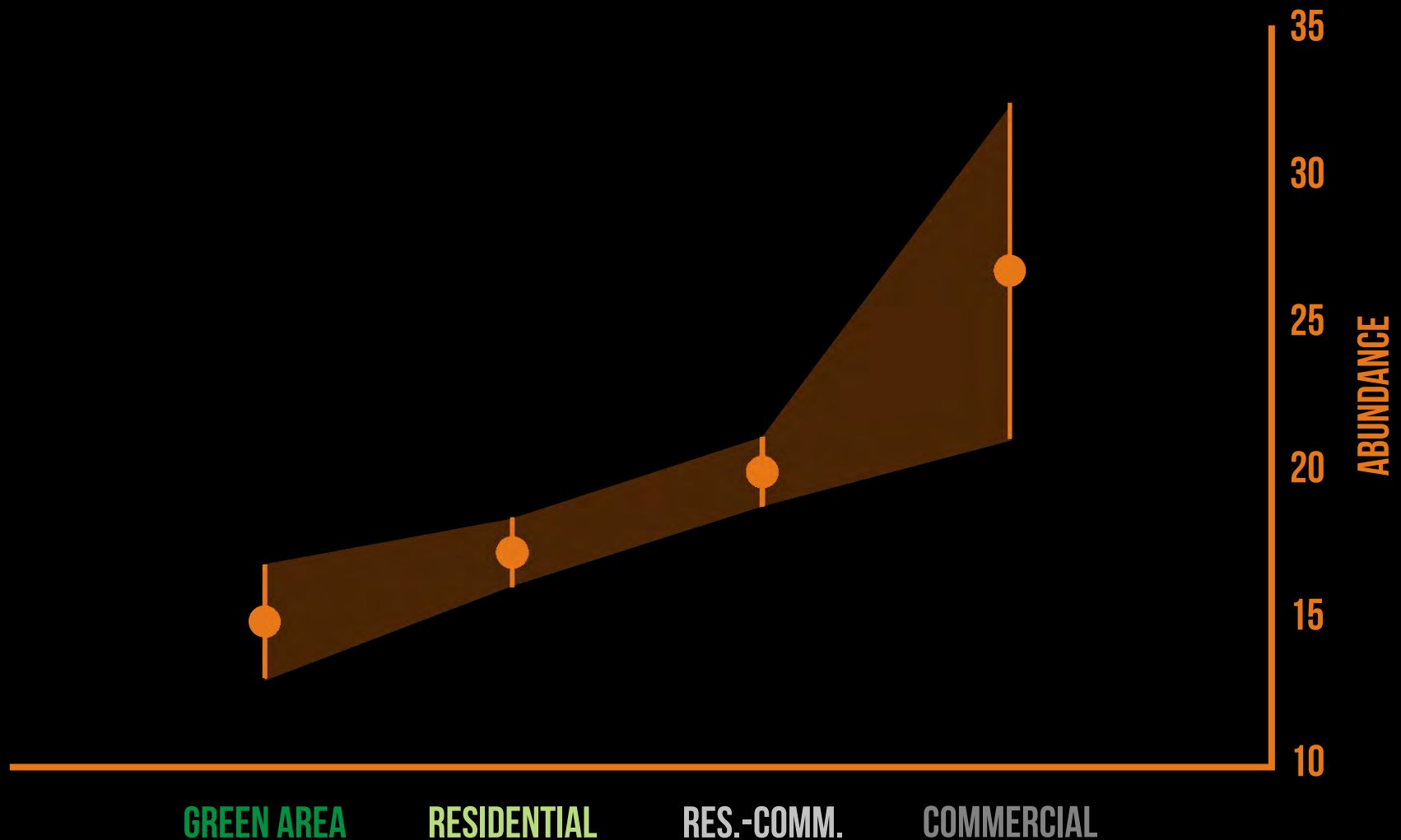


CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ CENTRAL MEXICO

ORTEGA-ÁLVAREZ & MACGREGOR-FORS (2009) LANDSC URBAN PLAN, 90: 189-195

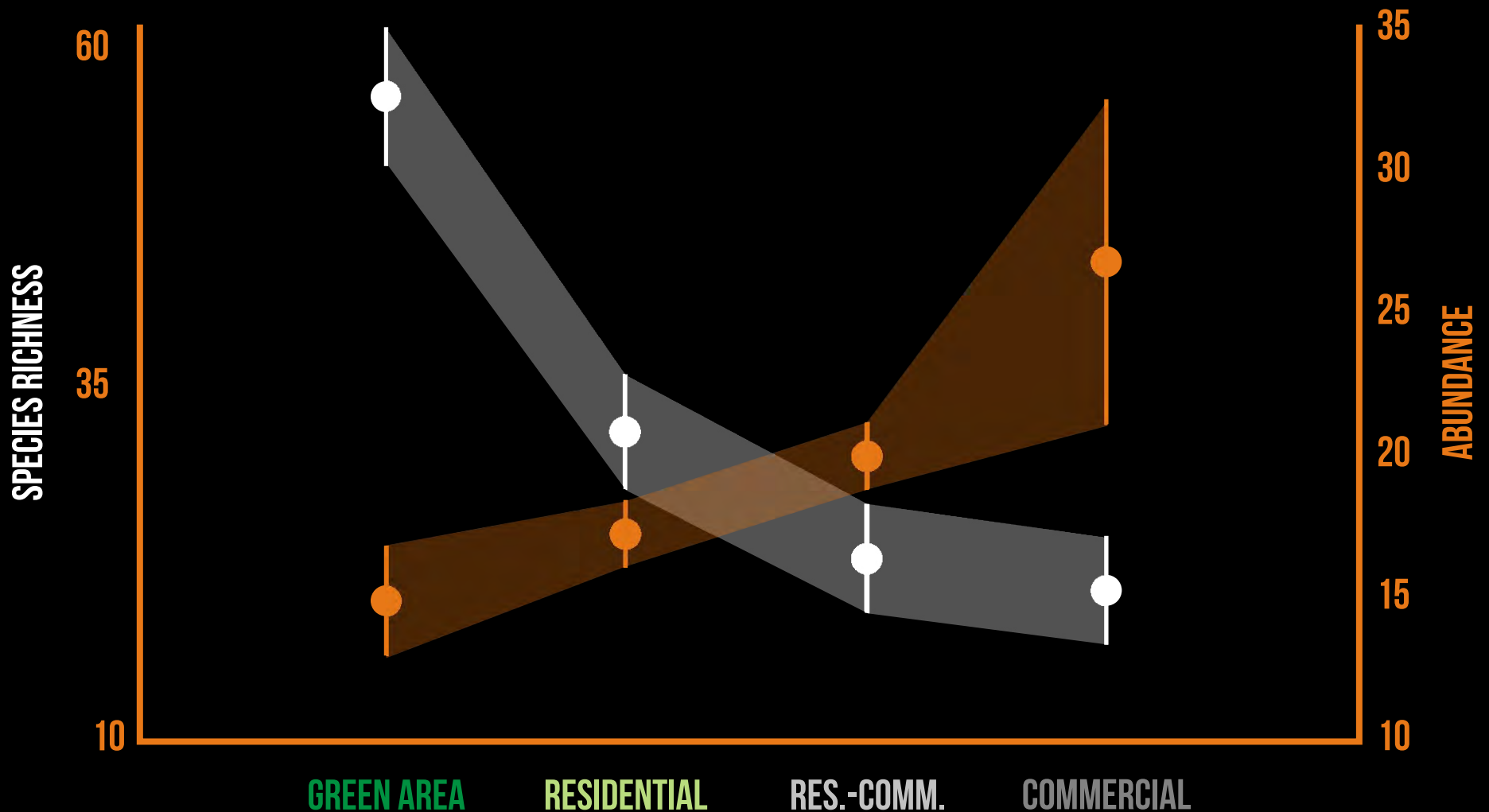


CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ CENTRAL MEXICO

ORTEGA-ÁLVAREZ & MACGREGOR-FORS (2009) LANDSC URBAN PLAN, 90: 189-195





**WHICH ARE THE FACTORS
BEHIND THESE PATTERNS?**

33 VARIABLES

VEGETATION • BUILT INFRAST. • HUMAN ACTIVITIES • THREATS



WHICH ARE THE FACTORS
BEHIND THESE PATTERNS?

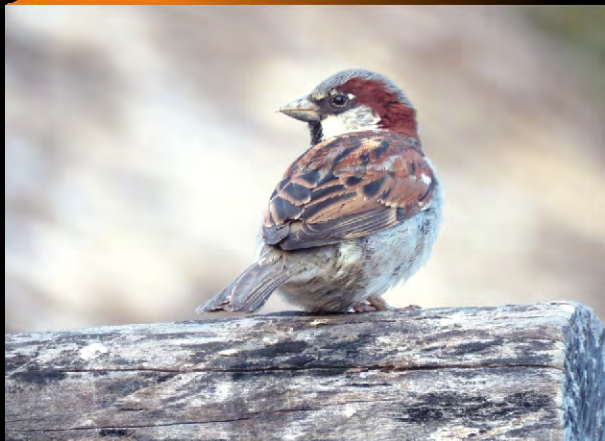
33 VARIABLES

VEGETATION • BUILT INFRASTR. • HUMAN ACTIVITIES • THREATS

ABUNDANT

MODERATELY ABUNDANT

RARE



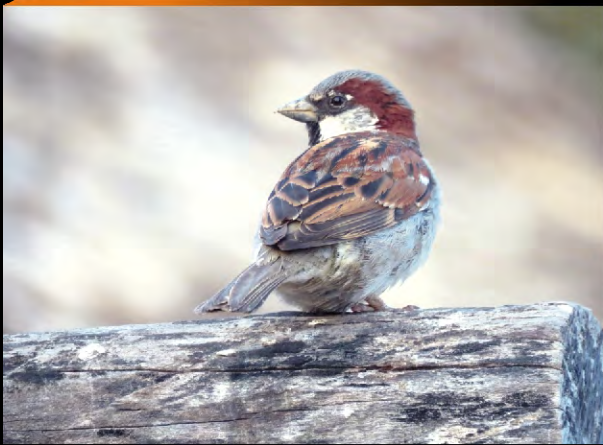
CASE STUDIES

URBAN FOCUS

MULTIPLE-CITY ○ WEST-CENTRAL MEXICO

MAGGREGOR-FORS & SCHONDUBE (2011) BASIC APPL ECOL, 12: 372-381

ABUNDANT



CABLES (+)
LIGHTNING RODS (+)
BUILDING HEIGHT (+)

MODERATELY ABUNDANT



TREE/SHRUB COVER (+)
PASSING PEDESTRIANS (-)
BUILDING COVER (-)
POLES/DOGS (-)

RARE



TREE COVER (+)
HERBACEOUS HEIGHT (+)
DOGS/PEDESTRIANS (-)
LAMP POLES (-)

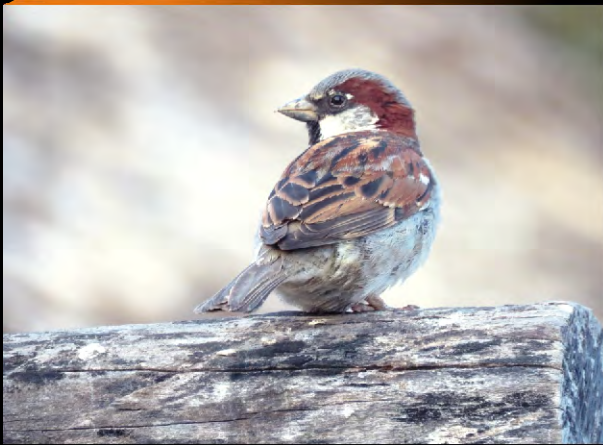
CASE STUDIES

URBAN FOCUS

MULTIPLE-CITY ○ WEST-CENTRAL MEXICO

MAGGREGOR-FORS & SCHONDUBE (2011) BASIC APPL ECOL, 12: 372-381

ABUNDANT



CABLES (+)
LIGHTNING RODS (+)
BUILDING HEIGHT (+)

MODERATELY ABUNDANT



TREE/SHRUB COVER (+)
PASSING PEDESTRIANS (-)
BUILDING COVER (-)
POLES/DOGS (-)

RARE



TREE COVER (+)
HERBACEOUS HEIGHT (+)
DOGS/PEDESTRIANS (-)
LAMP POLES (-)

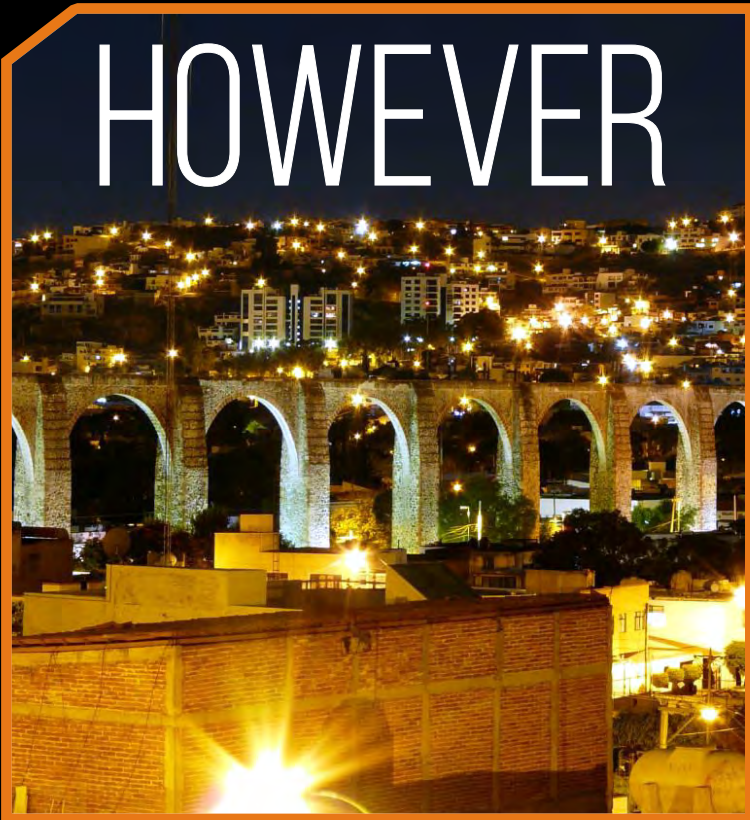
CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ SEMI-ARID CENTRAL MEXICO

MALAGAMBA-RUBIO ET AL (2013) ORNITOL NEOTROP, 24: 371-386

HOWEVER

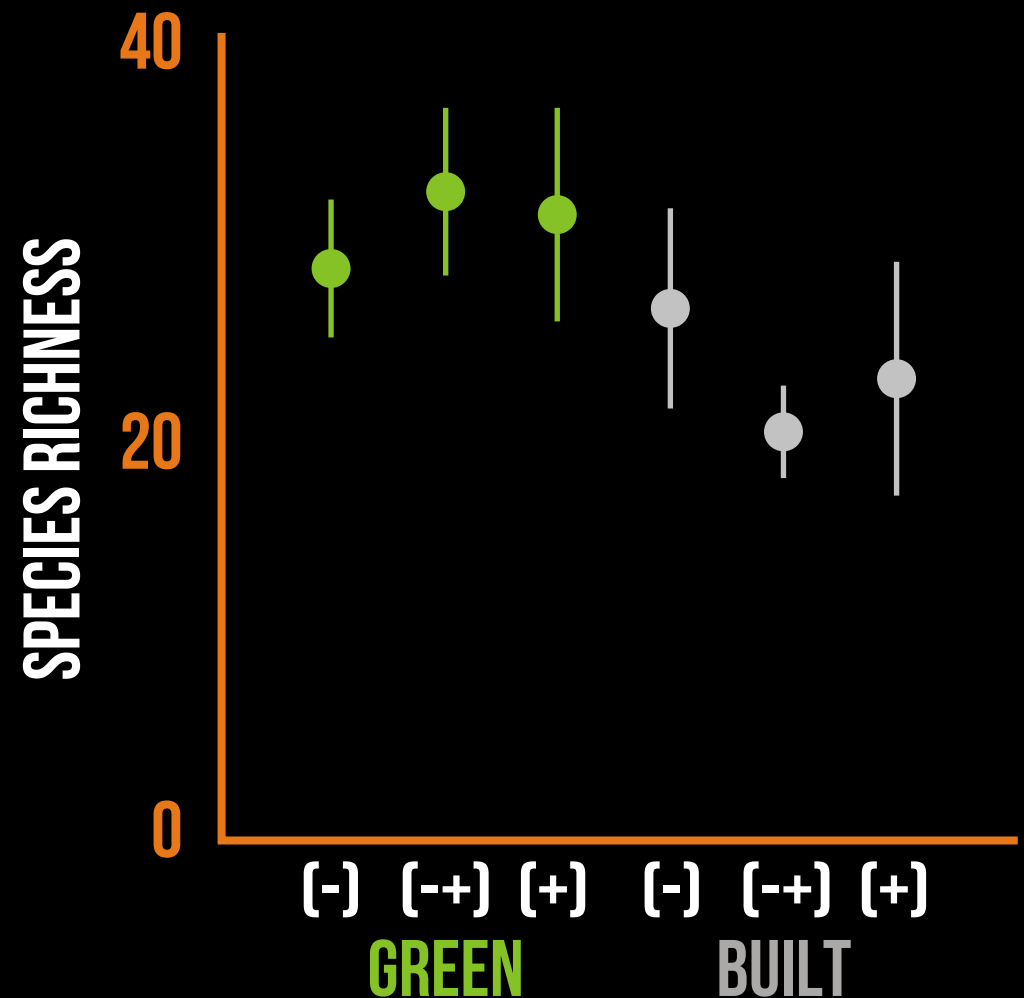
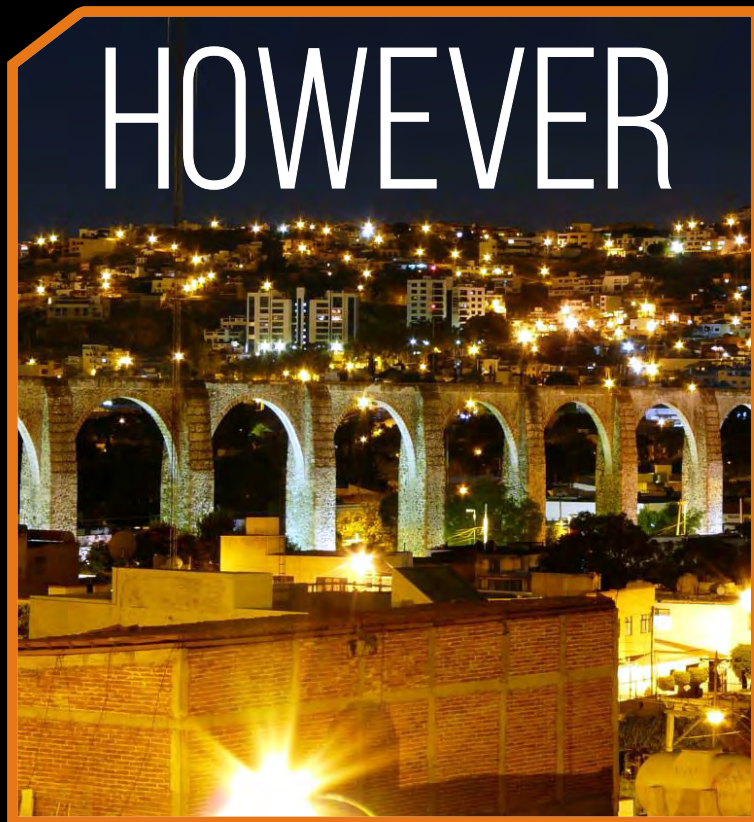


CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ SEMI-ARID CENTRAL MEXICO

MALAGAMBA-RUBIO ET AL (2013) ORNITOL NEOTROP, 24: 371-386

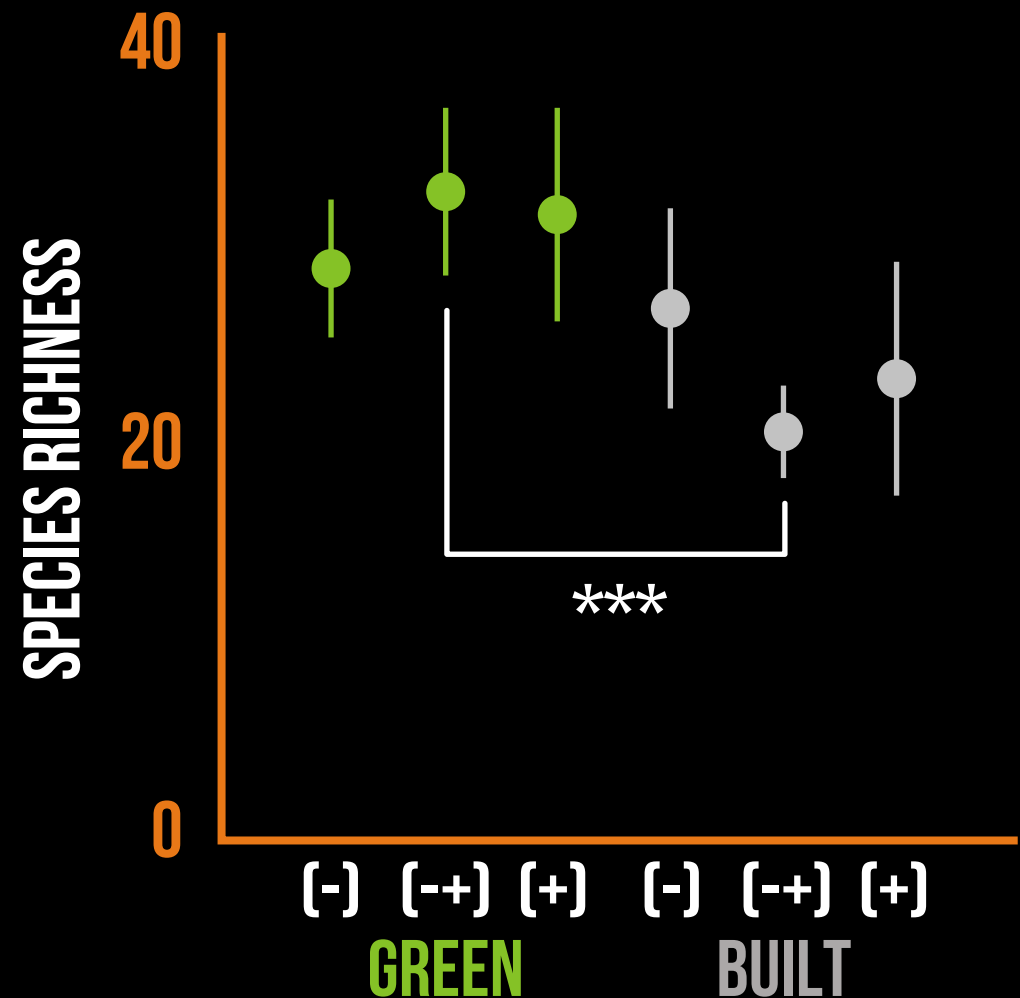
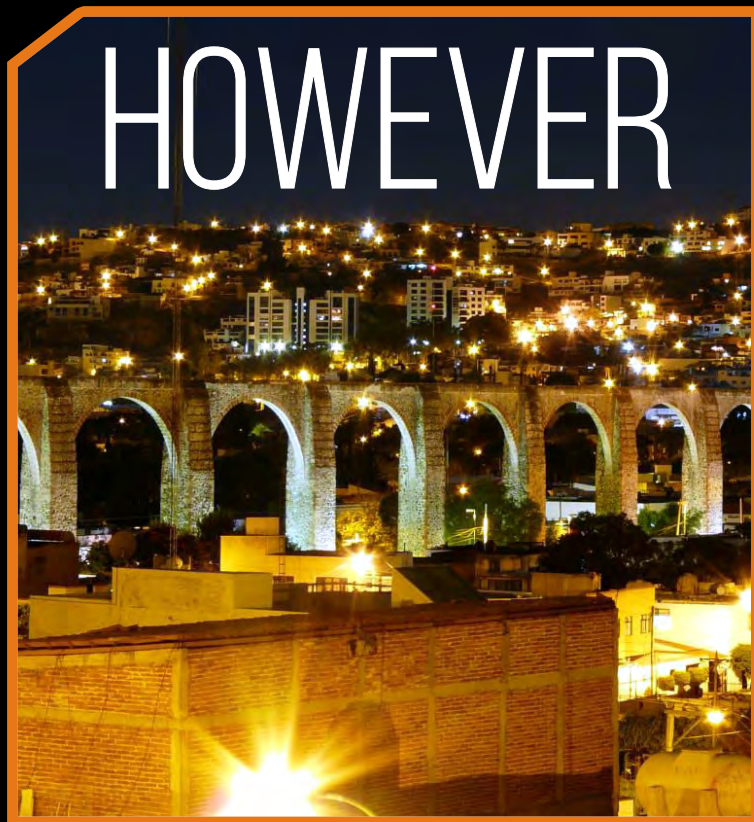


CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ SEMI-ARID CENTRAL MEXICO

MALAGAMBA-RUBIO ET AL (2013) ORNITOL NEOTROP, 24: 371-386



SINGLE-CITY ○ WEST-CENTRAL MEXICO

MACGREGOR-FORS ET AL (2010) CONDOR, 112: 711-717

WHAT
HAPPENS
TO
MIGRATORY
BIRDS?

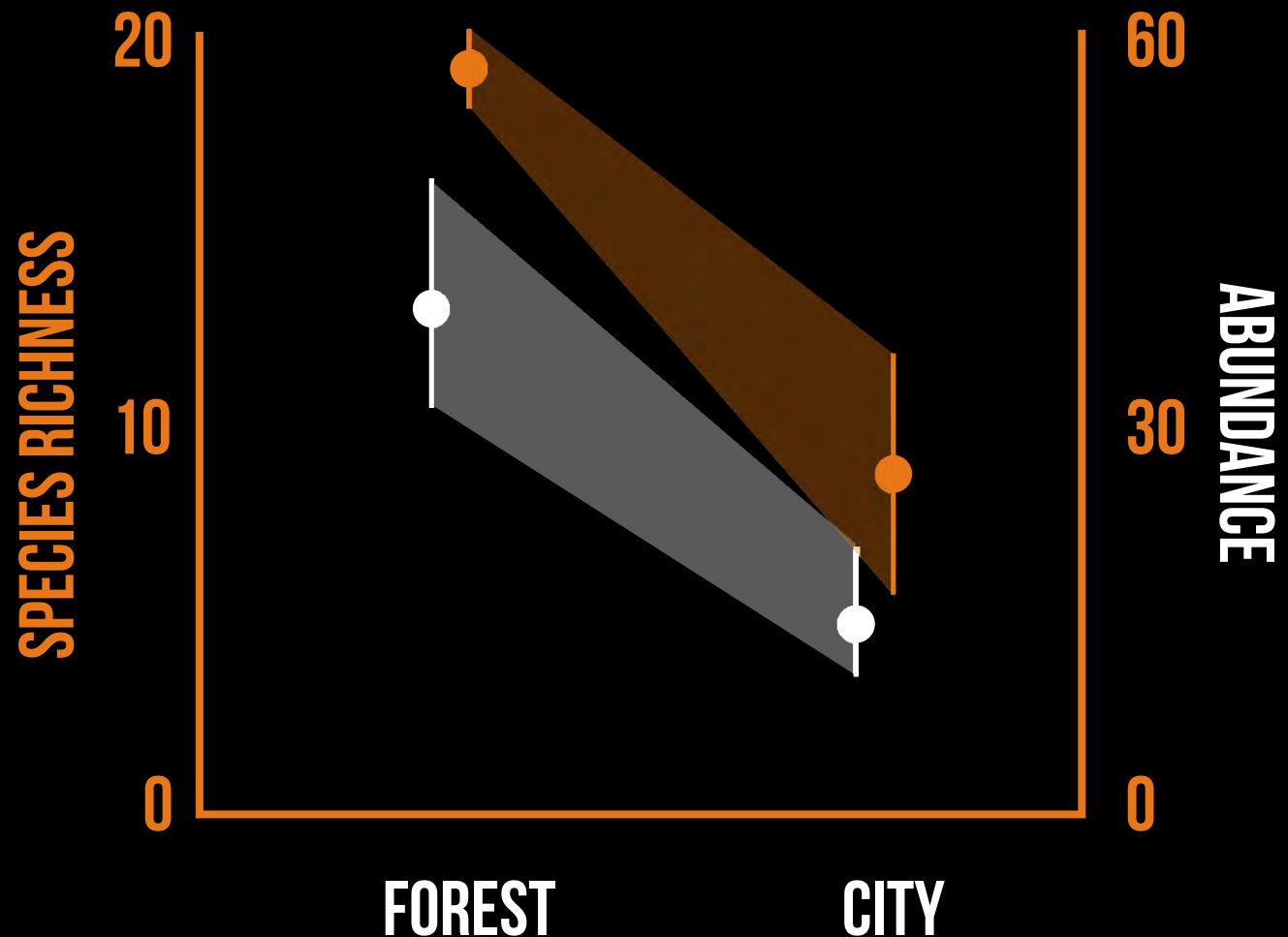
CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ WEST-CENTRAL MEXICO

MACGREGOR-FORS ET AL (2010) CONDOR, 112: 711-717

WHAT
HAPPENS
TO
MIGRATORY
BIRDS?



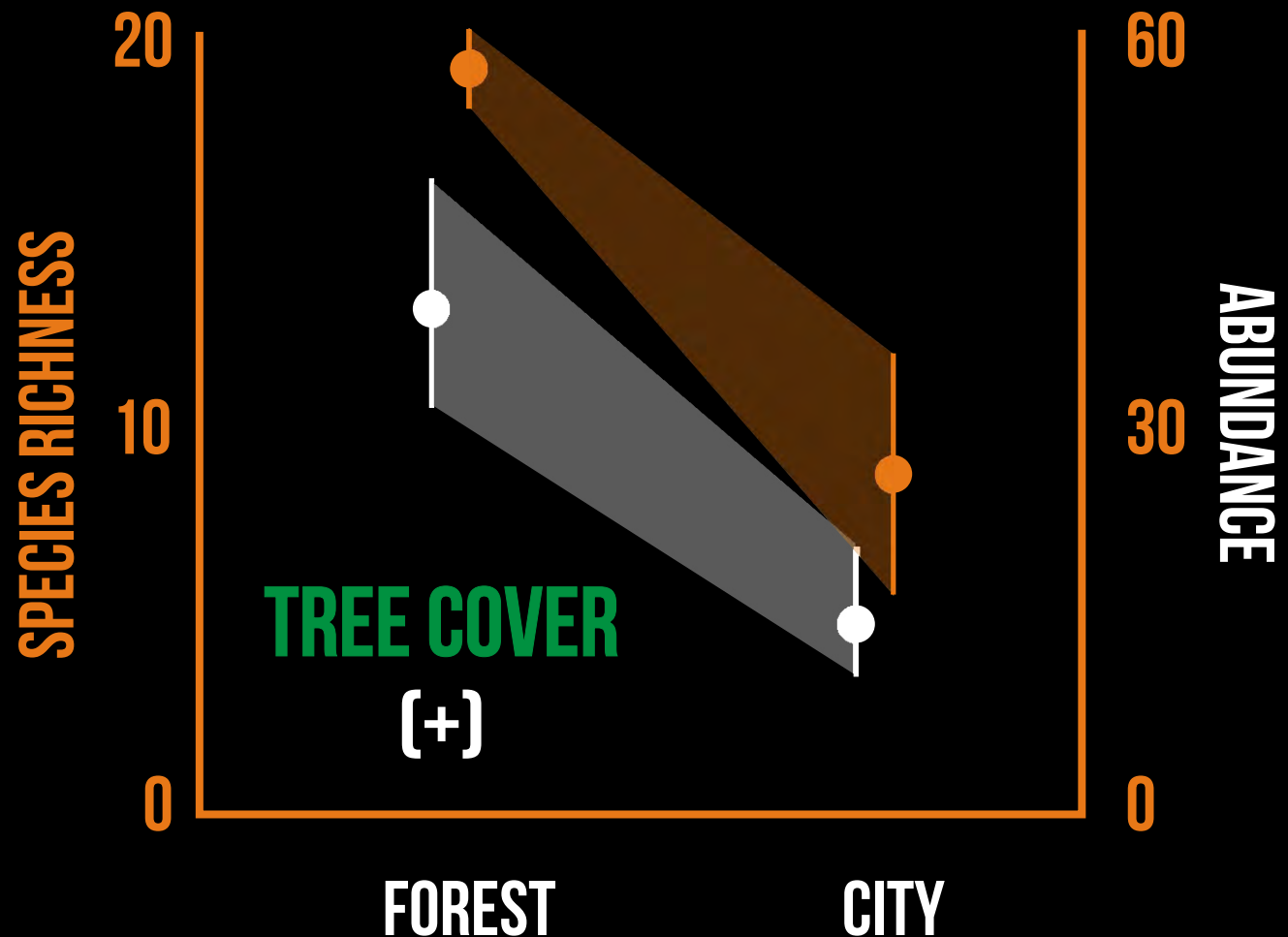
CASE STUDIES

URBAN FOCUS

SINGLE-CITY ○ WEST-CENTRAL MEXICO

MACGREGOR-FORS ET AL (2010) CONDOR, 112: 711-717

WHAT
HAPPENS
TO
MIGRATORY
BIRDS?

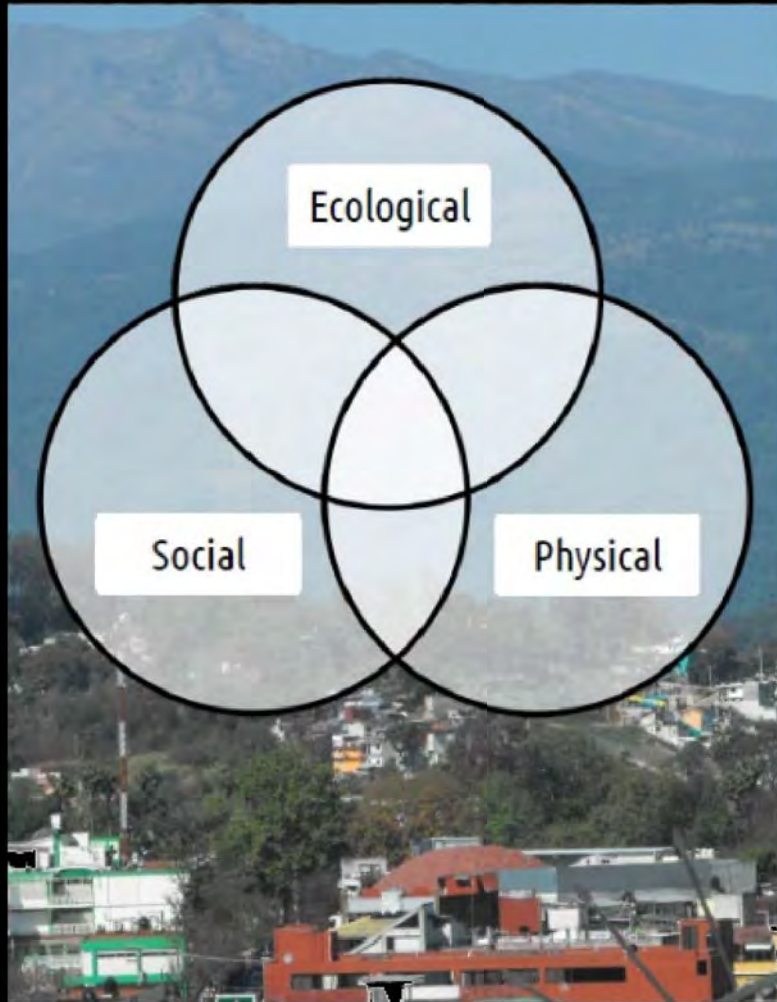


GETTING THINGS

COMPLICATED

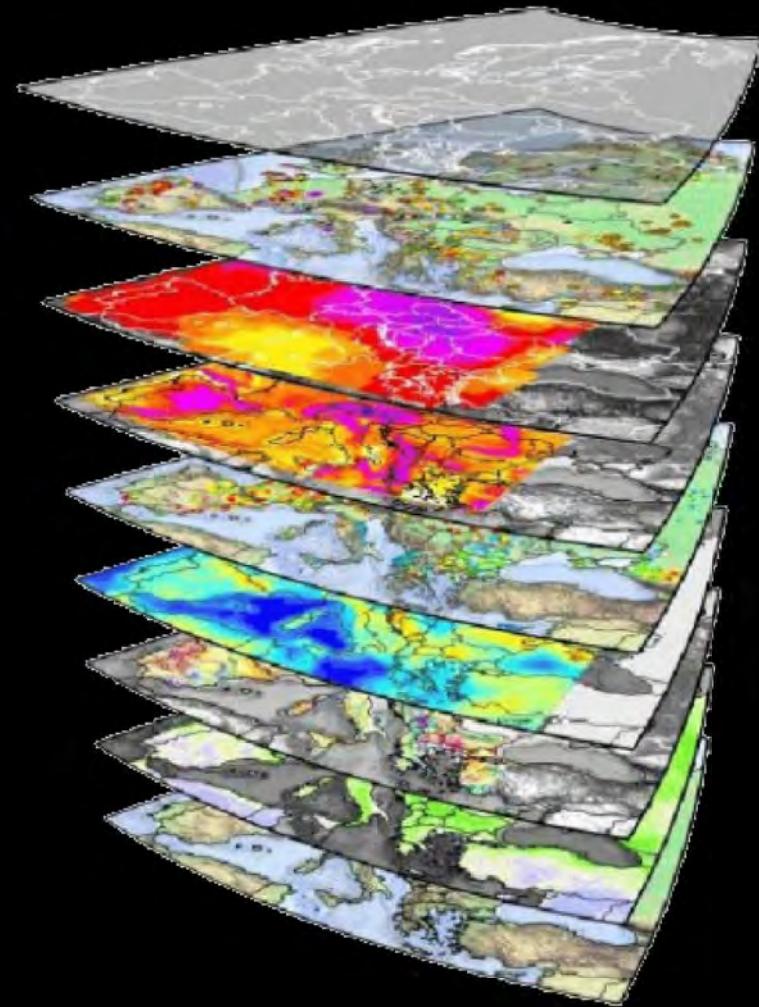
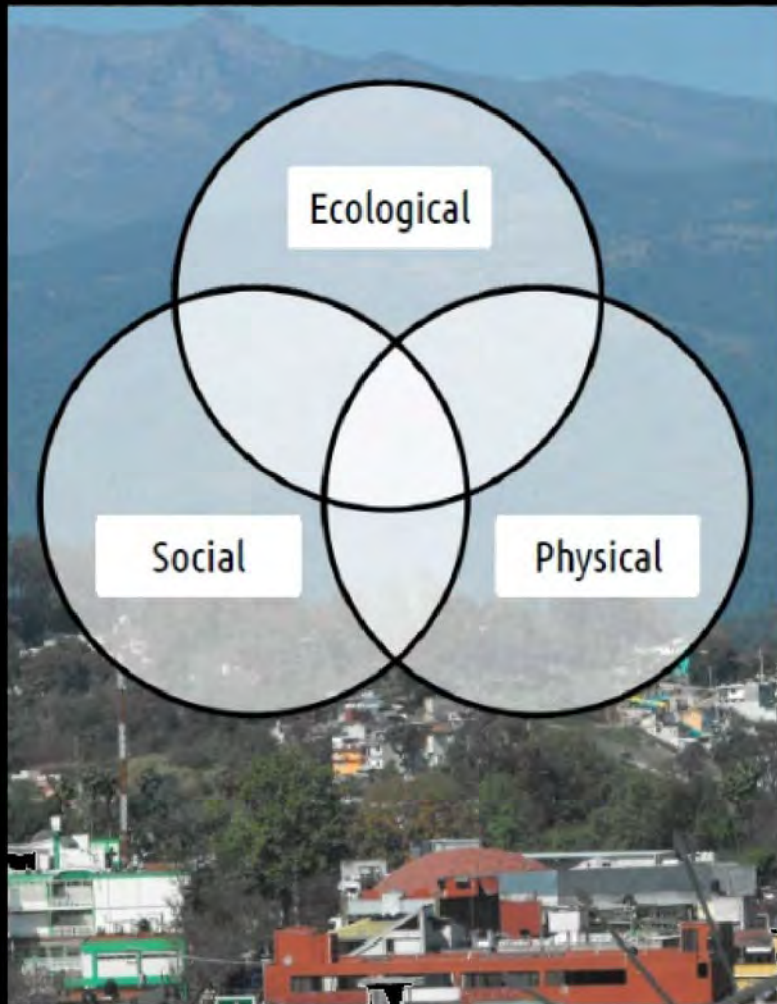
GETTING THINGS

COMPLICATED



GETTING THINGS

COMPLICATED



ECOSYSTEM

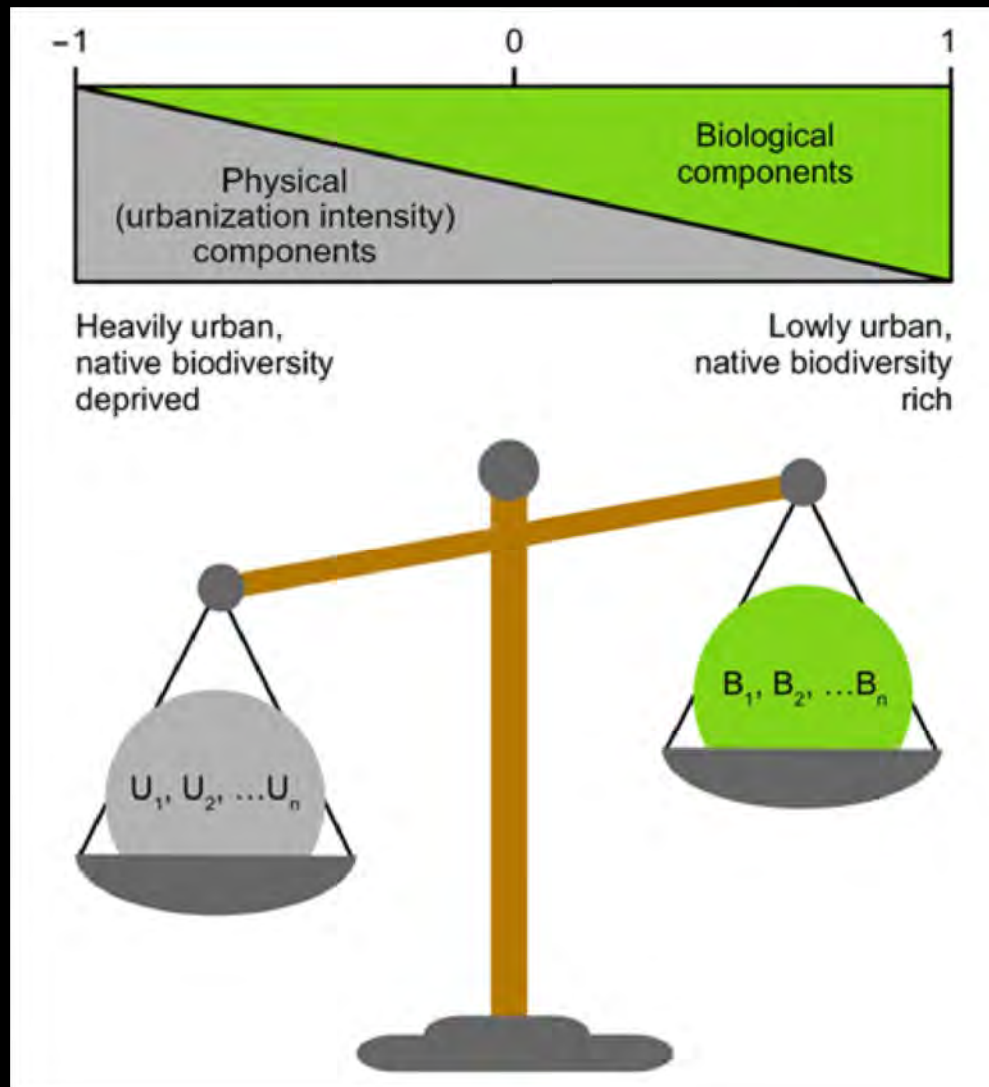
INTEGRITY

“THE CAPABILITY OF SUPPORTING AND MAINTAINING A BALANCED, INTEGRATED, ADAPTIVE COMMUNITY OF ORGANISMS HAVING A SPECIES COMPOSITION, DIVERSITY, AND FUNCTIONAL ORGANIZATION COMPARABLE TO THAT OF NATURAL HABITAT OF THE REGION”

KARR ET AL. 1981

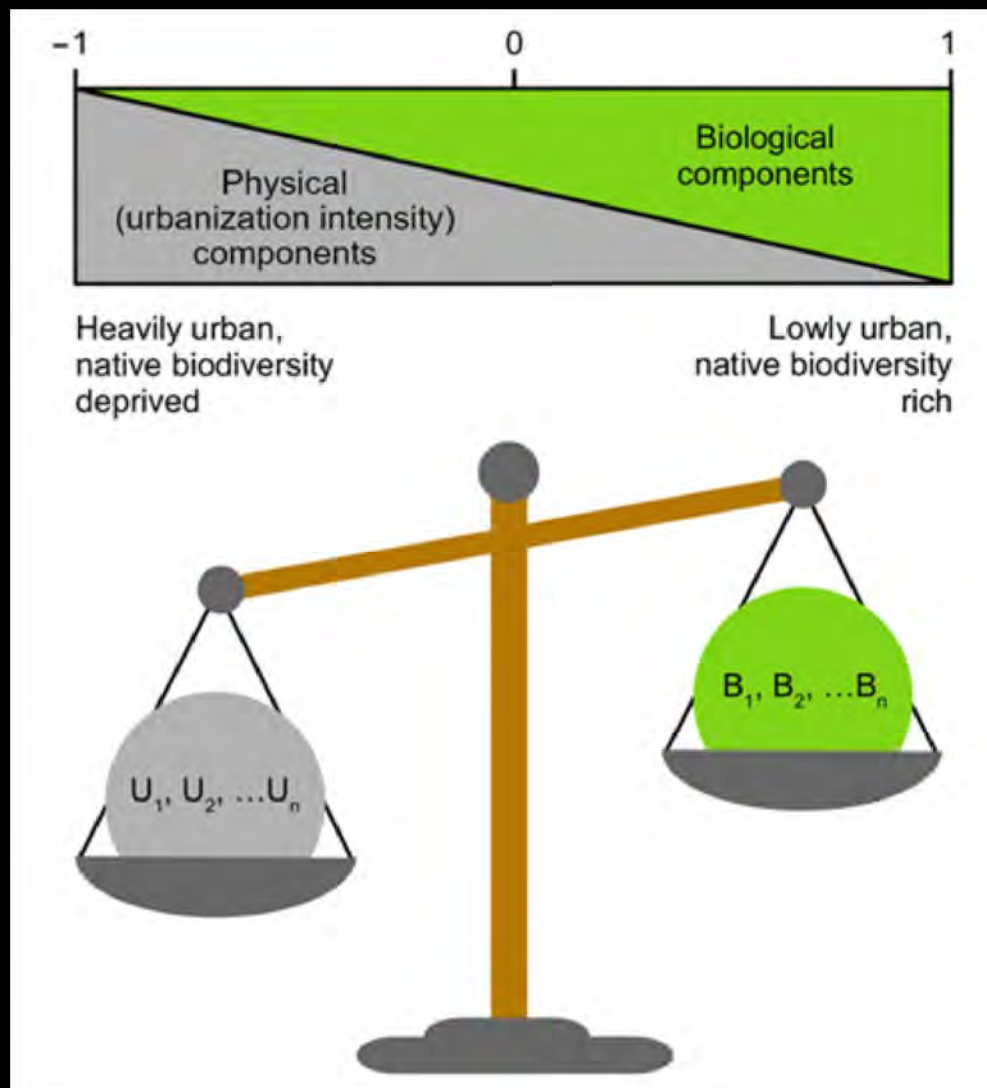
ECOSYSTEM

INTEGRITY



ECOSYSTEM

INTEGRITY



$$UEII = \{[(U_1 + U_2 + \dots + U_n)/n_U] (-1)\} + [(B_1 + B_2 + \dots + B_n)/n_B],$$

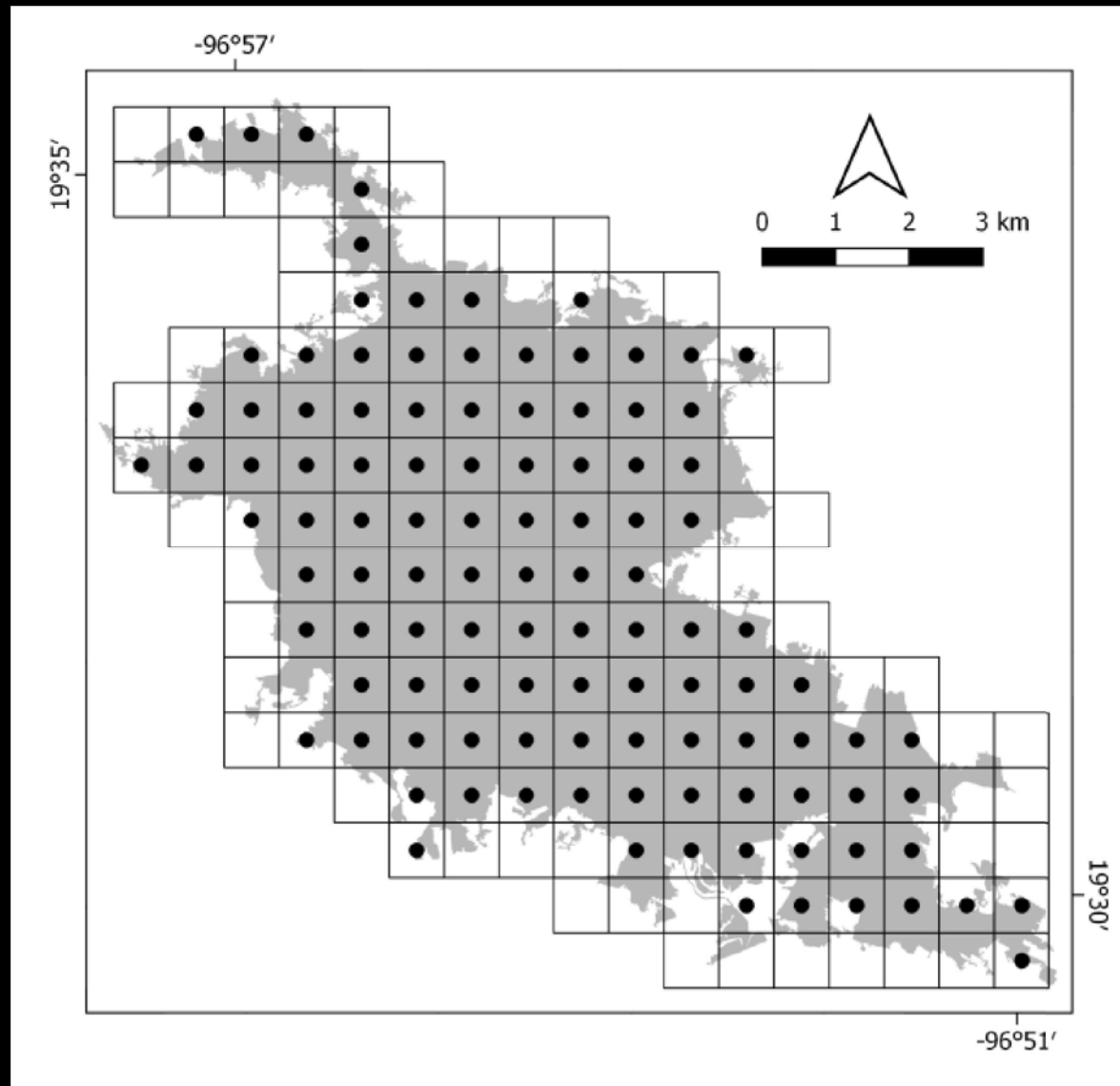
ECOSYSTEM

INTEGRITY



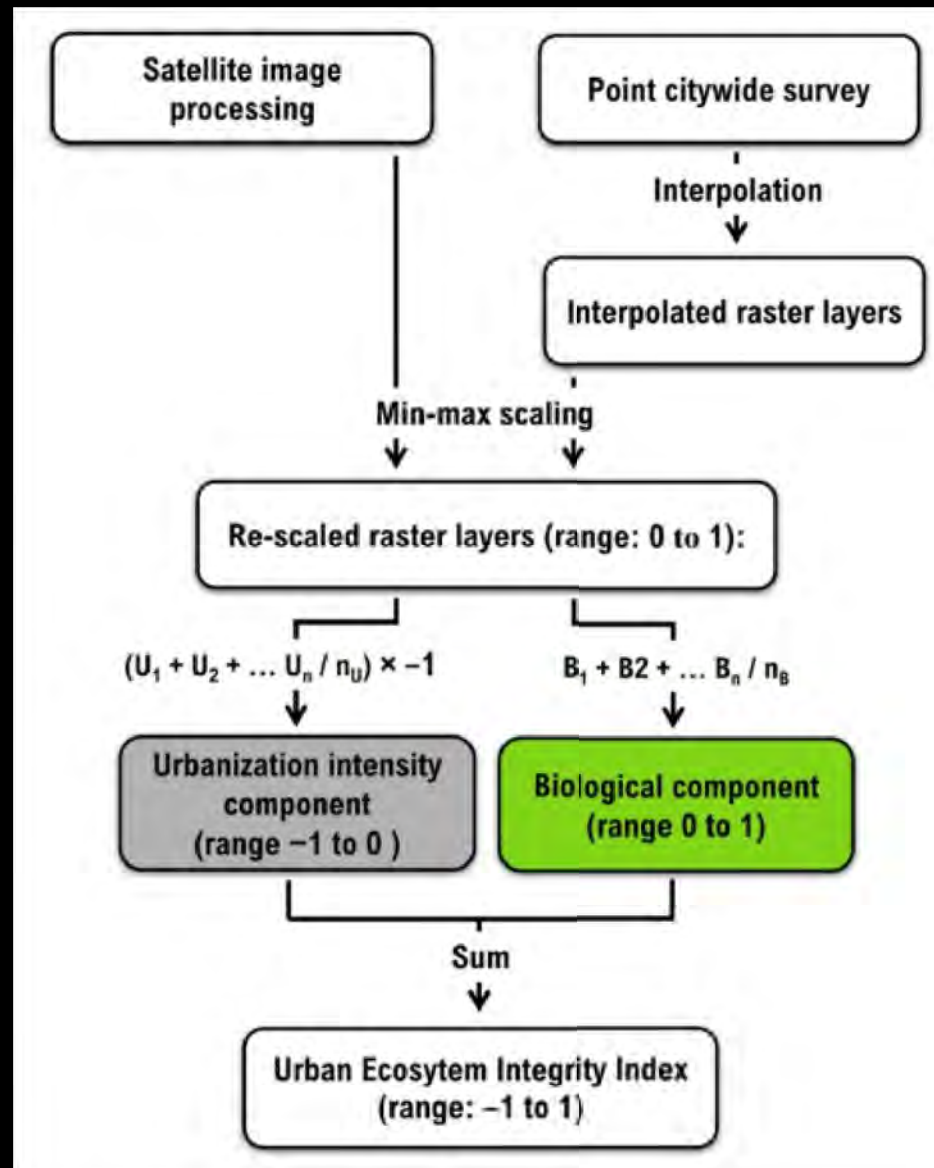
ECOSYSTEM

INTEGRITY



ECOSYSTEM

INTEGRITY

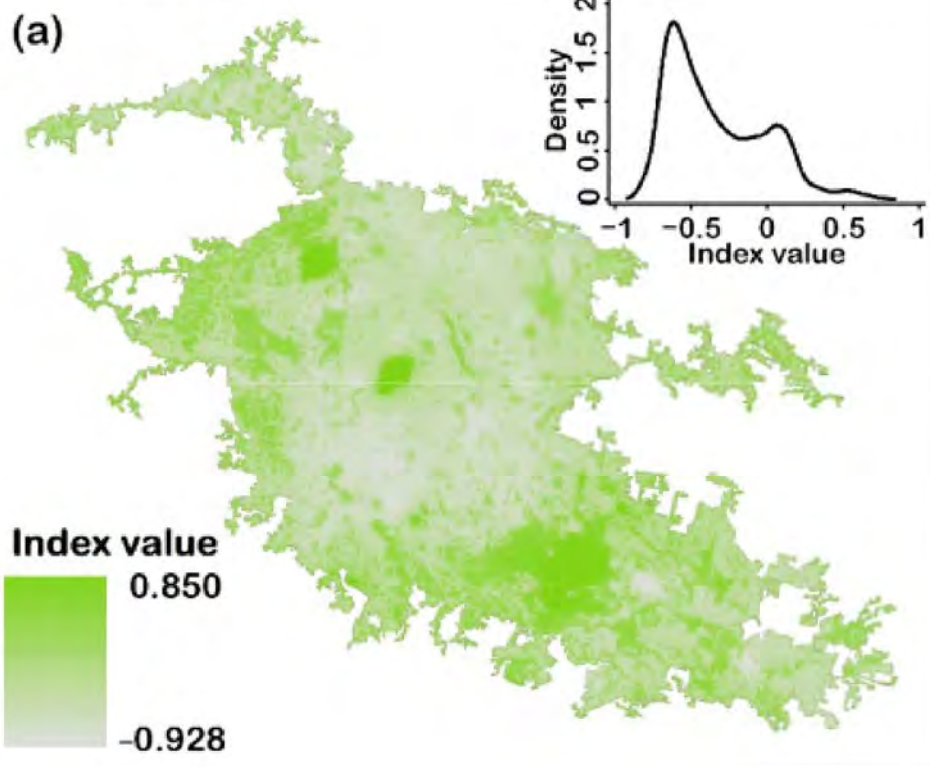


ECOSYSTEM

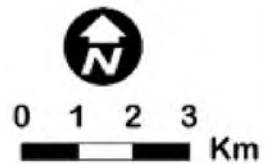
INTEGRITY

96°57'0"W

19°35'15"N



(b)



19°29'45"N

96°51'30"W