

Bird Community Responses to Afforested Eucalyptus Plantations in Argentina

a preliminary investigation

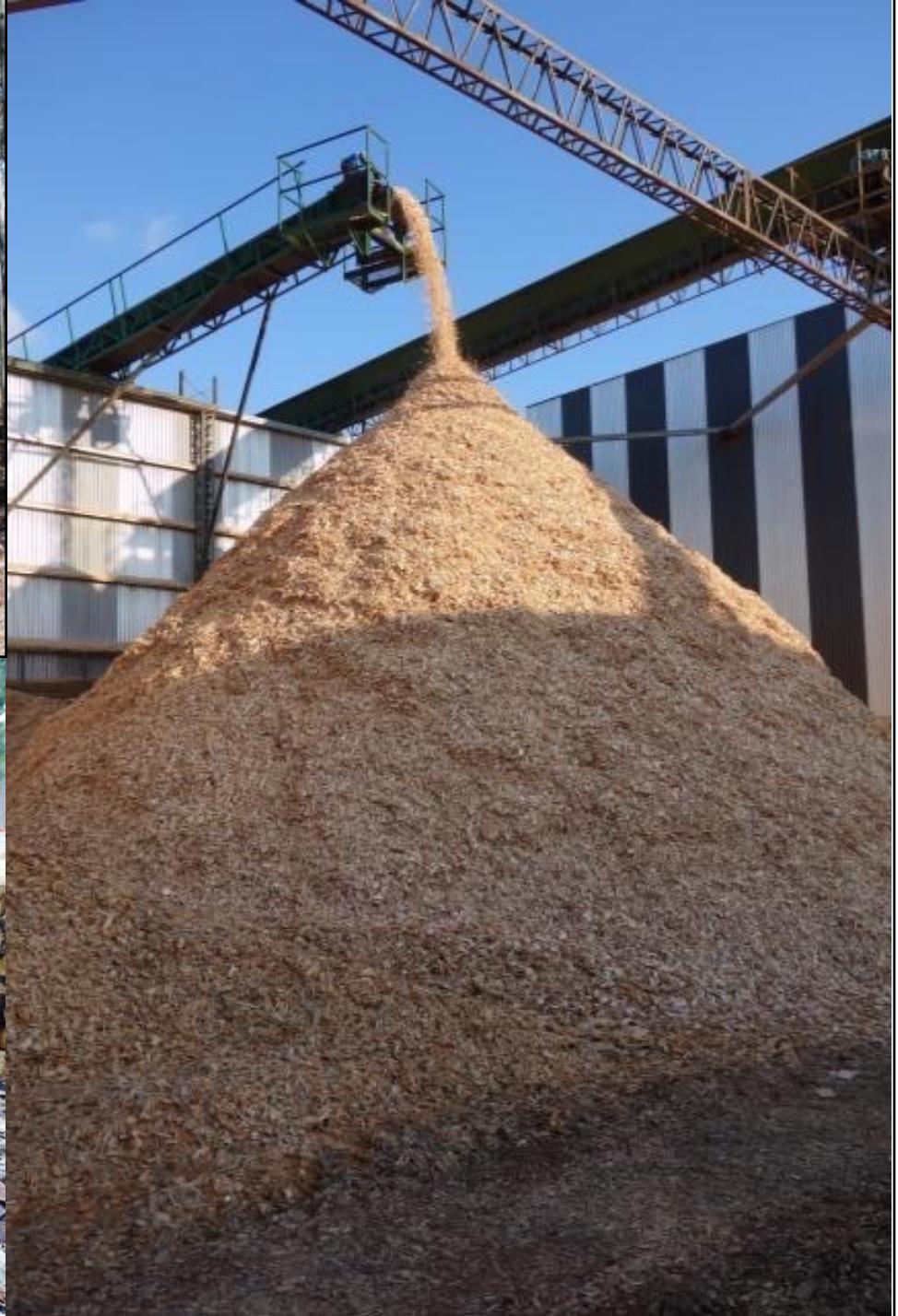
IALE 2016: Reshaping Landscapes Bioenergy & Biodiversity Symposium

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Argentina Bioenergy Background

- **3rd largest producer of bioenergy** (soy → biodiesel)
- Law N° 26.190 sets **8% renewable energy** by 2016
→ biomass part of portfolio → **biomass export**
- Law N° 25.080 & N° 26.432 provides **direct tax incentives for investment in plantation forestry**
- 2003 – 2015, **9x increase in tree plantations** in Entre Ríos
- In 2016 President Macri announced a **200+% increase in afforested plantation subsidizes** → expanding eucalyptus plantations, mostly in Entre Ríos because of available land



What is the social-ecological sustainability of large-scale eucalyptus plantations in this region?

Biodiversity: Essential to Sustainability



Birds and native bees provide direct ecosystem services that contribute to human well-being

Biodiversity: Essential to Sustainability



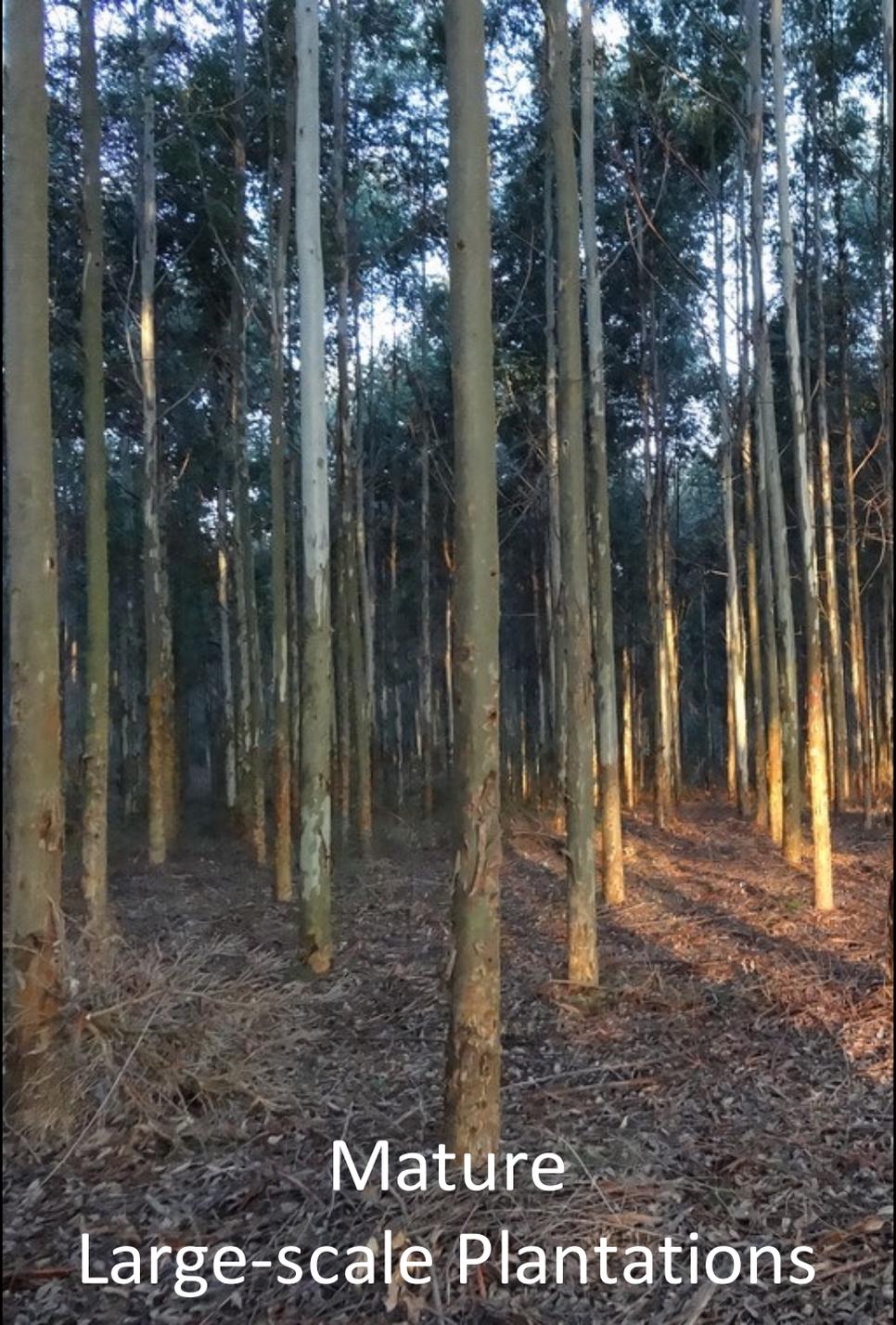
Birds and native bees provide direct ecosystem services that contribute to human well-being

How does bioenergy related
land-use change affect *avian*
biodiversity?





Pasture/Annual Crops



Mature
Large-scale Plantations



Young
Large-scale Plantations



Small Eucalyptus



Blueberry



Citrus

Mixed-use Farms



Espinal Savanna



Mature
Eucalyptus



Young
Eucalyptus



Pasture/Annual
Crops



Mixed-use
Farms



Espinal
Savanna

How do birds respond to these 5 land uses?

Research Questions

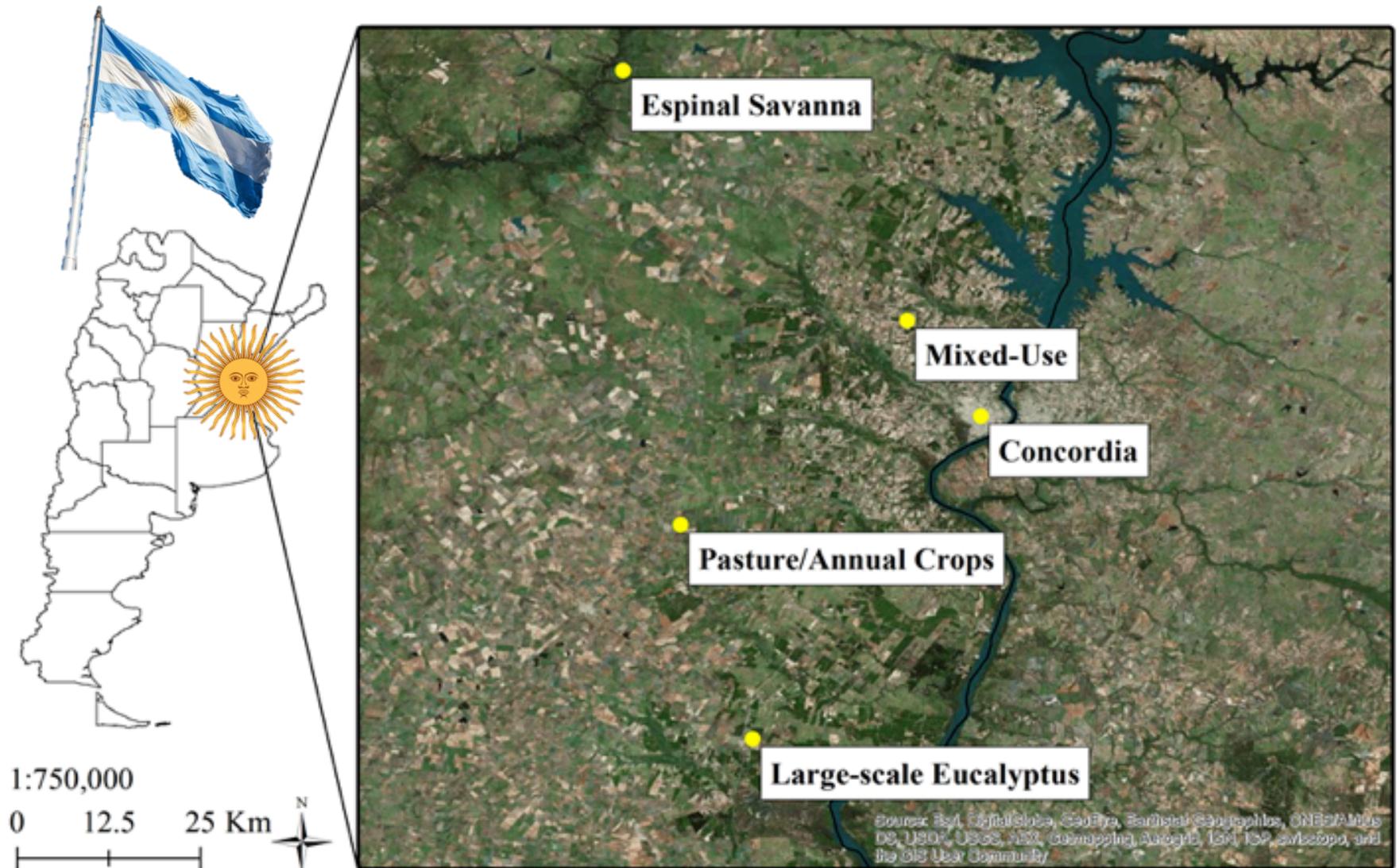
Q1: How does land-use change affect richness, abundance and community?

Q2: Do birds use Is there a threshold between young & old eucalyptus stands?

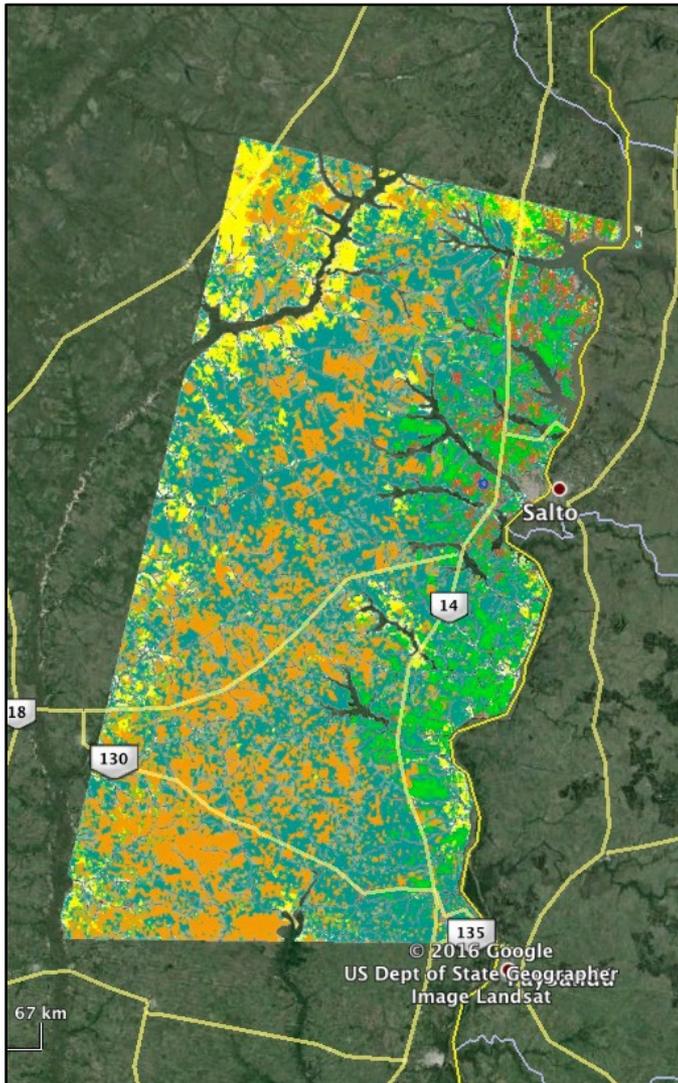
Q3: Do edge effects extend beyond the plantation edge?



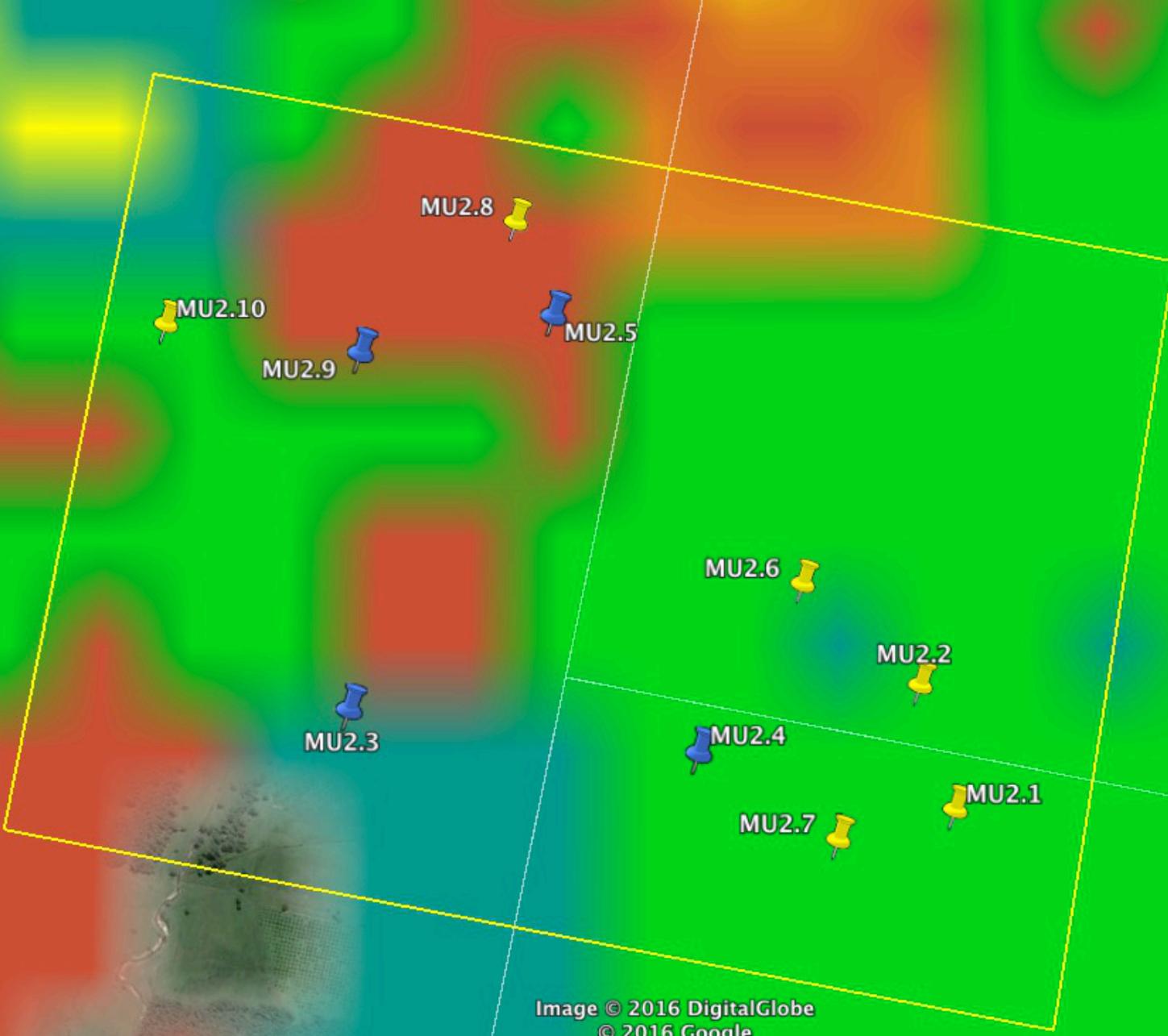
Study Area & Design



Study Area & Design



- Custom land use map with 5 land use covers
 - Plantation
 - Fruiculture
 - Pasture
 - Annual crops
 - Espinal
- Ground-truthed & confusion matrix → 95% accuracy
- Four 300 ha replicates/land use (* only 3 young euc.)



MU2.8



MU2.10



MU2.9



MU2.5



MU2.6



MU2.2



MU2.3



MU2.4



MU2.7



MU2.1

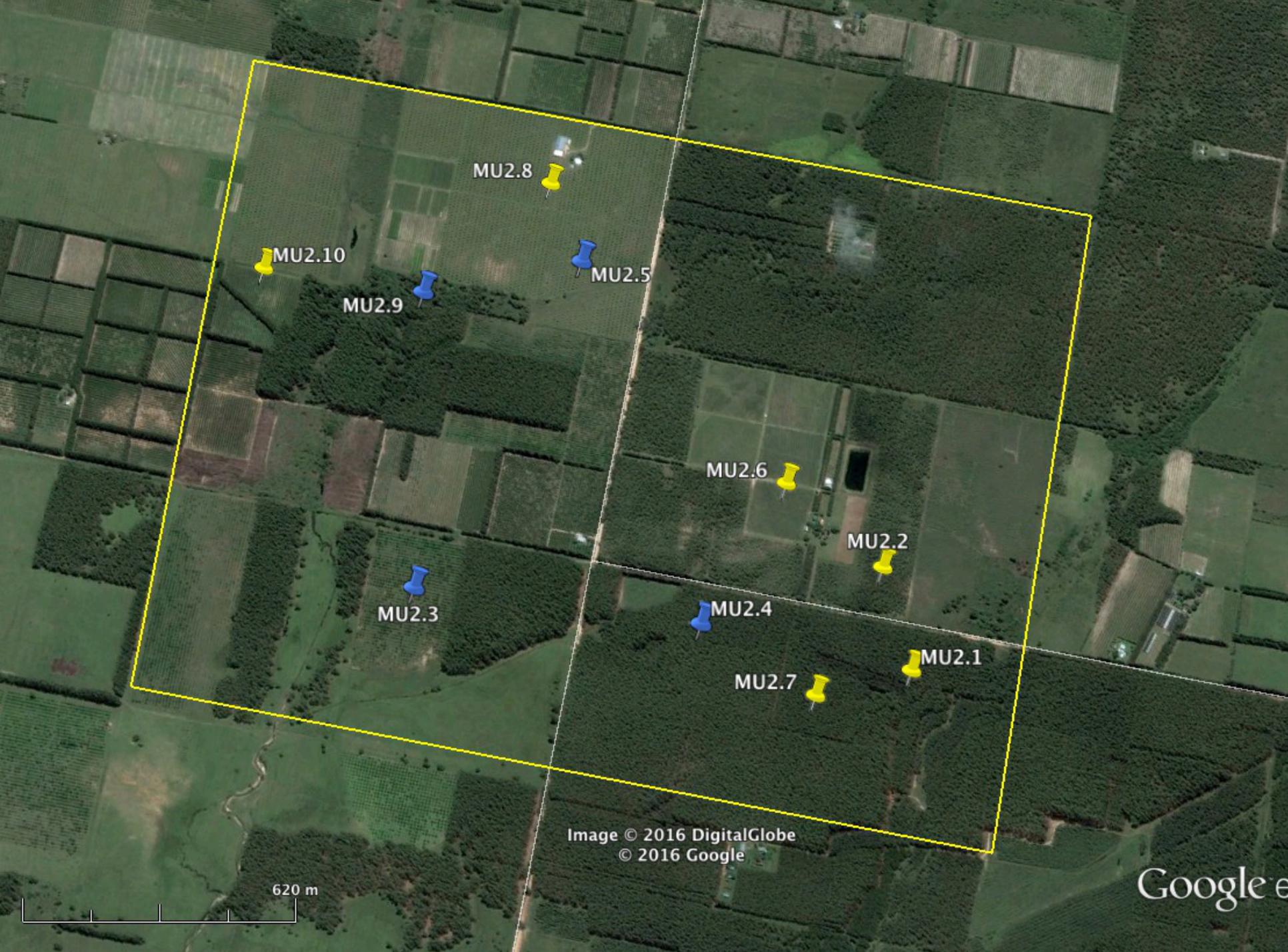


Image © 2016 DigitalGlobe
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620 m



Google



MU2.8

MU2.10

MU2.9

MU2.5

MU2.6

MU2.2

MU2.3

MU2.4

MU2.7

MU2.1

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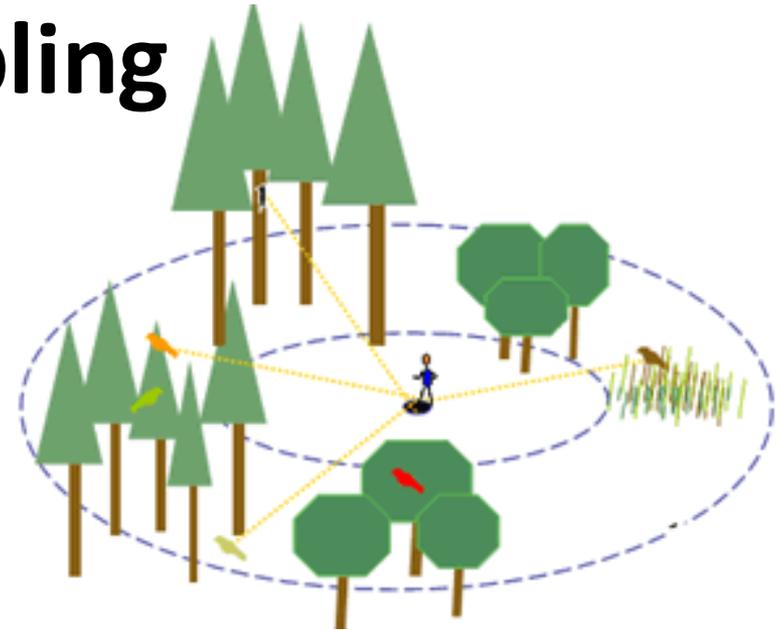
620 m

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Methods: Bird Sampling

Land Use Sampling

- Four 300 ha replicates/land use
- 10 random point/replicate
- 8 minute, 25 m fixed radius
- 2 surveys (Sept. & Nov.)



Edge Effect Sampling

- Three 1000 m transects
- Bisected large-scale plantation and adjacent grassland
- 10 points/transect
- Same methods & schedule

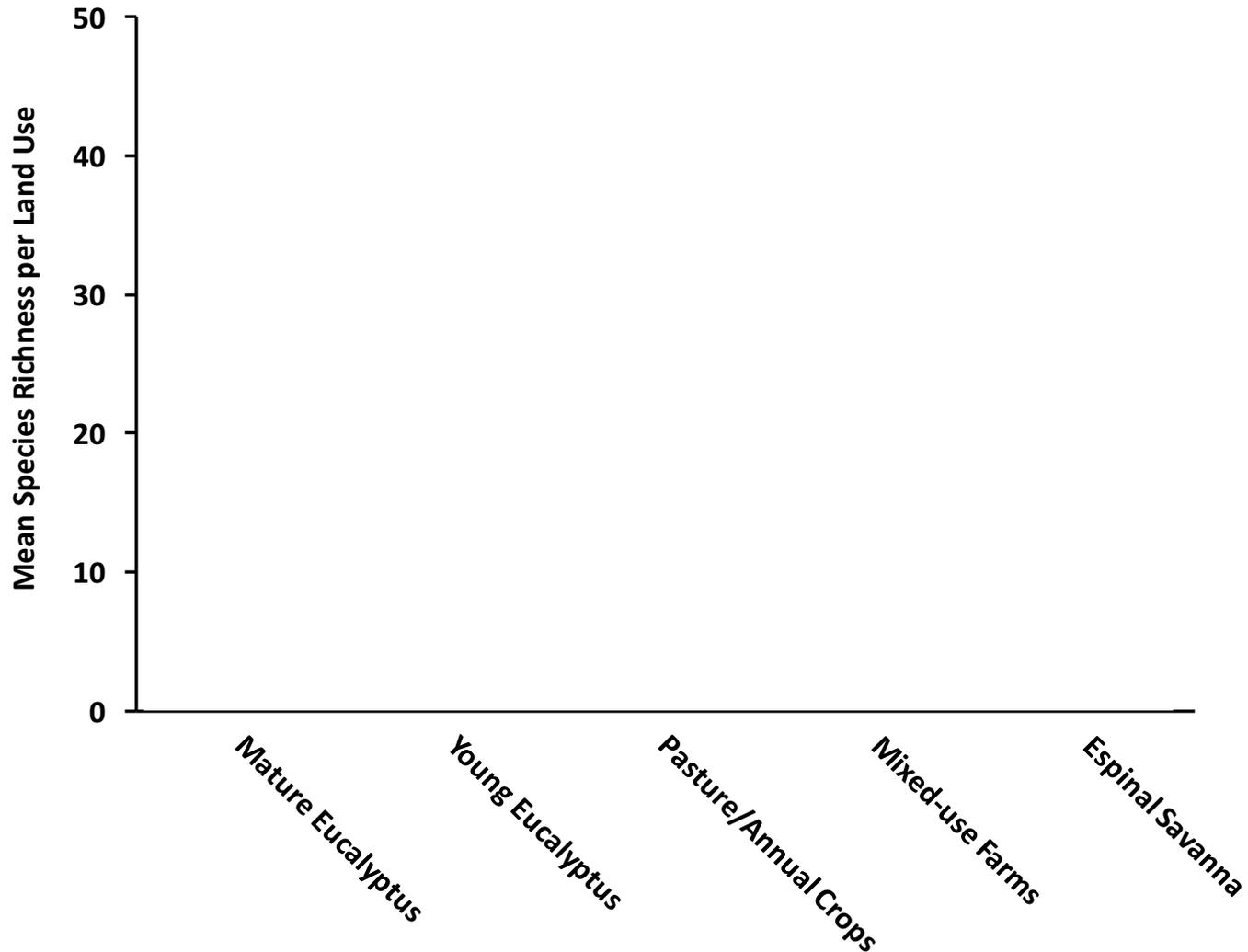


Methods (continued)

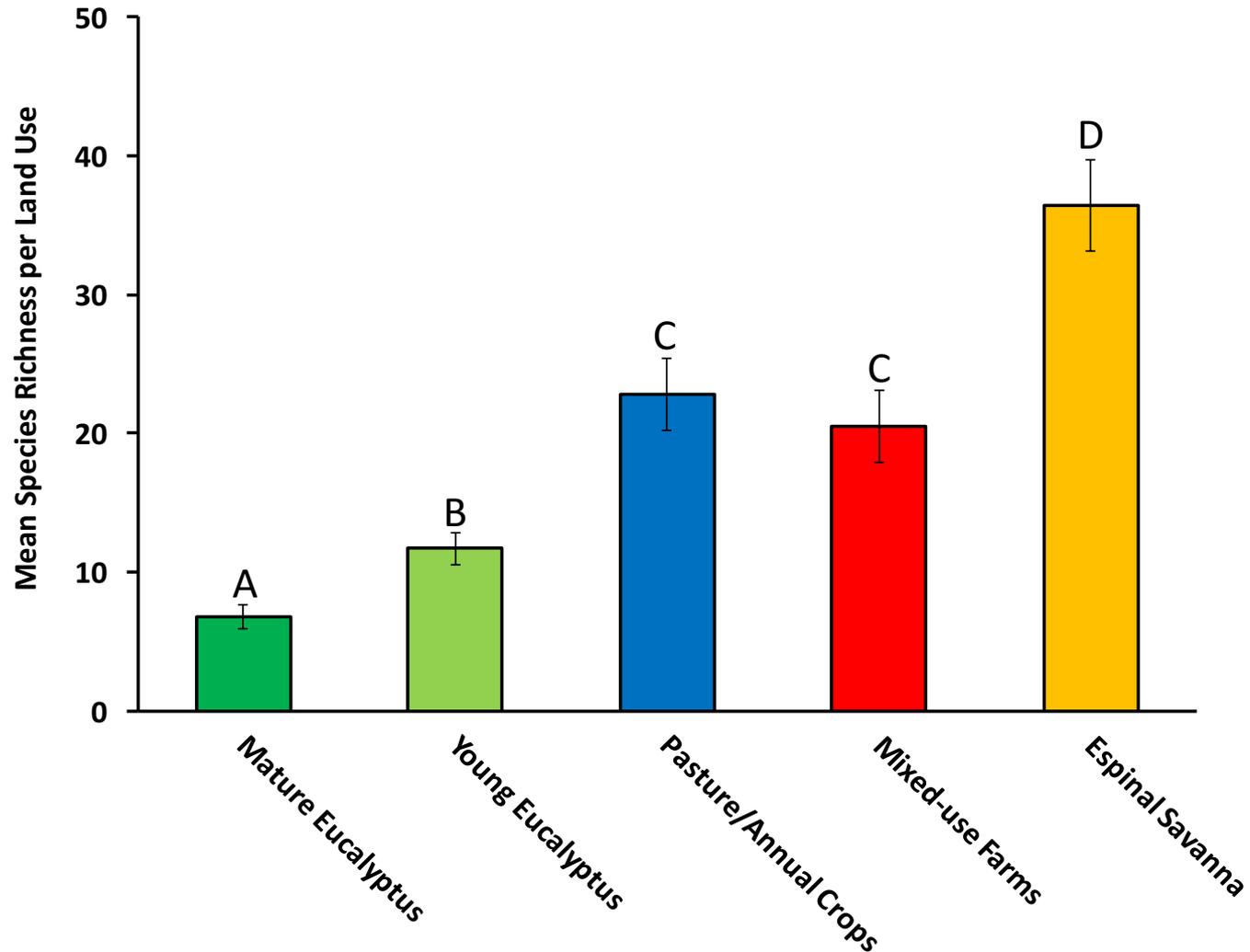
- **Q1 & Q2:** Contrast richness and abundance and use Nonmetric Multidimensional Scaling (NMDS) ordination technique to visualize communities
 - H1: Bird diversity would be greatest in the espinal & pasture and lowest in the large eucalyptus plantations because the plantations are the most structurally different from the original mosaic grasslands and savanna
 - H2: Young stands would show greater bird diversity than mature stands
- **Q3:** regression model with distance (independent) and richness and abundance as (dependent)
 - H3: Bird diversity would increase with increasing distance from the plantation due to “hard” plantation edge

Q1 Results: Species Richness

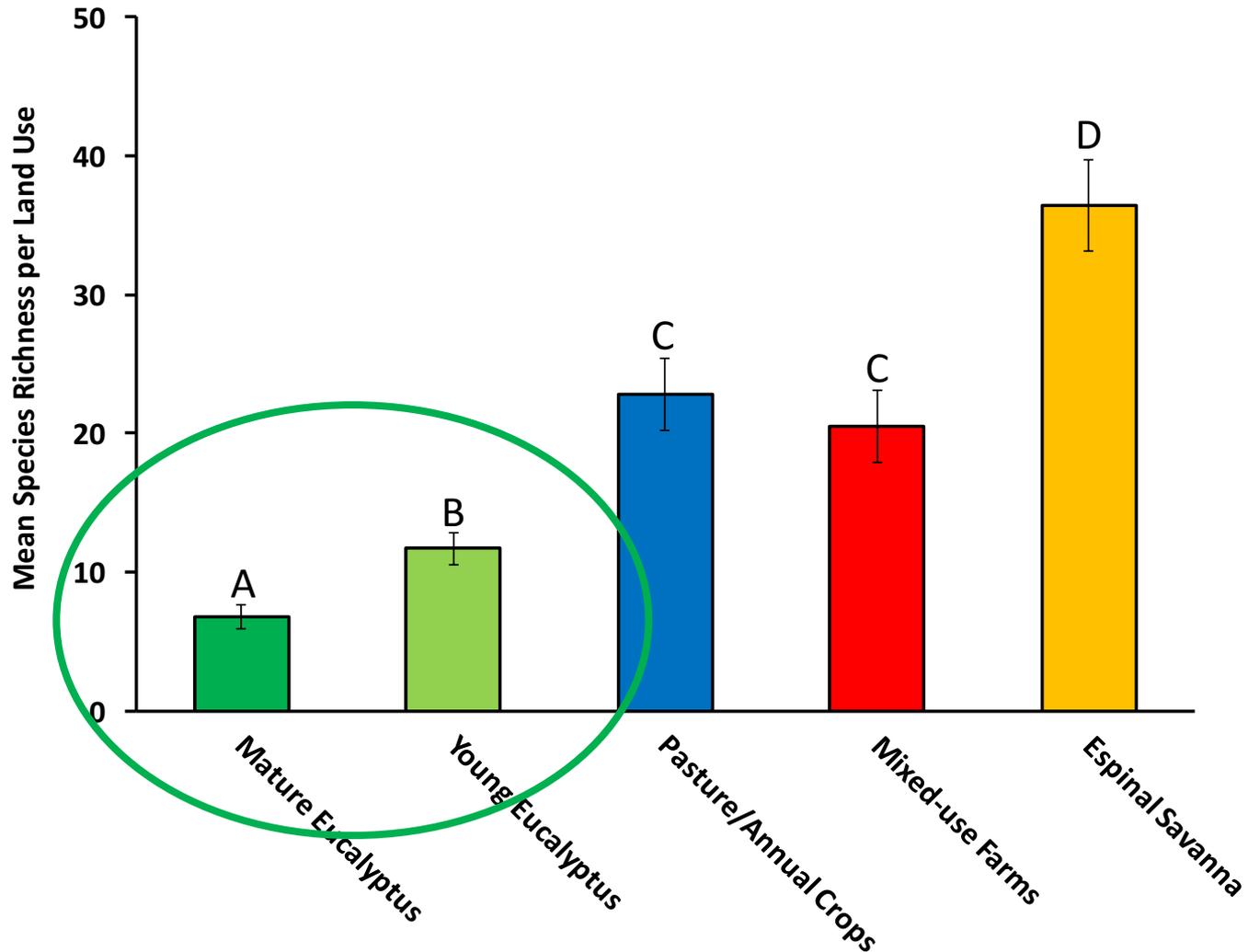
107 Spp total • 35% of est. 300 spp. in this region • 2,134 birds



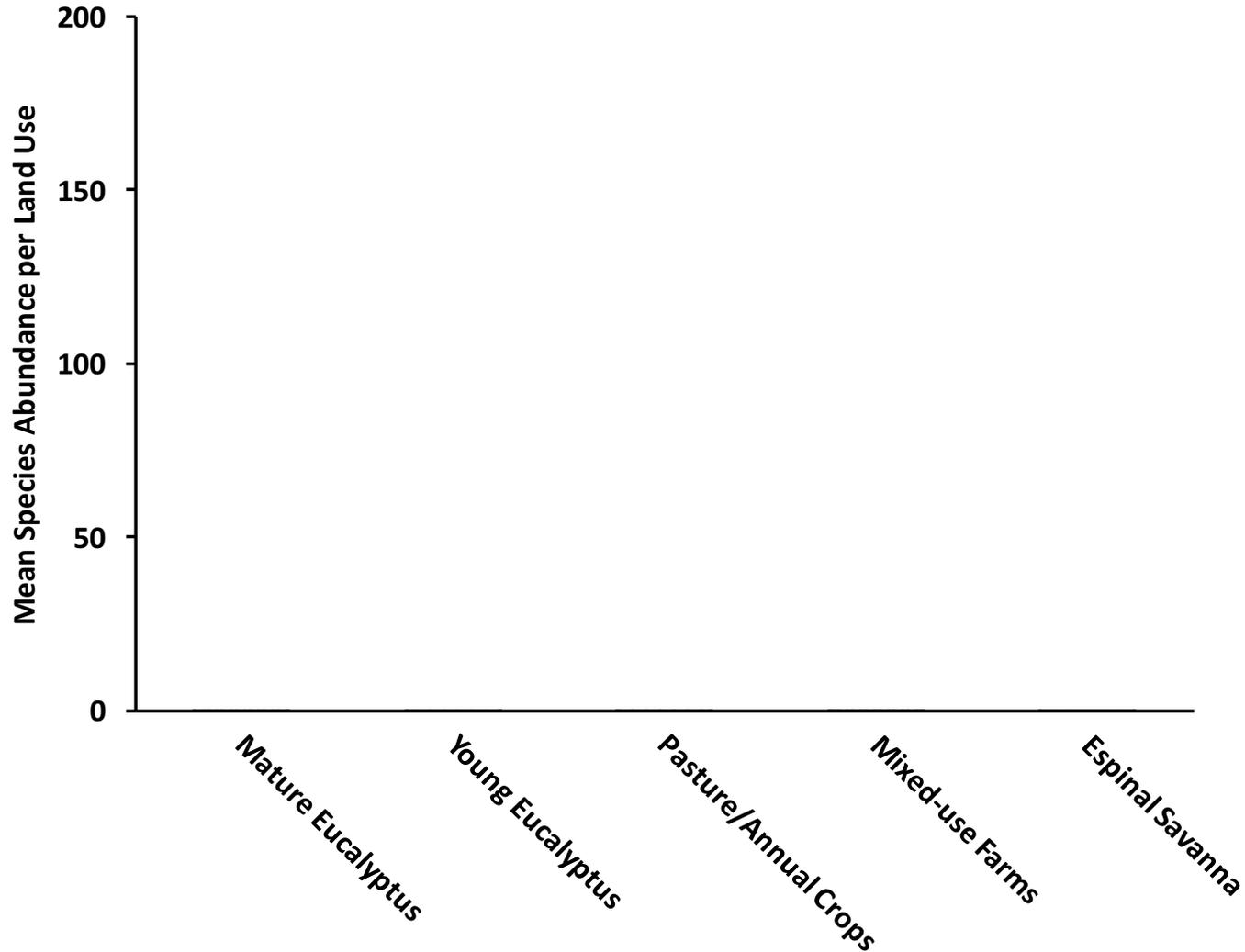
Q1 Results: Species Richness



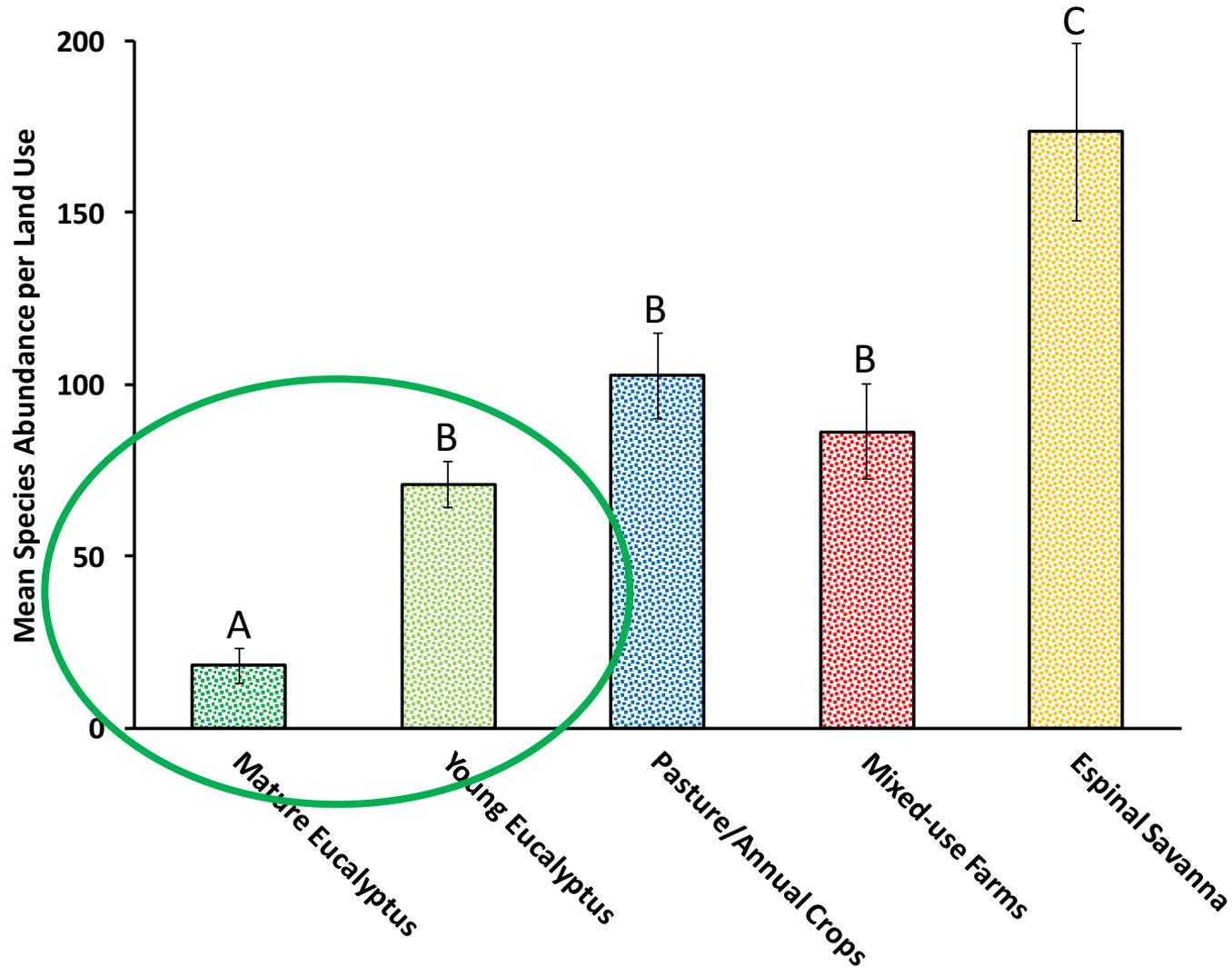
Q2 Results: Species Richness



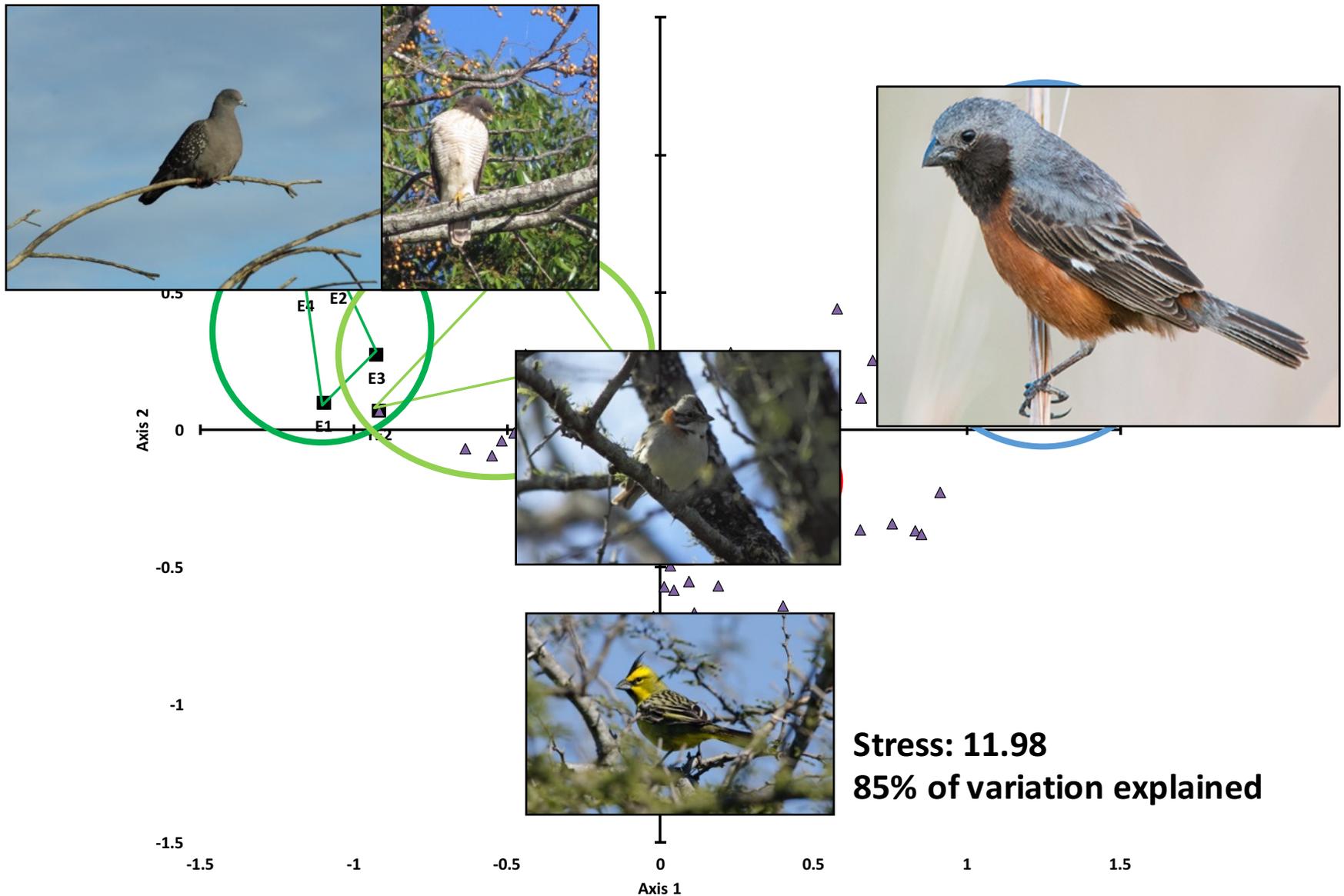
Q1 Results: Bird Abundance



Q1 & Q2 Results: Bird Abundance



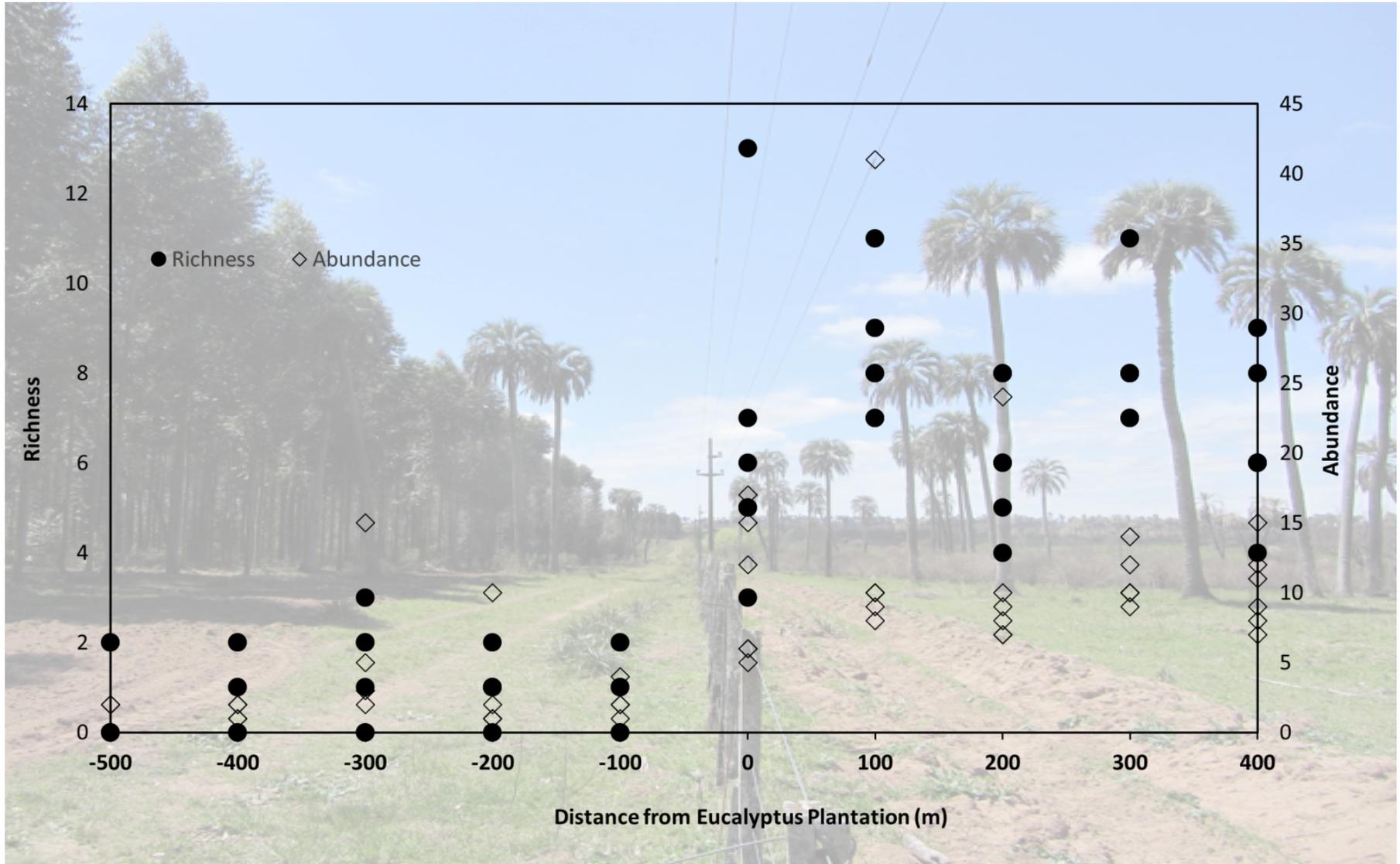
Q1 &2 Results: Community



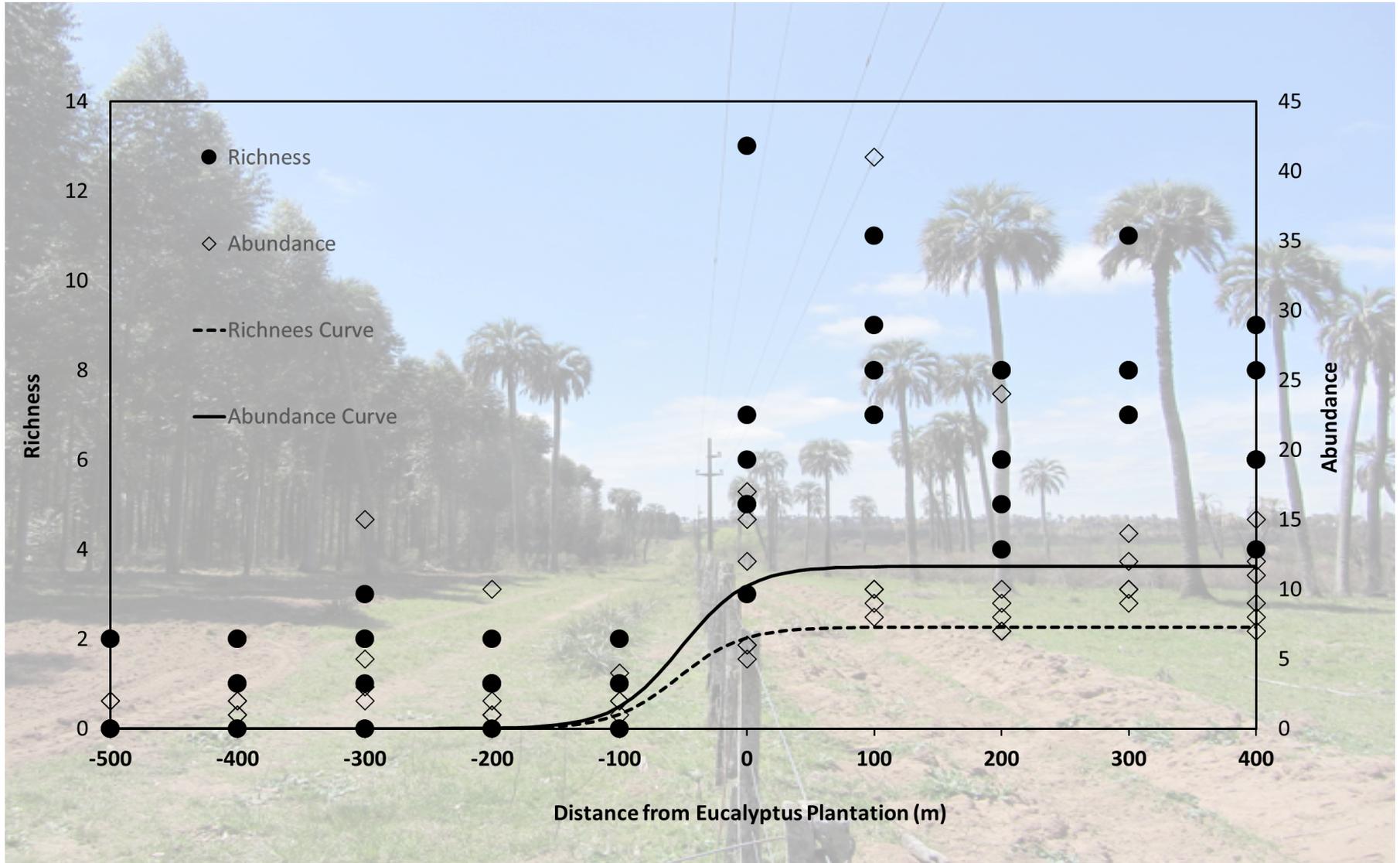
Q3 Results: Edge Effect



Q3 Results: Edge Effect



Q3 Results: Edge Effect



Summary

- Q1: Eucalyptus plantations result in impoverished avian community
- Q1: Mixed-use farms & pasture/annual crops supported levels
- Q1: Distinct communities associated with each land use in this region
- Q2: Threshold between young and mature plantations for some species
- Q3: Effects of plantations do not extend far beyond plantation



Management and Conservation

Landscape level

- Rotate young and mature stands
- Connected grassland/pasture corridors
- Consider mixed-use model
- Grassland reserves

Stand level

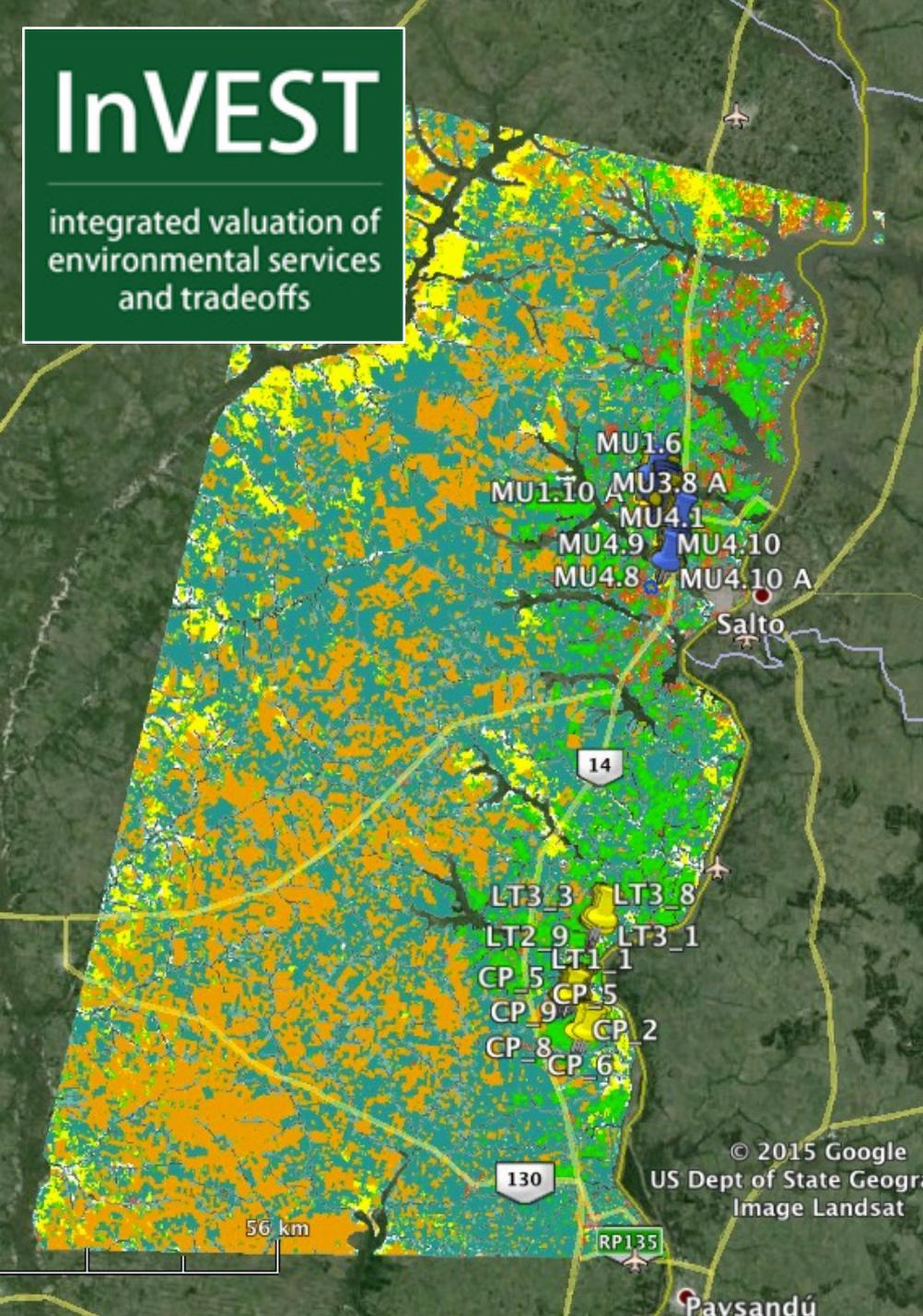
Need to study effectiveness of:

- Understory development via gaps
- Biological legacy (yatay palm)
- Lower-density planting intermixed with grazing



InVEST

integrated valuation of
environmental services
and tradeoffs



Next Steps

- Functional ecology perspective
- Reproductive success and possible telemetry study
- Native bees and land-use change research
- Model multiple ecosystem services in Entre Ríos with NatCap's InVEST software, including future eucalyptus expansion scenarios
- Integrate interviews, survey data, and focus groups

Acknowledgements

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Argentina virtus roboratur

Thank you for listening – Questions?



My son and favorite field assistant!